



## Angas Securities Pty Ltd

Lot 1 DP 549247 Subdivision - planning proposal  
Bushfire Assessment

June 2015

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# 1. Introduction

## 1.1 Purpose of this report

This is a bushfire assessment report for the Lot 1 DP 549247 subdivision to support a proposed rezoning to facilitate an amendment to the Penrith LEP 2010 which allows for 2 hectare lots at Nepean Gorge Drive/Fairlight Road Mulgoa (part Lot No. 1 DP 549247) (hereafter referred to as the 'subject land') (). The subject land is currently zoned as E3 Environmental Management.

This report has been prepared in accordance Section 100B of the *Rural Fires Act (1997)* and Section 91 of the *Environmental Planning and Assessment Act (EP&A Act)* to meet the aims and objectives of *Planning for Bushfire Protection 2006 (NSWRFS 2006) (PBP)*.

This report replaces previous assessments prepared for the subject land and issued to Penrith City Council.

## 1.2 Bushfire prone land

The subject land is designated as bushfire prone (See Figure 1) due to the presence of bushfire prone land within and adjoining the site. A site-based hazard assessment was used to confirm bushfire prone vegetation adjoining the subject land (See Section 2).

## 1.3 Description of the property

The location of the subject land is provided in Figure 2 and consists of an eastern and western section divided by a proposed biobanking offset area to be managed as native vegetation.

The western portion of subject land (Lots 1-13) is bounded to the:

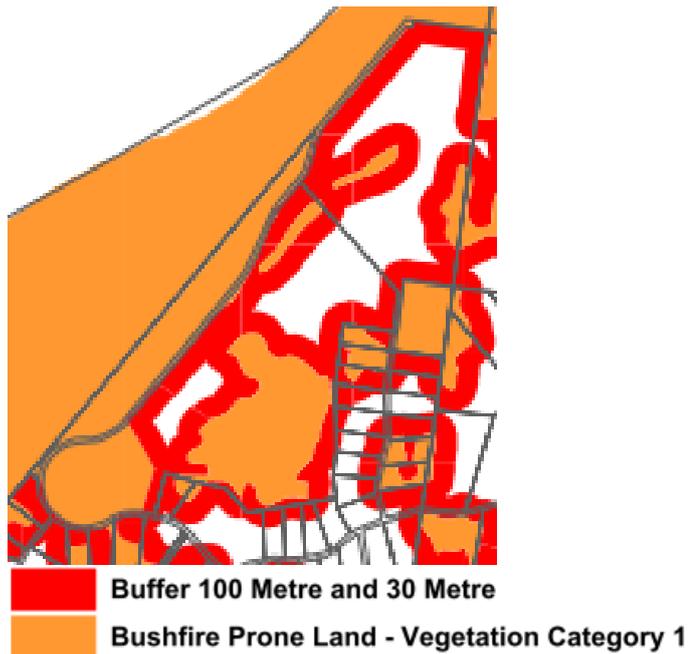
- West and south by Fairlight Road– an all-weather two wheel drive formed access road. The bushland west of this road includes a thin privately owned parcel of land and the Blue Mountains National Park.
- East by dry sclerophyll forest within a proposed biobanking area that has historically been grazed and will be set aside for biodiversity conservation.

The eastern section of subject land (Lots 14 and 15) is bounded to the:

- East by private rural-residential lots along Nepean Gorge Drive– an all-weather two wheel drive formed access road; and
- West by dry sclerophyll forest within a proposed biobanking area that has historically been grazed and will be set aside for biodiversity conservation.

Access to both sections of subject land is via Fairlight Road and Nepean Gorge Drive, local two-way access roads.

Figure 1 Bushfire prone lands mapping



Source: Penrith City Council Website<sup>1</sup>

### 1.3.1 Environmental features

The vegetation community within and adjoining the subject land consists of

- Red Bloodwood - Grey Gum woodland (HN564).
- Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland (HN542).
- Coastal freshwater wetland (HN 630).
- Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556) (potentially Shale/Sandstone Transition Forest EEC#).
- Cleared land / exotic grassland.

# potentially listed as EECs under the schedules of the NSW *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999*.

The threatened species *Grevillea juniperina* subsp. *juniperina* and *Micromyrtus minutiflora* have been recorded in the western portion of the Fernhill Estate but outside the proposed subdivision area.

Further details of vegetation including a map are provided in Section 2.1

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1

[http://www.penrithcity.nsw.gov.au/uploadedFiles/Content/Website/Our\\_Services/Planning\\_and\\_Development/Building\\_Development/Fact\\_Sheet/BushFireProneLandMap.pdf](http://www.penrithcity.nsw.gov.au/uploadedFiles/Content/Website/Our_Services/Planning_and_Development/Building_Development/Fact_Sheet/BushFireProneLandMap.pdf)

## 1.4 Scope and limitations

*This report: has been prepared by GHD and may only be used and relied on by for the purpose agreed as set out in Section 1.1 of this report.*

*GHD otherwise disclaims responsibility to any person arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.*

*Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.*

## 2. Hazard Assessment

### 2.1 Vegetation

Survey transects of 140 m in length were completed on 7 June 2013 to confirm the “Predominant Vegetation Class Formation” in accordance with *Planning for Bushfire Protection*. The vegetation classes correspond with the vegetation types shown in Figure 2 and Table 2-1.

