

Building Construction in Bush Fire Prone Areas

Bushfire Hazard Assessment Report

REF No. 16.12.307

Address Lot 6 DP 1209152
168 Church Lane
Castlereagh NSW 2749

For N. & K. Borg

The site was inspected on 18th October 2017

Report Preparation

Craig Burley

Grad Dip Design for Bushfire Prone Areas
FPAA Certified BPAD – Level 3 Practitioner



Bushfire Risk Assessment Certificate

As required by legislation under section 79BA of the *Environmental Planning and Assessment Act 1979 No 203*

Property Address:	Lot 6 DP 1209152 168 Church Lane Castlereagh NSW 2749
Description of Proposal	New Class 1a dwelling and new Class 10a building
Plan Reference: [Relied upon in report preparation]	This assessment is based on plans prepared by: Frank Kosztelnik and associates Dated: May 2018 Issue A Project No: 2919
Bushfire Hazard Assessment Report Ref. No.	16.12.307
Report Date:	12.06.2018
BAL Rating:	BAL 29
Does the proposal comply with the requirements of <i>Planning for Bush Fire Protection 2006</i> ?	YES with incorporation of the recommendations included contained in the attached Bushfire Hazard Assessment Report
Does the proposal require referral to the NSW Rural Fire Service?	YES
Does the proposal rely on Alternate Solutions?	YES and includes an AS 3959-2009 Method 2 Detailed Analysis

I Craig Burley of Control Line Consulting have carried out a bushfire risk assessment on the above mentioned proposal and property.

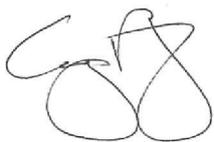
A detailed Bushfire Hazard Assessment Report has been prepared in accordance to the submission requirements as set out in *Appendix 4 of Planning for Bush Fire Protection 2006* together with recommendations as to how the relevant specifications and requirements are to be achieved.

I hereby certify, in accordance with *79BA of the Environmental Planning and Assessment Act 1979 No 203*:

1. That I am a person recognised by the *NSW Rural Fire Service* as a qualified consultant in bushfire risk assessment; and
2. That subject to the recommendations contained in the attached Bushfire Hazard Assessment Report the proposed development conforms to the relevant specifications and requirements.

I am aware that the Bushfire Hazard Assessment Report, prepared for the above mentioned site is to be submitted in support of a development application for this site and will be relied upon by Penrith City Council as the basis for ensuring that the bushfire risk management aspects of the proposed development have been addressed in accordance with *Planning for Bushfire Protection 2006*.

Yours faithfully



Craig Burley
Grad Dip Design in Bushfire Prone Areas
FPA Australia BPAD – Level 3 Certified Practitioner



Executive Summary

We have been engaged by N. & K. Borg the owners of the subject land to prepare a bush fire hazard assessment report to be a supplement for inclusion in a development application to Penrith City Council, for the proposed construction of a new Class 1a dwelling and a new Class 10a building upon their land.

The site has been identified as being bushfire prone land and therefore the legislative requirements for the proposed development are applicable.

The proposed development is an infill development as defined within *Planning for Bush Fire Protection 2006* and this report has been prepared in accordance with the requirements of *Section 79BA of the Environmental Planning and Assessment Act 1979*.

The objectives and performance requirements for the proposed development as required by the Building Code of Australia Volume 2 and the document *Planning for Bush Fire Protection 2006* will be achieved by the incorporation of the recommendations contained within this report.

However, the assessment includes an alternate solution for the Cumberland DSF vegetation being specific modelling for fuel loads as previously negotiated with the NSW Rural Fire Service. Additionally, an assumption of Rainforest has been used to determine the potential bushfire behaviour from the Remnant Forest located within the northern most section of the allotment.

Bushfire Attack Summary

Lot 6 DP 1209152

168 Church Lane Castlereagh NSW 2749

	South	North
Vegetation Formation	Forest	Remnant forest (Rainforest default)
Vegetation Slope	Downslope 18 degrees	Level
Building Separation Distance metres	45	13
Separation Slope	Level	Level
Fire Danger Index	100	100
Radiant Heat kw/m ²	21	NA
Flame Length metres	40.8	NA
Category of Bushfire Attack	High	High
AS 3959 Construction Standard	BAL 29	BAL 29

The proposal and the recommendations contained within this report can provide for conformity to *Planning for Bush Fire Protection 2006* and therefore will assist in providing a reasonable level of bushfire protection and improve but not guarantee the chances of building survival, or provision for the occupants with a safe refuge during the passage of a bushfire front and or the provision of a defensible space for fire fighters.

Table of Contents

1.0	Introduction	1
1.1	Purpose of Report	1
1.2	Scope of Report	1
1.3	Regulatory Controls	1
1.4	Methodology	2
1.5	The Proposal	2
2.0	Site and Adjacent Developments	3
2.1	Site Description	3
2.2	Description of Adjoining Lands	5
3.0	Environmental Considerations	6
4.0	Bushfire Hazard Assessment	7
4.1	Classification of Vegetation and Separation Distance from Proposed Development	7
4.2	Slope Assessment	8
4.3	Category of Bushfire Attack	9
5.0	Assessment of the extent to which the development conforms or deviates from Chapter 4 of <i>Planning for Bush Fire Protection 2006</i>	9
5.1	Asset Protection Zones	10
5.2	Siting and Design of Proposed Development	11
5.3	Construction Level	11
5.4	Access / Egress	12
5.5	Utility Supplies	12
5.6	Landscaping	15
6.0	Bushfire Hazard Assessment Recommendations	16
7.0	Conclusion	18
	References	19

Appendix 1 – Proposed dwelling plans ex Frank Kosztelnik and Associates

Appendix 2 – AS 3959-2009 Method 2 Detailed Analysis Calculations ex Flamesol

1.0 Introduction

We have been engaged by N. & K. Borg the owners of the subject land to prepare a bush fire hazard assessment report to be a supplement for inclusion in a development application to Penrith City Council for the proposed construction of a new Class 1a dwelling upon the subject land.

The site has been identified as being bushfire prone land and therefore the legislative requirements for the proposed development are applicable.

The proposed development is an infill development as defined within *Planning for Bush Fire Protection 2006* and this report has been prepared in accordance with the requirements of *Section 79BA of the Environmental Planning and Assessment Act 1979*.

1.1 Purpose of Report

- To determine the vegetation type, the expected fire behaviour and the threat to the proposal; and
- To assess the proposal with reference to *Planning for Bush Fire Protection 2006*; and
- To assess the proposed construction with reference to the Building Code of Australia Volume 2; and
- To determine the level of construction with reference to AS 3959-2009 *Construction of buildings in bushfire prone areas*; and
- To identify any other such measures as to improve the chances of building survival during a bushfire event; and
- To assist the consent authority Penrith City Council in the determination of the development application subject to this proposal.

1.2 Scope of Report

The scope of this report is limited to the Bushfire Hazard Assessment for the proposed development and only contains recommendations for the subject property. Where reference is made to adjacent or adjoining lands, this report does not purport to assess those lands; rather it may discuss bushfire progression on and through those lands with the possible bushfire impact to the subject property and the proposed development.

1.3 Regulatory Controls

The preparation of this report has given consideration to the various legislative and regulatory requirements including the *Environmental Planning and Assessment Act 1979*, the Building Code of Australia, *Planning for Bush Fire Protection 2006* and AS 3959-2009 *Construction of buildings in bushfire prone areas*.