Table 2-1 Vegetation type, formation and classification

Vegetation type	Vegetation formation (Keith 2004 <sup>2</sup> )	AS3959:2009 <sup>3</sup> classification
Red Bloodwood - Grey Gum woodland (HN564)	<i>Dry Sclerophyll Forests (Shrub subformation)</i>	Forest
Coastal freshwater wetland (HN 630)	<i>Freshwater wetland</i>	Scrub
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland (HN542)	<i>Dry Sclerophyll Forests (Shrub subformation)</i>	Forest
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556)	<i>Dry Sclerophyll Forests (Shrub/grass subformation)</i>	Forest
Cleared land / exotic grassland	<i>Grassy woodland</i>	Woodland

The exotic grassland communities above (Table 2-1) match the description of Grassy Woodland vegetation formation (NSW RFS 2006) for the following reasons;

- Open to sparse layer of eucalypts with crowns rarely touching.
- Foliage cover of approximately 30%.
- Groundcover of grasses, tussocks and herbs with a sparse distribution of shrubs.

The vegetation identified as *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest* matches the description of *Dry Sclerophyll Forest – Shrubby Grass* vegetation formation (NSWRFS 2006) for the following reasons;

- Dominated by eucalypts >10m tall with foliage cover 20-50%.
- Presence of grasses in the understorey.
- A significant shrub component in areas.

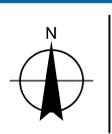
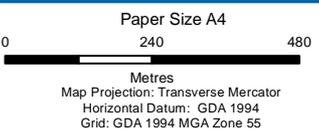
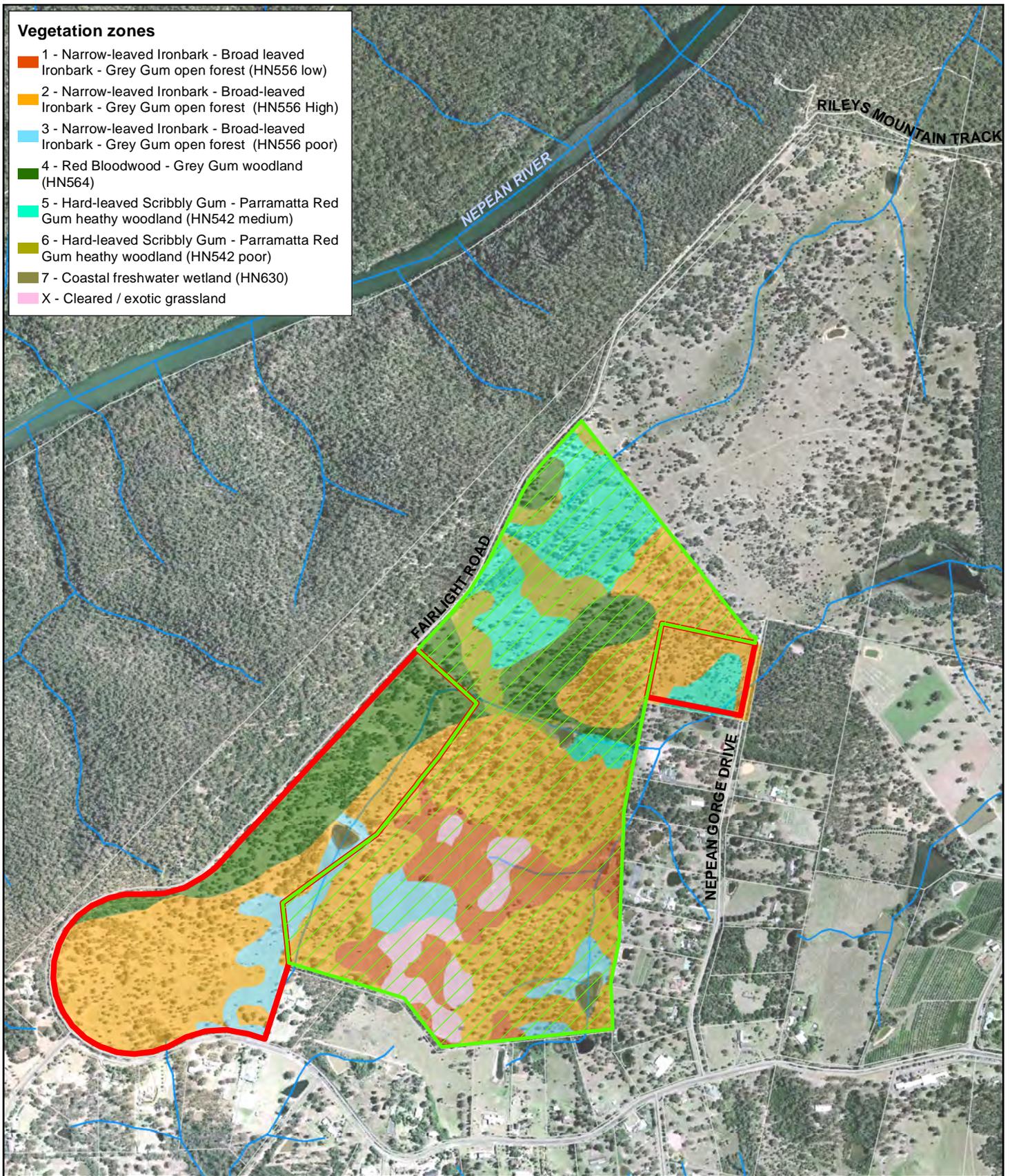
The scribbly gum and red bloodwood vegetation types match the description of *Dry Sclerophyll Forest – Shrubby* vegetation formation (NSWRFS 2006) owing to a predominance of understorey shrubs (over grasses in the community type above).

<sup>2</sup> Keith, D.A. (2004) *Ocean Shores to Desert Dunes, the native vegetation of New South Wales and the ACT*. NSW Department of Environment and Conservation, Sydney.

<sup>3</sup> Standards Australia 1999. AS3959 – 2009 *Construction of Buildings in Bushfire-prone areas*. Standards Australia, Sydney.

These vegetation formations can support high intensity bushfires, most likely burning as a crown fire in forest formations and as a faster moving surface fire in open woodland communities without a shrubby understorey. The subject land has been subject to high intensity bushfires in the past.

Photographs of vegetation formations are shown in Figure 3.



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Subdivision Bushfire Assessment

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Vegetation types map

Figure 2

N:\AU\Sydney\Projects\22\16709\GIS\Maps\Lot1\_Subdivision\_Bushfire\2216709\_2010\_WesternPrecinct\_VegetationZones\_Bushfire\_portrait.mxd  
Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com  
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Data source: Geoscience Australia: 250k Data - Jan 2011; Google Earth Pro: Aerial Imagery, Accessed: 2013; Mott Macdonald: Indicative development footprint, digitised from hardcopy; GHD: Vegetation 22-10-2013. Created by: qjchung



Figure 3 Vegetation photographs

Note: Open woodland and exotic grassland is shown on report cover.

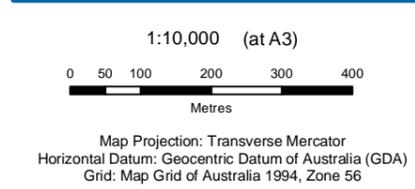
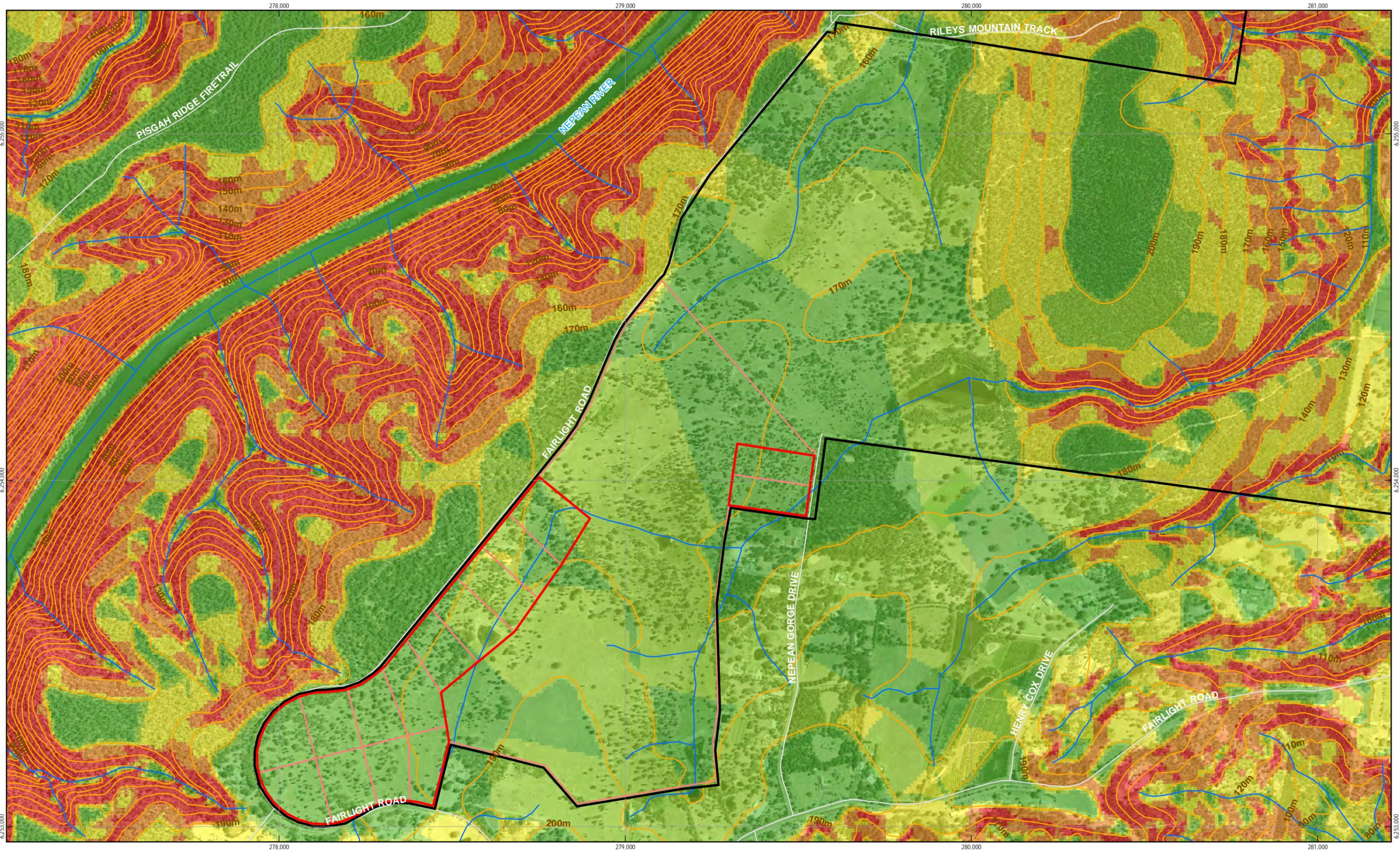
## 2.2 Effective slope