1.4 Methodology

A site inspection for the purpose of assessing bushfire related matters affecting this site was conducted on the 18th October 2017 and a review of the proposed construction plans as supplied and prepared by Franks Kosztelnik and Associates has taken place.

An assessment of slope was conducted out to a distance of 100 metres and assessment of vegetation to a distance of 140 metres from the proposed development.

The findings were related and assessed with reference to *Planning for Bush Fire Protection* 2006 Addendum to Appendix 3 and section 2 of AS 3959-2009 *Construction of buildings in bushfire prone areas* for the formulation of the Bushfire Hazard Assessment.

1.5 The Proposal

The proposal as indicated by consultation with the proponents and perusal of plans supplied, shows for the construction of a new two storey Class 1a dwelling and a new Class 10a building being a storage shed.

The building footprint for the dwelling has been positioned upon the plans supplied and detail on such plans shows the new dwelling shall be located approximately 30.0 metres from the north eastern (road frontage) boundary, 15.0 metres from the south eastern boundary and 24.0 metres from the north western boundary.

The external finishes have not been shown upon the plans supplied although it is envisaged that these will be detailed subject to the findings of this report.

In regards to the Class 10a building this is shown to be located not closer than 11.0 metres to the west from the dwelling and 5.0 metres from the north western boundary.

Further details of construction are shown upon plans included within appendix 1 of this report.

However, it must be noted that the plans supplied may not fully satisfy the recommendations included within this report and subject to actual consent conditions issued by the consent authority some modifications or changes may need to occur to achieve the required compliance.

2.0 Site and Adjacent Developments

The following seeks to describe the site, the adjoining lands and land uses effective upon the development proposal.

2.1 Site Description

The site is identified as Lot 6 DP 1209152
 168 Church Lane
 Castlereagh NSW 2749
 LGA Penrith City Council

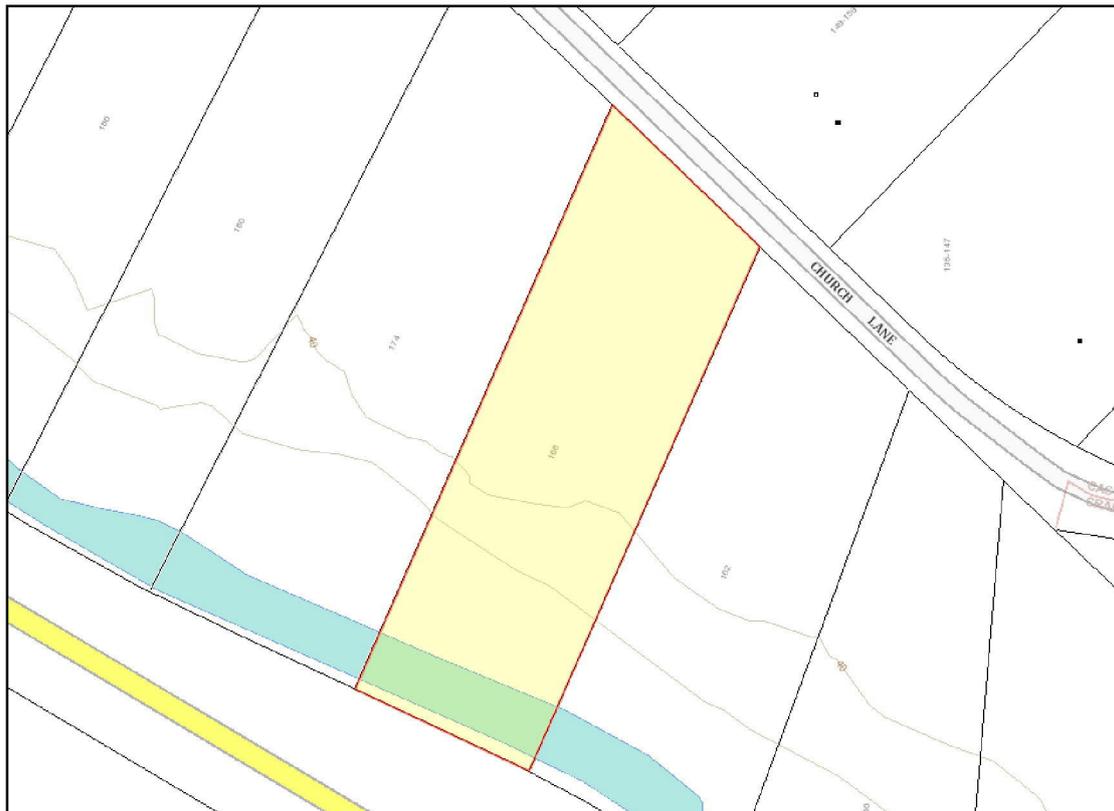


Figure 1: Address validation ex Dept of Lands

The subject allotment was created to the current subdivisional requirements contained within *Planning for Bush Fire Protection 2006*.

The site is a rural lifestyle allotment of approximately 2.092 hectares located on the south western side of Church Lane. The area in which the proposal is located is generally similar development that has been established for many years although the subject allotment is within a subdivision that has been very recently registered.

The subject allotment is located within an area that should be considered as having a direct interface to bushfire hazardous vegetation.

The subject allotment is positioned upon the level terrain and south westerly aspect slopes above the alluvial river flats adjacent to the eastern side of the Nepean River. The parcel of land is essentially rectangular in shape and the north eastern boundary is the road frontage for the subject site. At present the site has no structural improvements and should be considered as being vacant land.

In terms of vegetation within the subject allotment there are only two areas of vegetation effective upon the proposed development being a significant section of vegetation located on the south westerly aspect slopes within the southern most section of the allotment.

This area has been identified as being a section Cumberland Dry Sclerophyll Forest (DSF) after consultation with the NSW Rural Fire Service.

Additionally, there is a very small area of remnant forest located adjacent to the north eastern (road frontage) boundary.

The site is shown upon the Penrith Bushfire Prone Land Map (Figure 2) to be wholly almost within category 1 vegetation with only small areas of category 2 vegetation to the north and south.

However, the site inspection and interpretation of aerial photography for the site confirms that the subject allotment has a significantly large of cleared land across the central and northern sections of the allotment which would be more accurately described as being buffer zone.

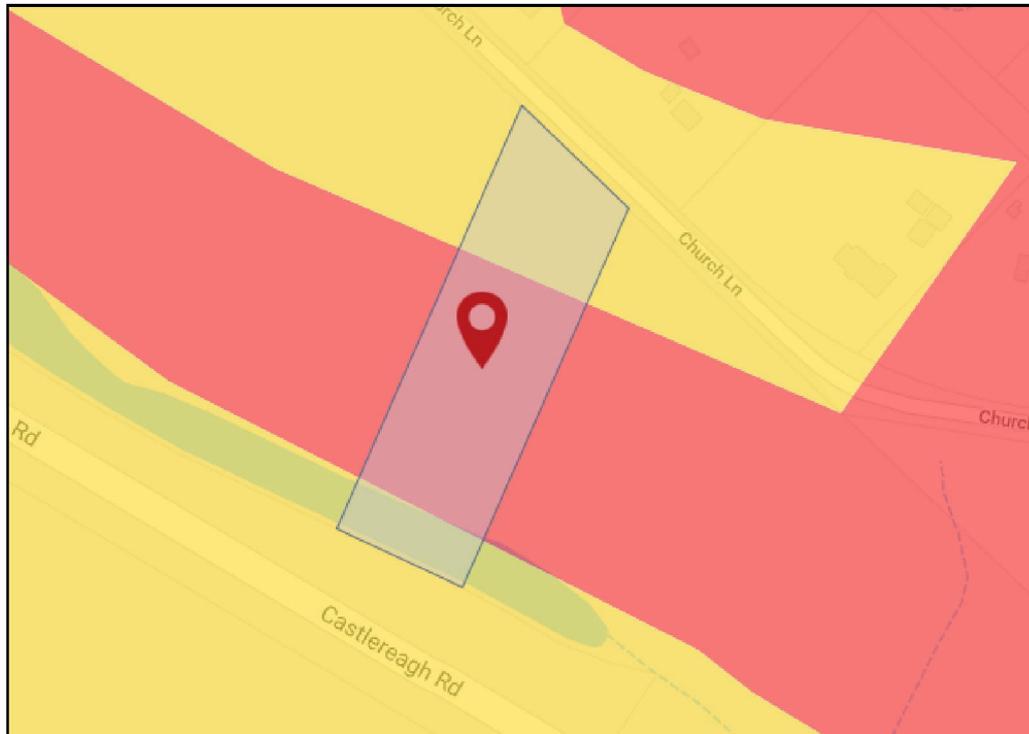


Figure 2; Section Penrith LGA Bushfire Prone Land Map

Provision of mains reticulated water supply, electricity and phone is available to the proposal by existing infrastructure.

2.2 Description of Adjoining Lands

To the north of the subject allotment is the carriageway of Church Lane and beyond this are rural lifestyle allotments that are mostly in a well maintained condition. There is a section of Woodland vegetation approximately 130 metres to north of the proposed dwelling location although given this separation distance this vegetation has little influence on the subject allotment.

To the east and west of the subject allotment is other lands within the same subdivision as created the subject allotment. This land is a combination of grassland adjacent to the eastern boundary that transitions into being Cumberland DSF on the descending slopes further to the south.

It should be noted that the adjoining allotments in these directions are also subject to recent development applications and the similar criteria for assessment has been used in this assessment as these are accepted inputs.

To the south of the subject allotment is the carriageway of Castlereagh Road and beyond this is the Penrith Lakes Development Scheme. This area consists of being a combination of open grasslands and lakes.



Figure 3: Aerial photo depicting localised terrain and adjoining allotments ex Nearmap

3.0 Environmental Considerations

The scope of this report has not been to provide an environmental survey although this report will be a supplement to a Statement of Environmental Effects as part of the development application process.

The proposed scope of works does not necessitate the removal of any significant sections of vegetation to satisfy the recommendations for asset protection zones. It is also our opinion that the bushfire protection measures as recommended within this report will have little or no adverse environmental effects.

The proposal is located on a site that has been developed for many years and this proposal does not change the current approved land use or increase the expected level of occupancy.

4.0 Bushfire Hazard Assessment

The bushfire hazard assessment was conducted for the proposed development, using the procedures as outlined in *Planning for Bush Fire Protection 2006*, Addendum to Appendix 3 and section 2 of AS 3959-2009 *Construction of buildings in bushfire prone areas* procedure to determine the bushfire attack level (BAL) likely upon the development.

The assessment was conducted on the assumption of the building footprint being positioned as described in section 1.5 The Proposal of this report and the site plan.

4.1 Classification of Vegetation and Separation Distance from Proposed Development

The vegetation was assessed for a distance of 140 metres from the proposed development building footprint in each of the following directions. To the north, east, south and west being the general direction adjacent and away from the proposed building elevations within such building footprint.

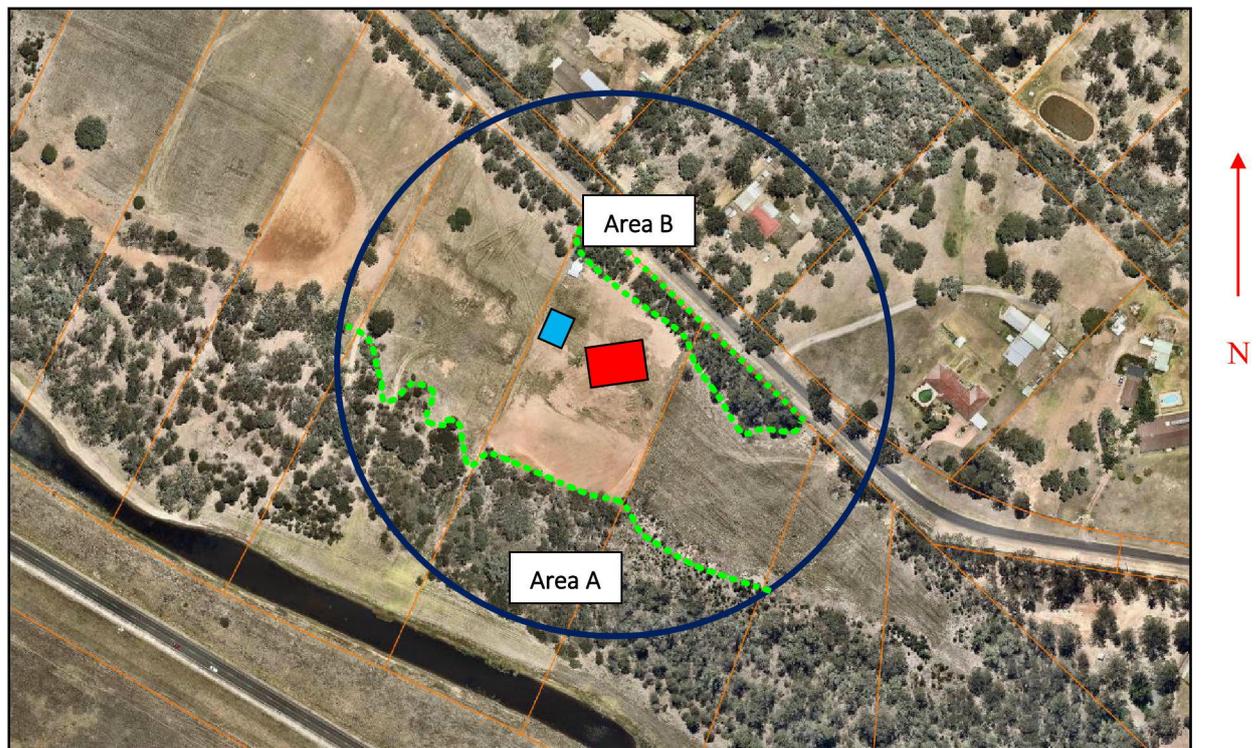


Figure 4: Vegetation study area Image ex Dept Lands Forest

■ Proposed dwelling approx. location ■ Proposed shed approx. location

To the south of the subject allotment (Area A) is the most effective bushfire hazardous vegetation and this area should be classified as being a vegetation formation of Cumberland Dry Sclerophyll Forest as determined by consultation with the NSW RFS.

After consideration of the asset protection zones approved for the original subdivision by Penrith City Council a distance of 53.0 metres in separation shall be provided.