Survey transects, 140 m in length were utilised to confirm the "Effective Slope" in accordance with *Planning for Bushfire Protection*. Overall slope classes within the vegetation hazard were either upslope | flat or >0-5 degrees. Note there are small areas within the site where the slope may exceed these classes, which will require consideration as part of a lot specific bushfire assessment (i.e. outside this report).

Slope classes for the subject land is shown in Figure 4.

## 2.3 Fire weather

Penrith City Council being within the 'Greater Sydney Region' has a corresponding FDI rating of 100 (NSWRFS 2006).



LEGEND		Slope Degrees	
	Indicative development footprint		0°
	New Lot Boundaries		0° - 5°
	Fernhill Estate		5° - 10°
	waterways		10° - 15°
	Roads		15° - 20°
	10m Contour		



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### Slope Analysis

### Figure 4

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Data source: Geoscience Australia: 250k Data - Jan 2011; Google Earth Pro: Aerial Imagery, Accessed: 2013; Mott Macdonald: Indicative development footprint, digitised from hardcopy. Created by:qjchung

### 3. Bushfire protection measures for the proposal

A range of bushfire mitigation measures are to be incorporated in the development of the subject land (Figure 5) including provision of Asset Protection Zones, and all-weather road and fire trail access. These bushfire protection measures meet the aims and objectives of *PBP* (NSW RFS 2006) and are described in the following sections.

#### 3.1 Asset Protection Zones

Asset Protection Zones (APZ) are proposed (refer Figure 5), comprising of Inner Protection Area and Outer Protection Areas of the dimensions shown in Table 3-1 below. The residential dwelling is to be contained outside the APZ.

Table 3-1 APZ dimensions

Vegetation	Slope class	APZ	Inner	Outer	Comment
Forest	flat   upslope	20 m	10 m	10 m	APZ may incorporate roads and trails and associated easements
Forest	0-5 degrees	25 m	10 m	15 m	

Class 10b buildings (such as fences, retaining walls, walls and swimming pools) within the APZ need to be constructed of non-combustible materials. Where an above ground pool is erected it should not adjoin or be attached directly to the wall of the dwelling (NSWRFS 2006).

Class 10a buildings (such as a garage, carport, shed or other non-habitable buildings) need to be located greater than 10 m away from the dwelling. If the building is located within 10 m of the dwelling, the 10a building must meet the construction standard specified for the dwelling (NSWRFS 2006).

##### 3.1.1 Inner Protection Area (IPA)

The IPA will extend from the building line. It is contained within the residential allotments and be maintained in accordance with *PBP* (NSWRFS 2006):