To the north of the proposed dwelling is an isolated section of Remnant Forest (Area B). The proposed dwelling is to be located no closer than 15.0 metres from this section vegetation. Given that this vegetation is a Remnant Forest to determine the potential bushfire behaviour Rainforest has been used to determine the potential bushfire attack.

4.2 Slope Assessment

The slope was assessed for a distance of 100 meters within the bushfire hazardous vegetation and reference to slope classifications has been undertaken considering the procedure specified within section 2 of AS 3959-2009 *Construction of buildings in bushfire prone areas*.

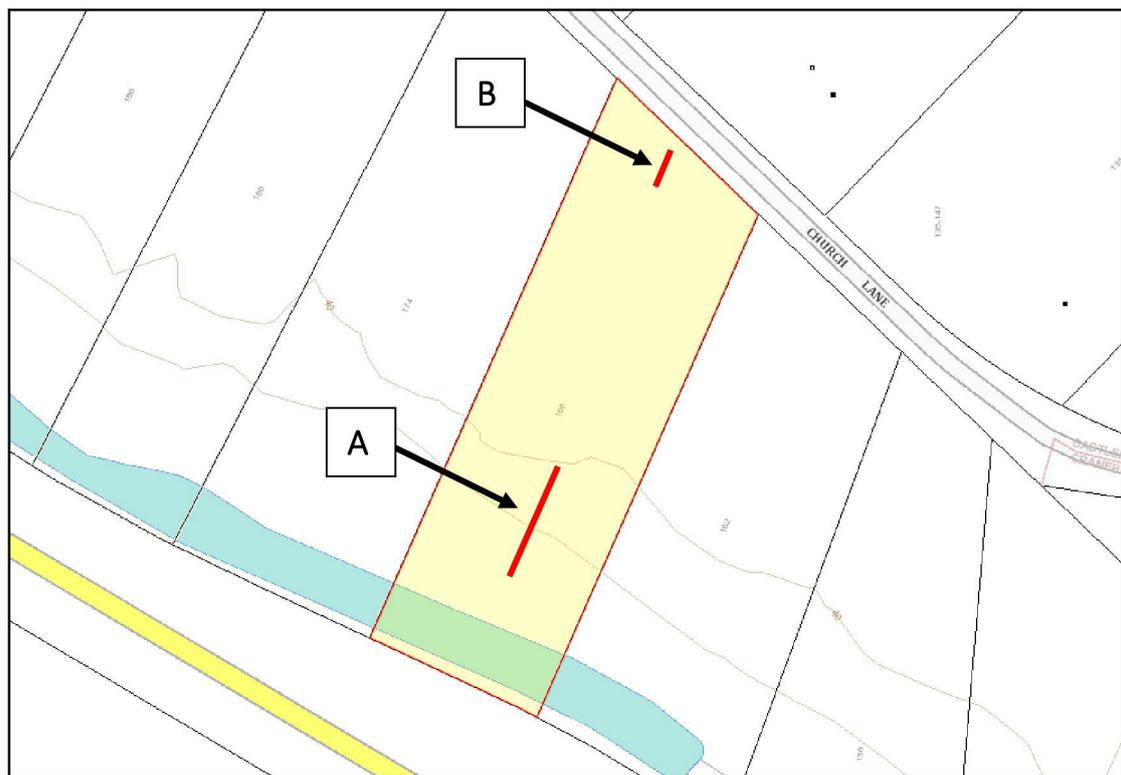


Figure 5; Slope assessment study area Image ex Dept Lands

The **effective slope** of the land, out to a distance of 100 metres from the proposed scope of works (that is, the slope of the land most likely to influence bushfire behaviour for the purposes of calculating the Category of Bushfire Attack and Asset Protection Zones, has been assessed (using a clinometer) and desktop analysis as being;

- Downslope 18 degrees to the south – A
- Level slope to the north – B

4.3 Category of Bushfire Attack

The bushfire attack level (BAL) for the proposed development was determined by using the information gathered with respect to the classification of the vegetation, the effective slope and provision of asset protection zones specified in this report with reference given to the Addendum to Appendix 3 of *Planning for Bush Fire Protection* 2006 and the procedures within section 2 of AS 3959-2009 *Construction of buildings in bushfire prone areas*.

It is the determination of the site inspection, the assessment procedure with incorporation of the recommendations in this report that the proposed development could experience a **High** category of bushfire attack. The proposed development is most likely to be subject to the greatest bushfire attack from any area to the **south** from the proposed development location.

Bushfire Attack Summary

	South	North
Vegetation Formation	Forest	Remnant forest (Rainforest default)
Vegetation Slope	Downslope 18 degrees	Level
Building Separation Distance metres	45	13
Separation Slope	Level	Level
Fire Danger Index	100	100
Radiant Heat kw/m ²	21	NA
Flame Length metres	40.8	NA
Category of Bushfire Attack	High	High
AS 3959 Construction Standard	BAL 29	BAL 29

5.0 Assessment of the extent to which the development conforms or deviates from Chapter 4 of *Planning for Bush Fire Protection 2006*

The proposed development being the construction of a new Class 1a dwelling will conform to the requirements of *Planning for Bush Fire Protection 2006* when considered in conjunction of both the proposal supplied for this assessment and the recommendations arising from this bushfire hazard assessment report.

5.1 Asset Protection Zones

The provision of asset protection zones for the proposed building footprint can be fully provided for on site to satisfy the requirements of *Planning for Bush Fire Protection 2006*.

The maintenance of the majority of area upon the subject allotment currently would mostly satisfy the requirements of an inner protection area of an asset protection zone as contained in *Planning for Bush Fire Protection 2006*.

This report will recommend that the site where not built upon is maintained to the requirements of an inner protection area of an asset protection zone and managed to these provisions for the lifetime of the development as follows;

- From the northern elevation of the proposed dwelling for a distance of 15.0 metres;
- From the eastern and western elevation of the proposed dwelling to adjacent section of the allotment boundaries; and
- From the southern elevation of the proposed dwelling for a distance of 58.0 metres.

The following is a summary of the requirements for an asset protection zone inner protection area as described within the documents *Planning for Bush Fire Protection 2006* and *NSW RFS Standards for Asset Protection Zones*.

Inner Protection Area

An IPA should provide a tree canopy cover of less than 15% and the tree canopy should be located greater than 2.0 metres from any part of the roof line of a dwelling. Garden beds of flammable shrubs should not be located under trees and should be located not closer than 10 metres from an exposed window or door. Trees should have lower limbs removed up to a height of 2.0 metres above the ground.

Ground fuels such as fallen leaves, twigs (less than 6mm in diameter) and branches should be removed on a regular basis, and grass needs to be kept closely mown and where possible green.

The creation and continued maintenance of the full asset protection zone is one of the primary factors in bushfire protection measures for developments in bushfire prone areas.

5.2 Position and Design of Proposed Development

The design and siting of the proposed dwelling must take into consideration the actual bushfire risk and this report contains recommendations to assist in mitigating the mechanisms of bushfire attack.

5.3 Construction Level

The Building Code of Australia contains both the performance requirements and the 'deemed to satisfy' provisions relating to construction of class 1, 2 & 3 buildings that are proposed for *construction in bushfire prone areas*. To satisfy the performance provision P2.3.4 of the Building Code of Australia Vol. 2, a Class1a building that is constructed in a designated bushfire prone area must be designed and constructed to reduce the risk of ignition from a bushfire while the fire front passes.