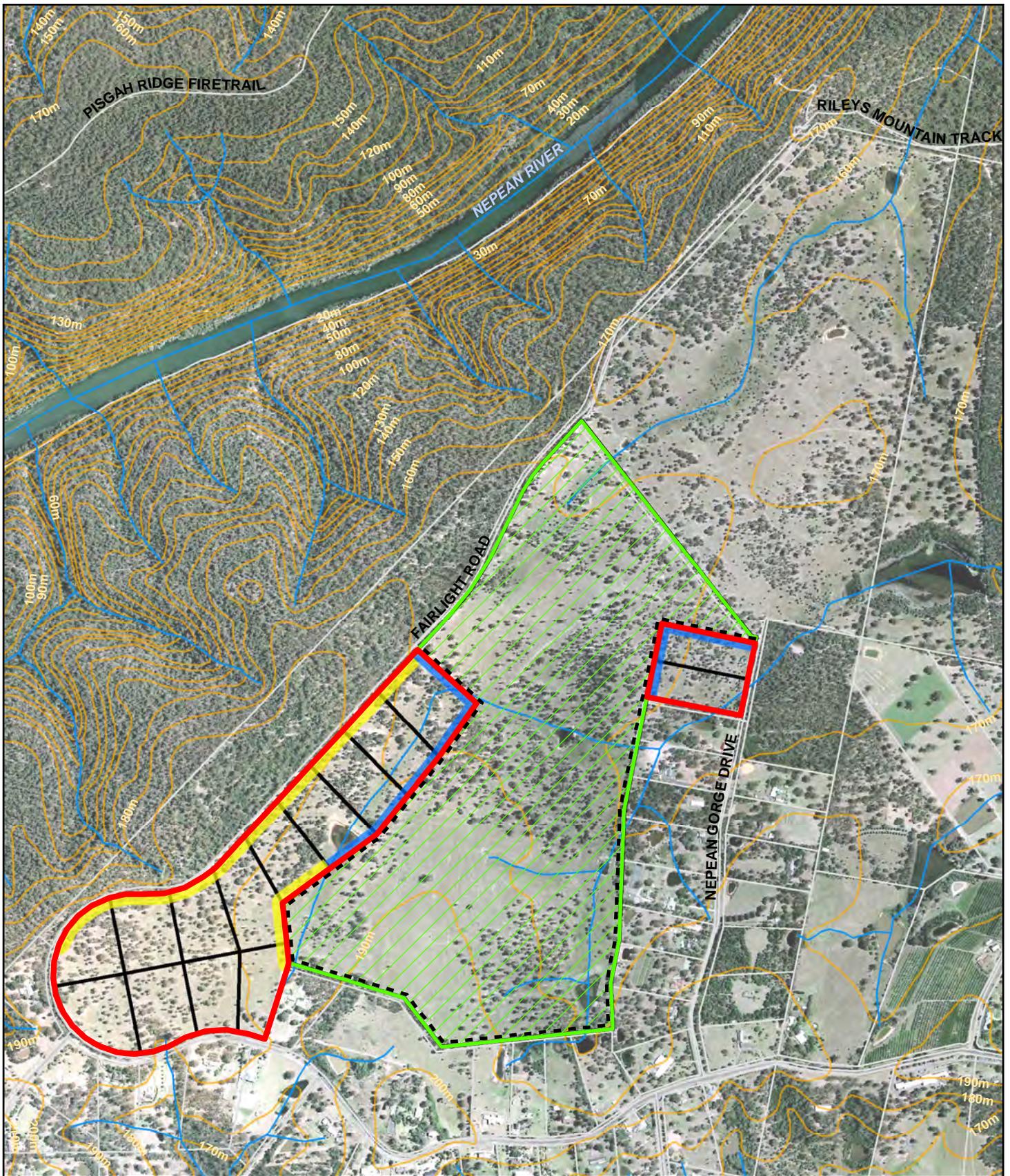
*An IPA should provide a tree canopy cover of less than 15% and should be located greater than 2 m from any part of the roofline of a dwelling. Garden beds of flammable shrubs are not to be located under trees and should be no closer than 10 m from an exposed window of door. Trees should have lower limbs removed up to a height of 2 metres above ground.*

The property owner is responsible for the maintenance of the IPA.

##### 3.1.2 Outer Protection Area (OPA)

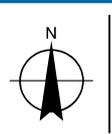
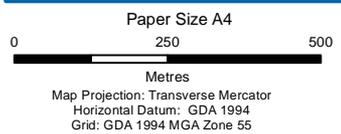
The OPA will extend from the IPA (*i.e.* from the building line) towards the hazard. The landholder is responsible for the OPA contained within the subject land. Parts of the OPA may comprise an all-weather access road or fire trail managed. The OPA within the residential allotments is to be maintained in accordance with *PBP* (NSWRFS 2006) as a minimum requirement:

*An OPA should provide a tree canopy cover of less than 30% and should have understorey managed (mowed) to treat all shrubs and grasses on an annual basis in advance of the fire season (usually September).*



**LEGEND**

- |  |  |   |            |   |             |
|--|--|---|------------|---|-------------|
|  | Indicative development footprint                     |  | Fire Trail |  | Watercourse |
|  | Indicative Fernhill South West Biobank site Boundary |  | 20m APZ    |  | Roads       |
|  | New Lot Boundaries                                   |  | 25m APZ    |  | Cadastre    |



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Subject land layout including APZ **Figure 5**

N:\AU\Sydney\Projects\2216709\GIS\Maps\Lot1\_Subdivision\_Bushfire\2216709\_Z012\_WesternPrecinct\_APZ\_Bushfire\_portrait.mxd Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com  
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 Data source: Geoscience Australia: 250k Data - Jan 2011; Google Earth Pro: Aerial Imagery, Accessed: 2013; Mott Macdonald: Indicative development footprint, digitised from hardcopy; GHD: Vegetation 22-10-2013. Created by:qjchung

### 3.1.3 Maintenance of bushfire fuel

Within the IPA and OPA fuels are to be managed in accordance with the *Standards for Asset Protection Zones* (NSWRFS 2005), this requires;

#### **1. Raking or manual removal of fine fuels:**

Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter), and bark should be removed on a regular basis.

#### **2. Mowing of grass:**

Grass needs to be kept short and where possible, green.

#### **3. Removal or pruning of trees, shrubs and understorey:**

Prune or remove trees so that there is discontinuous canopy leading from the hazard to the asset. Separate tree crowns by at least two to five metres. A canopy should not overhang within two to five metres of any building.

Native shrubs and trees should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

## 3.2 Heat shielding

Colorbond fences may be used for additional bushfire mitigation within the subject land. The CSIRO has identified (Leonard et al (2006)<sup>4</sup>) that a Colorbond steel fence reduces the radiation levels within the fencing boundary to below 5 kW/m<sup>2</sup> immediately behind the fencing system during all radiation exposures, and reduces the radiant heat exposure on a structure 9 metres from the fencing by at least a factor of two. The research showed even at directly exposed peak heat flux on the front face of the fencing at 63 kW/m<sup>2</sup> and the back face was 4 kW/m<sup>2</sup>.

## 3.3 Services

### 3.3.1 Water supply

Tank water will supply the subject land and include dedicated water tanks for fire fighting.

Fire hydrants are installed to comply with the Rural Fires Regulation, fire hydrant spacing, sizing and pressures (AS2419.1 – 2005). These hydrants are located outside parking areas.

### 3.3.2 Electricity

Electricity lines within the subject land and servicing the proposed development will be overhead lines, with the powerline owner responsible for installing, inspecting and completing powerline vegetation clearance works which comply with required regulatory requirements.

### 3.3.3 Gas

In order to comply with the Rural Fires Regulation, all gas supplies are to be installed and maintained in accordance with AS 1596 – 2002.

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<sup>4</sup> Leonard JE, Bianchi R, White N, Bicknell A, Sargeant A, Reisen F, Cheng M, Honavar K. 2006. Research and Investigation into the performance of residential boundary fencing systems in bushfires. CMIT-2006-186 Technical report for the Bushfire CRC and BlueScope Steel Ltd.

## 3.4 Access

### 3.4.1 Perimeter access

Perimeter access in the form of fire trails will provide suitable access for fire management and suppression purposes (Figure 5). Each fire trail is accessible from two points internally or to access either Nepean Gorge Drive or Fairlight Road.

Access is 6 m wide with a minimum trafficable width of 4 m. Where the access from the public road meets the fire-trail, reversing bays are provided. Gates/bollards will be installed at each end of the fire trail to limit unauthorised access, as illegal rubbish dumping is currently a significant problem at the site.

The gradient and the crossfall of the fire trail network is less than 10 degrees. Fire trails will not interrupt hydrological flows but do cross an intermittent drainage feature, and does not expose acid-sulphate soils.

For reasons listed below, the provision of a perimeter fire trail at this location provides many benefits over a perimeter public road:

- The perimeter fire trail will provide a strategic control line around the hazard side of the APZ.
- Fire suppression and management activities can be undertaken by combat and management agencies using the fire trail without obstruction from residential traffic.

The management specifications of the trails are as follows:

- A minimum carriageway of 4 m with a 1 m wide either side of the fire trail cleared of long grass and bushes.
- A minimum vertical clearance of 4 m to any overhanging obstructions.
- Gates are to be installed and locked with a key/lock system authorised by the Rural Fire Service.
- A management plan is prepared for the bio-banking land that details maintenance requirements to ensure that the fire trail is kept to the above specifications at all times.
- The management plan will also provide for weed management. Therefore the fire trail is not expected to spread or introduce weeds.

### 3.4.2 Public roads

The subject land is accessed from Nepean Gorge Drive and Fairlight Road.

The existing public roads are two-wheel drive, all weather roads (comprised of sealed and unsealed sections) which will remain. The width of the road complies with Table 4.1 of *Planning for Bushfire Protection 2006*, as shown below.

Curve radius (inside edge)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<25	3.6	4.5	8.7
25-39	3.3	4.2	8.1
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Source: AS2890.2 – 2002.

Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle)

Traffic management devices are not installed and curves are minimal to allow rapid access and egress. Curves will have a minimum inner radius of six metres and the distance between the inner and outer curves is 6 m. Maximum grades of the road do not exceed 10 m and the capacity will be sufficient to carry a fully loaded fire-fighting vehicle (15 tonnes).

Parking bays are not provided and therefore will not obstruct or reduce the paved width.

### 3.4.3 Property access roads

Fire appliance will generally be operating from the public road and / or the perimeter fire trail. Lot specific bushfire-related specifications are identified as part of the lot planning process.