Australian Standard 3959-2009 *Construction of buildings in bushfire prone areas* is referenced by the BCA as the deemed to satisfy construction standard for residential dwellings in designated bushfire prone areas with the exception that in NSW the requirements shall be varied to comply with the Addendum to Appendix 3 of *Planning for Bushfire Protection 2006*.

Given that the category of bushfire attack that could be anticipated for such development is High from vegetative fuels to the north and south, this proposed dwelling should therefore be designed and constructed to the requirements of AS 3959-2009 and must be constructed to comply with section 3 Construction General and section 7 BAL 29 of such standard apart from as varied to comply with the Addendum to Appendix 3 of *Planning for Bushfire Protection 2006*.

The Building Code of Australia (BCA) for Class 10a buildings and 10b structures does not provide for any bushfire specific performance requirements and as such AS3959 – 2009 *Construction of buildings in bushfire prone areas* does not apply as a set of deemed to satisfy provisions where a Class 10a building is separated by a distance greater than 6 metres from the building required to be constructed to the requirements of AS 3959.

In NSW this distance is increased to be 10 metres by the requirements of *Planning for Bush Fire Protection 2006* (PBP) although irrespective of separation distance the general aims and objectives of PBP for Class 10 developments must still be adequately considered.

Specifically the objectives are to;

- (i) afford the occupants of any building adequate protection from exposure to a bushfire;
- (ii) provide for a defensible space to be located around buildings;
- (iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;
- (iv) ensure that safe operational access and egress for emergency service personnel and residents is available;

- (v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and
- (vi) ensure that utility services are adequate to meet the needs of fire fighters (and others assisting in bushfire fighting).

In this instance the proposed Class 10a building is separated by a distance well in excess of 10 metres (being 11.0 metres) from the proposed dwelling and therefore AS 3959 does not apply. However the aims and objectives of PBP as noted are not satisfied with respect to potential direct flame contact due to the proximity of forest vegetation on the adjacent lands to the southwest.

PBP also states *“in circumstances where the aims and objectives of PBP (section 1.1) are not met, then the construction requirements for bushfire protection will need to be considered on a case by case basis.”*

Therefore, this report recommends that the Class 10a building is constructed using non combustible building materials. The use of timber or other combustible building elements is not supported.

5.4 Access / Egress

5.4.1 To the Proposed Development

The access to the subject site is from Church Lane which is a sealed two lane road in a well maintained condition and under most conditions should provide adequate access and egress for both residents and emergency service vehicles.

Church Lane links to other through roads at each end which would afford the residents the ability to evacuate the area to a location not being directly implicated by the mechanisms of bushfire attack, although under most bushfire conditions this would generally not be required.

5.4.2 Within the Site

The site plan for the proposal does show that vehicle access may not be possible to all elevations of the dwelling, although a fire tanker will be able to park in close proximity to the northern building elevation upon the road verge of Church Lane and foot access will be available to each of the other building elevations.

5.5 Utility Supplies

5.5.1 Water

This section of Castlereagh is serviced by a mains reticulated water system and a search of the mains reticulated water supply layout plans (see figure 6 below) indicates that a hydrant is located approximately 15 metres to the north from the subject allotment on the road frontage area of Church Lane.

Even though the proximity of the hydrants to the dwelling may satisfy the provisions of AS2419.1-2005 *Fire hydrant installations* the increased demands for water pressure and volume from the mains supply during a bushfire event may exceed the capabilities of the mains system and the water authority cannot normally guarantee supply. This is not an uncommon event during a bushfire event.

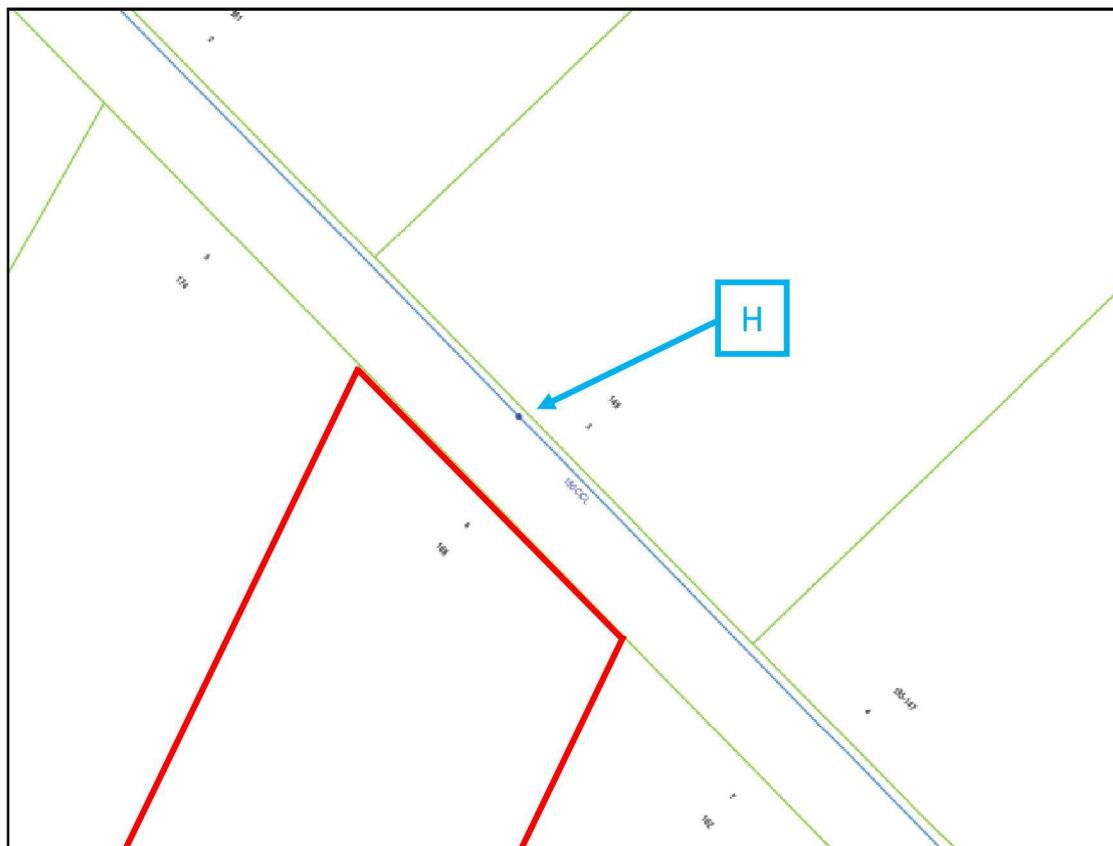


Figure 6: Section Sydney Water Reticulated Mains Water Supply Layout Plans

Therefore, the proposed development must be able to integrate suitable measures that ensure an independent, reliable water supply for use during a bushfire event by the occupants or a firefighting authority tanker, and should have the following key objectives:

- To enable a suitably prepared, able bodied person or persons to undertake first aid fire suppression of small ignitions near or on the external elevations of the building that may occur before and after the passing of a bushfire front.
- To be able to replenish bushfire tankers that may be in attendance during a bushfire event
- To be able to operate independently of the mains power supply so as to be able to fully function if an electrical mains power failure occurred
- To be able to supply an adequate amount of water at the required pressure to firefighting hose or hoses

It should be noted that as a bushfire front passes the levels of ember attack, radiant heat, smoke and flame impingement may not allow for residents or fire fighters to be directly exposed, and a safe refuge area should be retreated to until the main fire front has passed.

To satisfy the requirements of *Planning for Bush Fire Protection 2006* it is a recommendation of this report that a reserve Static Water Supply (SWS) of not less than 20,000 litres be permanently maintained on the subject allotment within noncombustible tanks located within the inner protection area of the asset protection zone.

The reserve Static Water Supply (SWS) should be permanently plumbed to a petrol or diesel firefighting water pump of not less than 5 hp. The pump must be shielded from the direct effects of a bushfire event.

The site restrictions may not allow for a bushfire tanker to have direct and clear access to the reserve Static Water Supply (SWS) and as such the proposed development should provide a delivery line of not less than 50mm diameter from the firefighting water pump to an outlet point located directly on the road frontage boundary. This outlet point should be fitted with a ball or gate valve and a 65 to 38mm Storz reducer fitting.

The water pump should also be connected to and supply water to kink resistant hose or hoses with a minimum diameter of not less than 19mm and firefighting nozzle capable of reaching all building elevations.

All plumbing and fittings associated with reserve water supply, the first aid fire hoses, the tanker refill outlet point and firefighting pump that is above the ground or below the ground for less than 300mm shall be metal.

The installation and ongoing maintenance of the plumbing and water pump must be undertaken to the manufacturer specifications.

The site shall provide NSW RFS Static Water Supply (SWS) approved signage fitted in the approved locations to enable fire fighters clear indication of the location of the reserve water and the outlet point.

The NSW RFS district office can assist with the procurement of these signs and the guidelines for suitable installation.

5.5.2 Electricity

The methodology for the connection of electricity shall be by overhead wire connection from the mains service supply to a pole that will be located just inside the road frontage boundary and from that point it shall travel underground to the metre box upon the external wall of the dwelling. This connection should not increase to a large extent the likelihood of bushfire ignition or be the cause of electrical failure to the subject site under most conditions due to the limited overhead distance to be spanned by the wiring.

5.5.3 Gas

At the time of report preparation it was not proposed to connect gas supply to the subject dwelling. However any future connection to either mains or portable gas supply should be undertaken and maintained to the provisions of AS 1596-2002 *Storage and handling of LP Gas*. All piping associated with the installation must be metal.

5.6 Landscaping

A formal landscaping plan was not supplied for perusal at the time of formulating this report however recommendations are made with respect to the maintenance of the area on the site.

It is highly probable that in the future landscaping and garden establishment may occur on the site. However no future planting of trees or shrubs, or combustible landscaping features should be undertaken or constructed in a manner which creates a path for bushfire progression towards the dwelling or allows for a potential compromise to the integrity of the asset protection zone.

5.7 Emergency Procedures

Preparation of procedures and actions by individuals and occupants of lands within bushfire prone areas has clearly been shown to increase chances of personal safety and building survival should a bushfire event occur.

The NSW Rural Fire Service and the NSW Fire Brigades have formulated a Bush Fire Survival Plan and this is readily available from either the NSW RFS website or the local district office.

This document should be completed by the residents in conjunction with all occupants of the household so as to better prepare all persons for a bushfire event.

After completion it should be regularly reviewed (at least once a year) and stored in a location as to be easily accessible for reference during a bushfire emergency.

6.0 Bushfire Hazard Assessment Recommendations

1. That the site where not built upon shall have the vegetation reduced where necessary to satisfy the requirements of *Planning for Bush Fire Protection 2006* and the NSW Rural Fire Service document “Standards for Asset Protection Zones” for an inner protection area of an asset protection zone and this area shall be maintained at this vegetation level for the lifetime of the development as described below:
 - From the northern elevation of the proposed dwelling for a distance of 15.0 metres;
 - From the eastern and western elevations of the proposed dwelling to adjacent section of the allotment boundaries; and
 - From the southern elevation of the proposed dwelling for a distance of 58.0 metres.

These areas are to form a continuous and linked buffer around the entire dwelling.

2. That no future landscaping features, planting of shrubs, trees or other vegetation shall occur in such a manner as to compromise the integrity of the asset protection zone.
3. That the proposed dwelling shall be constructed to a minimum standard of section 3 Construction General and section 7 BAL 29 of AS3959-2009 *Construction of buildings in bushfire prone areas* with the exception that the construction requirements shall be varied to comply with the requirements of the NSW Rural Fire Service Addendum to Appendix 3 Table A3.7 of *Planning for Bush Fire Protection 2006*.
4. That the Class 10a building is constructed using non combustible building materials. The use of timber or other combustible building elements is not supported.
5. That the dwelling shall maintain a reserve Static Water Supply (SWS) for use during a bushfire event of not less than 20,000 litres stored in a noncombustible tank within the area of recommended asset protection zone.
6. The reserve Static Water Supply shall be permanently plumbed to a petrol or diesel firefighting water pump with a minimum of 5hp. The pump shall be regularly maintained as per the manufacturer specifications. The pump must be located in such a position to be shielded from the direct mechanisms of bushfire attack.

7. That a water delivery line of not less than 50 mm diameter be plumbed from the firefighting water pump plumbed to the reserve Static Water Supply tank, to an outlet point directly on the northern road frontage boundary of the subject allotment to enable firefighting tankers to refill. The outlet of this line shall be fitted with a ball or gate valve and a 65 to 38mm reducer Storz fitting.
8. That the development must provide and have readily available kink resistant hose or hoses with a diameter of not less than 19mm and a fire fighting nozzle, capable of reaching all elevations of the dwelling, and fittings suitable for connection to the firefighting water pump.
9. That all plumbing associated with the reserve water supply above the ground or for a depth of not less than 300mm below the ground shall be metal.
10. That approved NSW Rural Fire Service; Static Water Supply signage is installed at approved locations for the proposed development.
11. That the supply of electricity and telephone to the dwelling shall be under ground where at all possible.
12. That if the supply of gas to the subject dwelling is undertaken it shall be installed and maintained in accordance with AS 1596-2002 and requirements of relevant authorities.
13. The residents should complete a *Bush Fire Survival Plan* as formulated by the NSW Rural Fire Service and the NSW Fire Brigades.

These recommendations are the opinions of the author of this report and are compiled to assist the consent authority and the NSW Rural Fire Service in the assessment of this proposed development and that the final conditions as imposed by the consent authority must be adhered to at all stages and where required for the lifetime of the development.

7.0 Conclusion

The objectives and performance requirements for the proposed development as required by the Building Code of Australia Volume 2 and the document *Planning for Bush Fire Protection 2006* will be achieved by the incorporation of the 13 recommendations contained within this report.

The recommendations contained within this report will assist in providing a reasonable level of bushfire protection and improve but not guarantee the chances of building survival, or provision for the occupants with a safe refuge during the passage of a bushfire front and or the provision of a defensible space for fire fighters.