## 3.5 Housing construction standards

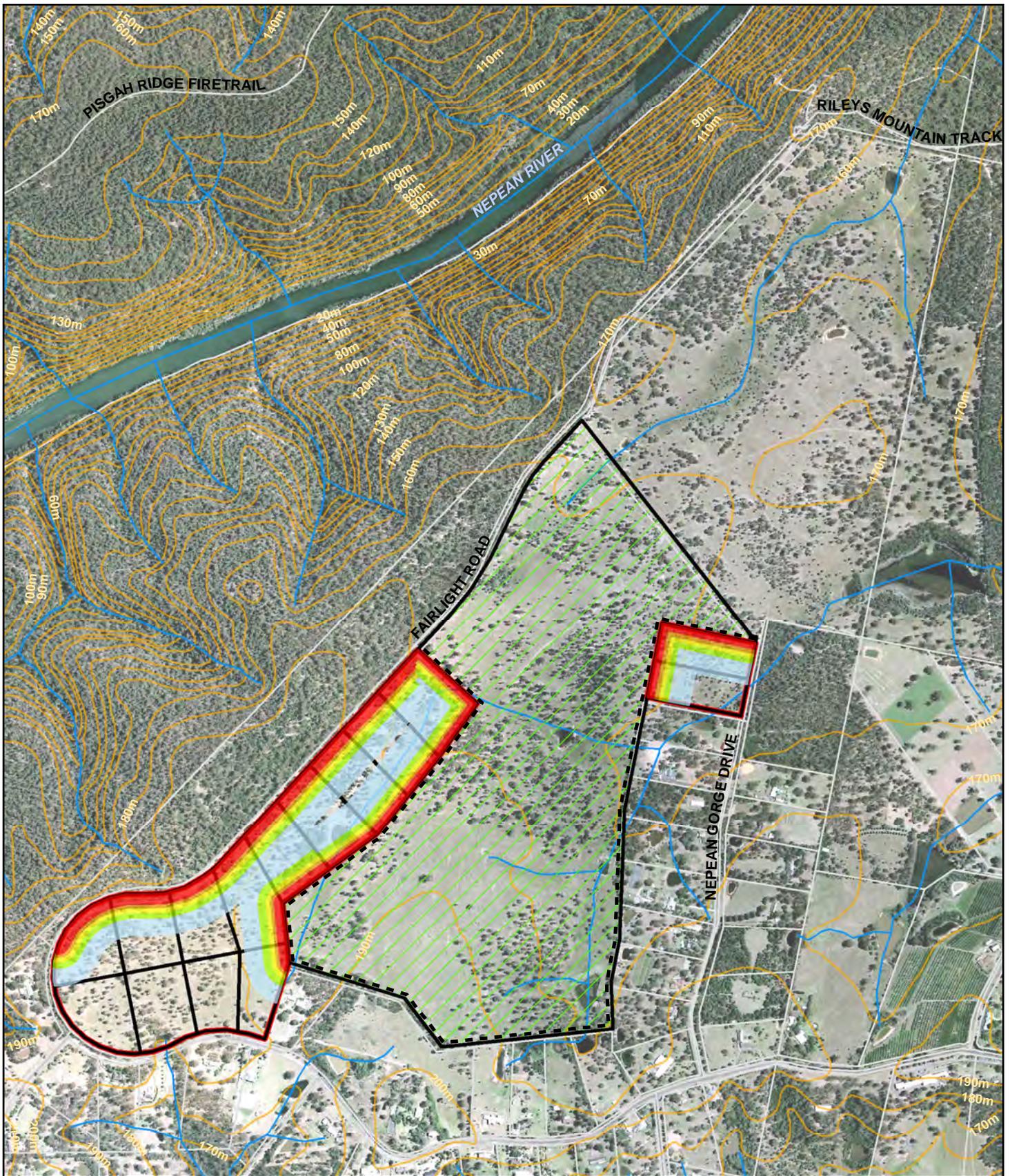
The Australian Standard AS 3959:2009 (*Construction of buildings in bushfire prone areas*) provides methodologies (*Method 1* (simplified) and *Method 2* (detailed)) to calculate bushfire attack level (BAL).

The simplified procedure methodology (*Method 1*) is based on a worst case scenario bushfire, burning at its highest intensity and rate of spread, with at least 100 metres flame front, under catastrophic weather conditions. Applying *Method 1* to subject land the following BAL requirements would be triggered for sections of the subdivision with the vegetation and slope class shown below\*. Based on indicative lot locations, the estimated BAL for each lot is shown in 6. Lots 2, 3, 4 and 15 have available land for a house footprint outside a BAL requirement. The remaining lots will be constrained by at least a BAL 12.5 depending on the positioning of a house. Individual house footprints would be identified during future development applications.

Table 3-2 AS 3959:2009 BAL calculation and lot estimate (only)

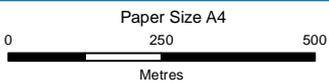
Vegetation	Slope Class	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
		Distance from predominant vegetation in metres				
Forest	flat   upslope	<19	19-<25	25-<35	35-<48	48-<100
Forest	0-5 degrees	<24	24-<32	32-<43	43-<57	57-<100

\*Note: An AS3959:2009 assessment would be required for a lot level development application and may differ from the BAL outputs broadly estimated here as it is based on site specific, rather than sub-division level site characteristics.