Craig Burley
Grad.Dip. Building in Bushfire Prone Areas (UWS)
FPA Australia Certified BPAD – Level 3 Practitioner



Caveat

Quote from *Planning for Bush Fire Protection 2006*, '*notwithstanding the precautions adopted, it should always be remembered that bushfire burn under a wide range of conditions and an element of risk, no matter how small always remains.*'

Quote from Standards Australia, '*Although the standard is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion.*'

References

Planning for Bush Fire Protection 2006 Planning NSW in conjunction with NSW Rural Fire Service

Building Code of Australia Volume 2 2005 Australian Building Codes Board

AS 3959 –2009 Construction of buildings in bushfire prone areas Standards Australia & Australian Building Codes Board

Landscape and building Design for Bushfire Areas Ramsay C. & Rudolph L. CSIRO 2003

Quantifying bushfire penetration into urban areas in Australia Keping Chan & McAneny J. Geophysical Research Letters, Volume 31, L12212, doi:10.1029/2004GL020244,2004

Bushfires in Australia Luke R.H. & McArthur CSIRO 1978

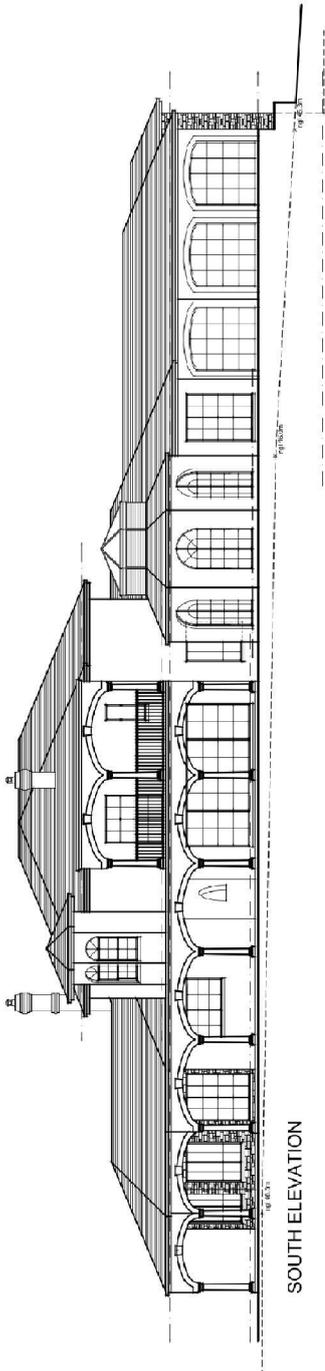
Performance of Building Elements in Bushfire Prone Areas Poon S.L. & England J.P. Warrington Fire Research Australia

Address Validation Search Department of Lands www.maps.nsw.gov.au

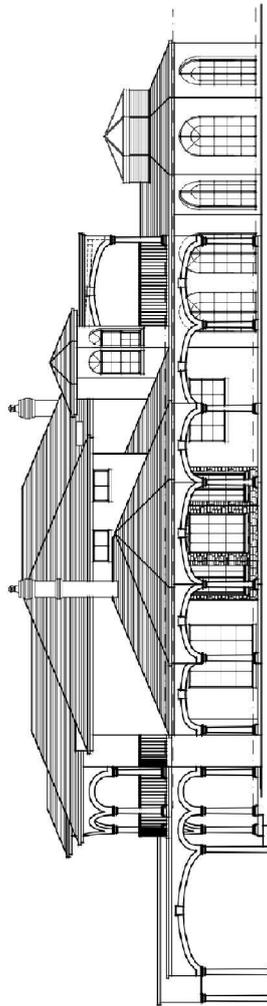
Standards for Asset Protection Zones NSW Rural Fire Service 2005

Ocean Shores to Dessert Dunes Keith D. Department of Environment and Conservation Sydney 2004

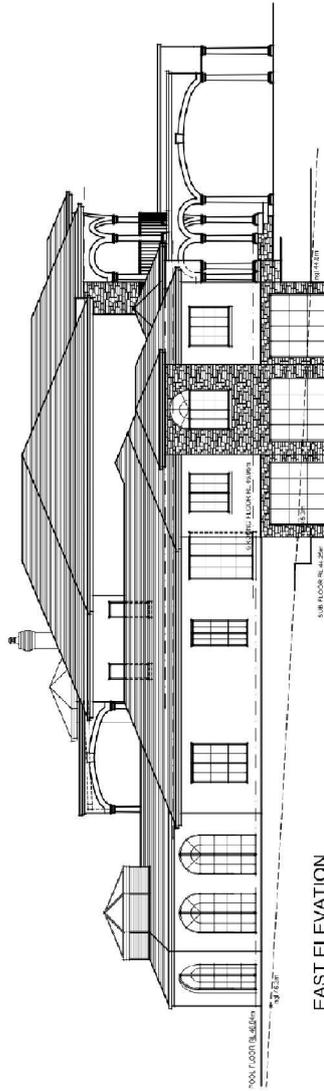
Appendix 1- Proposed dwelling plans ex Frank Kosztelnik and Associates



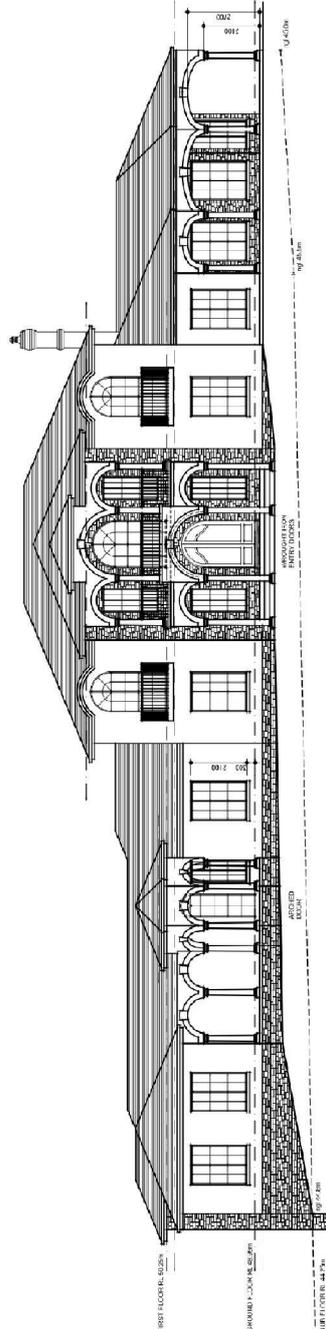
SOUTH ELEVATION



WEST ELEVATION



EAST ELEVATION



NORTH ELEVATION

ABBREVIATIONS

DIM. DIMENSIONS
 FIN. FINISHES
 GR. GROUND
 H. HEIGHT
 I. INTERIOR
 L. LENGTH
 M. MATERIALS
 N. NORTH
 P. PLAN
 R. RADIUS
 S. SOUTH
 T. THICKNESS
 W. WIDTH
 Y. YIELD
 Z. ZONE

CONSTRUCTION

CONCRETE CONCRETE
 BRICK BRICK
 STUCCO STUCCO
 SIDING SIDING
 ROOF ROOF
 FLOOR FLOOR
 CEILING CEILING
 PARTITION PARTITION
 WINDOW WINDOW
 DOOR DOOR
 RAILING RAILING
 STAIR STAIR
 BALCONY BALCONY
 PORCH PORCH
 TERRACE TERRACE
 DRIVE DRIVE
 GARAGE GARAGE
 PORCH PORCH
 TERRACE TERRACE
 DRIVE DRIVE
 GARAGE GARAGE

NOTES

1. ALL DIMENSIONS ARE IN FEET AND INCHES.
 2. ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.
 3. ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.
 4. ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.
 5. ALL DIMENSIONS ARE TO FACE UNLESS NOTED OTHERWISE.

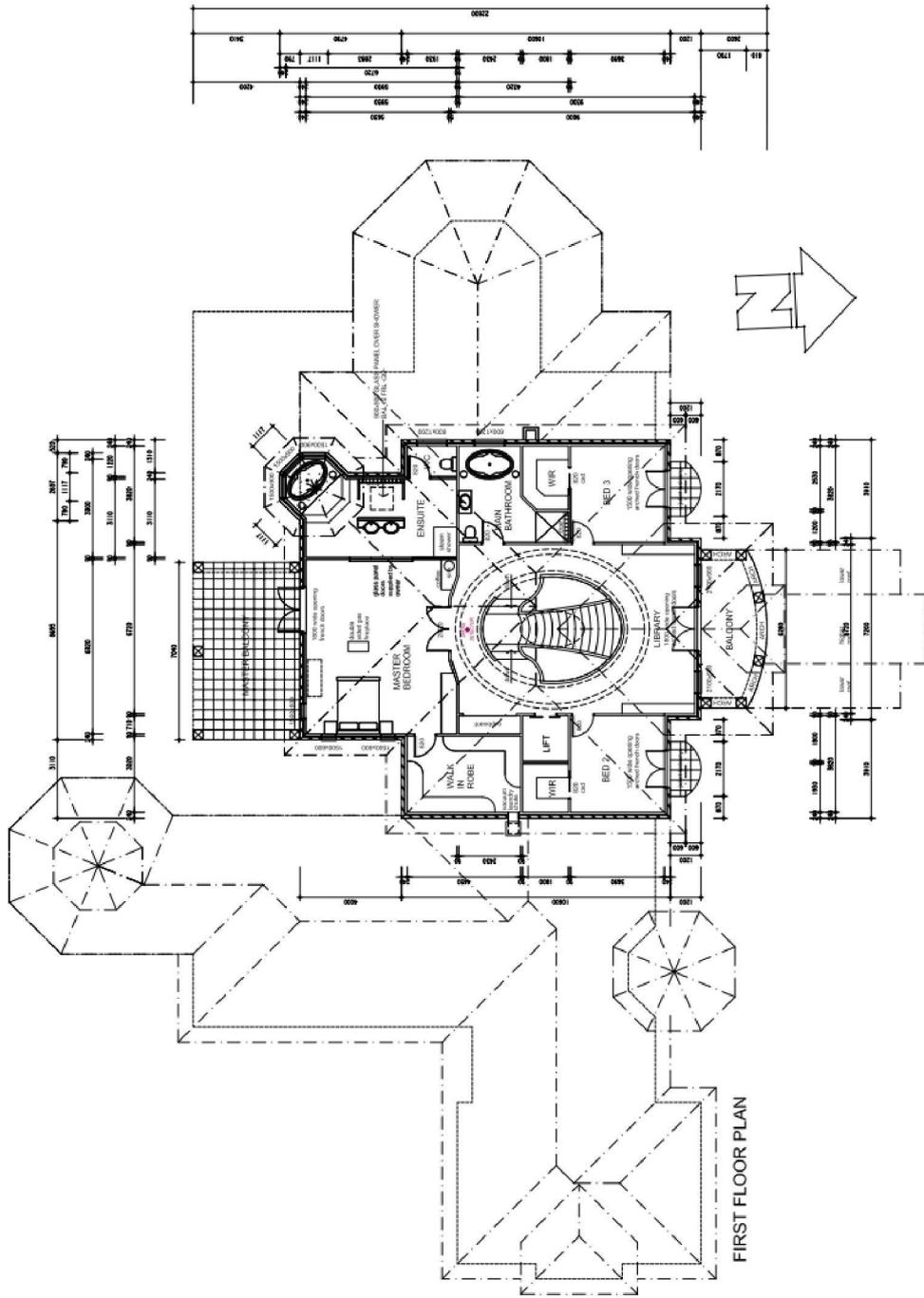
FRANK KOSZTELNIK AND ASSOCIATES
 ARCHITECTS
 168 CHURCH LANE
 CASTLEREAGH
 NEW YORK, NY 10516
 TEL: 914.382.1010
 FAX: 914.382.1011
 WWW.FRANKKOSZTELNIK.COM
 E-MAIL: FRANK@FRANKKOSZTELNIK.COM

PROPOSED RESIDENCE
 AT: 168 CHURCH LANE
 CASTLEREAGH
 FOR: N + K BORG

TITLE AND
 DATE
 DRAWN BY
 DATE
 CHECKED BY
 DATE
 JOB NO.

168 CHURCH LANE
 CASTLEREAGH, NY 10516
 168 CHURCH LANE
 CASTLEREAGH, NY 10516
 168 CHURCH LANE
 CASTLEREAGH, NY 10516
 168 CHURCH LANE
 CASTLEREAGH, NY 10516

ELEVATIONS, SECTION



FIRST FLOOR PLAN

ABBREVIATIONS

Bed to suite: B2S
 Kitchen: K
 Living area: LA
 Living room: LR
 Dining room: DR
 Study: S
 Office: O
 Bedroom: B
 Master bedroom: MB
 Bathroom: BATH
 Ensuite: ENS
 Lift: LIFT
 Staircase: STAIR
 Terrace: TERR
 Balcony: BALC
 Pergola: PERG
 Pool: POOL
 Spa: SPA
 Gym: GYM
 Garage: GAR
 Carport: CARP
 Driveway: DRIVE
 Entry: ENTRY
 Hallway: HALL
 Closets: CLO
 Wardrobe: WR
 Linen closet: LINCLO
 Utility room: UTILITY
 Laundry: LAUNDRY
 Storage: STOR
 Pantry: PANTRY
 Foyer: FOYER
 All dimensions are in millimetres unless noted otherwise.

This drawing is to be used in conjunction with the Specifications.
 All dimensions are subject to confirmation by the Builder.
 Figure dimensions to be taken in accordance to reading.

FRANK KOSZTELNIK AND ASSOCIATES
 ARCHITECTS
 AND DEVELOPMENT CONSULTANTS
 SUITE 11002 CHAMBERS
 10000 UNIVERSITY AVENUE
 KILGORE, NSW 2760 01444
 PHONE: 02 4620 2200
 PO BOX 475 KILGORE, NSW 2760
 EMAIL: frank.kosztelnik.com
 ACCREDITED BUILDING DESIGNER #0010

PROPOSED RESIDENCE
 AT: 108 CHURCH LANE
 CASTLEREAGH
 FOR: N + K BORG

1:100 UNO
 07/2018 JAKS
 DATE: 16/07/2018
 SHEET NO. 2/18

3 A

FIRST FLOOR PLAN

Appendix 2 – AS 3959-2009 Method 2 Detailed Analysis Calculations ex Flamesol

Calculated June 2, 2018, 12:49 pm (BALc v.4.8)

168 Church Lane Castlereagh

Bushfire Attack Level calculator - AS3959-2009 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	5.81 km/h
Vegetation classification	Forest	Flame length	40.8 m
Surface fuel load	14 t/ha	Flame angle	60 °
Overall fuel load	24.97 t/ha	Panel height	35.34 m
Vegetation height	n/a	Elevation of receiver	17.67 m
Effective slope	18 °	Fire intensity	75,046 kW/m
Site slope	0 °	Transmissivity	0.779
Distance to vegetation	53 m	Viewfactor	0.3269
Flame width	100 m	Radiant heat flux	19.37 kW/m ²
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

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

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