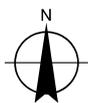


**LEGEND**

- |  |  |                              |            |        |          |            |             |          |
|--|--|------------------------------|------------|--------|----------|------------|-------------|----------|
|  | Indicative development footprint                     | <b>Bushfire Attack Level</b> |            | BAL 29 |          | Fire Trail |             | Cadastre |
|  | Indicative Fernhill South West Biobank site Boundary |                              | Flame Zone |        | BAL 19   |            | Watercourse |          |
|  | New Lot Boundaries                                   |                              | BAL 40     |        | BAL 12.5 |            | Roads       |          |



Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



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Estimated BAL for proposed lots **Figure 6**

N:\AU\Sydney\Projects\2216709\GIS\Maps\Lot1\_Subdivision\_Bushfire\2216709\_2013\_WesternPrecinct\_BAL\_Bushfire\_portrait.mxd Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com  
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Data source: Geoscience Australia; 250k Data - Jan 2011; Google Earth Pro: Aerial Imagery, Accessed: 2013; Mott Macdonald: Indicative development footprint, digitised from hardcopy; GHD: Vegetation 22-10-2013. Created by:qjchug

## 4. Summary Assessment of Compliance

The bushfire protection measures proposed for the subject land (Section 3) were designed to comply with all the “acceptable solutions” for each “performance measure” within Chapter 4 of *PBP*. As a result, compliance with the objectives of *PBP* has been achieved, as summarised in the Table 4-1 below.

Table 4-1 Compliance with *Planning for Bushfire Protection 2006*

Measure	Assessment of Compliance
Asset Protection Zones	<p>The proposed development has achieved the performance criteria by complying with the acceptable solutions, i.e.</p> <ul style="list-style-type: none"> <li>• An APZ can be provided in accordance with Appendix 2 of Planning for Bushfire Protection 2006 (refer to Section 3.1)</li> <li>• The APZ for each lot can be wholly within the boundaries of the development site (refer to Section 3.1)</li> <li>• The APZ will be managed in accordance with the requirements of Standards for Asset Protection Zones (RFS 2005) (refer to Section 3.1.3)</li> <li>• The APZ for each lot is located on lands with slopes less than 18 degrees (refer to Section 3.1)</li> </ul>
Public Roads	<p>The proposed development has achieved the performance criteria by complying with the acceptable solutions, i.e.;</p> <ul style="list-style-type: none"> <li>• Existing public roads are two-wheel drive (refer to Section 3.4.2)</li> <li>• Perimeter fire trail provides benefits over perimeter public road (refer to section 3.4.1)</li> <li>• Traffic calming devices are not proposed (refer to Section 3.4.2)</li> <li>• Public roads will have a crossfall not exceeding 3 degrees and grades not exceeding 10 degrees.</li> <li>• While the two public roads are dead-end roads, each lot within the sub-division, through the provision of perimeter fire trails, has two or more points of access and egress.</li> <li>• Curves are minimal and have the required dimensions.</li> <li>• Existing public roads have a capacity of greater than 15 tonnes.</li> </ul>
Property Access Roads	<p>Emergency access and egress is provided from Nepean Gorge Drive and Fairlight Road and a perimeter fire trail.</p>
Fire Trails	<p>The proposed development has achieved the performance criteria by complying with the acceptable solutions, i.e.;</p> <ul style="list-style-type: none"> <li>• A minimum carriageway of 4 m will be provided with an additional 1 m strip either side cleared of long grass and bushes (refer to Section 3.4.1).</li> <li>• The trail will have a grade less than 10 degrees (refer to Section 3.4.1).</li> <li>• A minimum vertical distance of &gt;4 m will be maintained (refer to Section 3.3.1).</li> <li>• The crossfall will be &lt;10 degrees (refer to Section 3.4.1)</li> <li>• Each fire trail has two access points and no dead-ends.</li> <li>• The fire trail does not traverse wetlands drainage channels, and is not expected to expose acid-sulphate soils.</li> <li>• Gates will be installed with a lock and key system.</li> <li>• A plan of management for bio-banking will include control of weeds that may result from the fire trail.</li> </ul>

Measure	Assessment of Compliance
Services – Water, electricity and gas	<p>The proposed development has achieved the performance criteria by complying with the acceptable solutions, i.e.;</p> <p>Tank water will be provided within the required specifications.</p> <p>Hydrants will not be located within parking areas.</p> <p>Electricity will be via overhead power lines.</p> <p>Gas supplies, where installed, will be in accordance with AS 1596.</p>

In conclusion, the development including the bushfire protection measures outlined in Section 3 of this report is therefore appropriate for the issuance of development approval in accordance with *Planning for Bushfire Protection*.

## 5. References

- Gould JS, McCaw WL, Cheney NP, Ellis PF, Knight IK, Sullivan AL (2007) Project Vesta – Fire in Dry Eucalypt Forest: Fuel Structure, Fuel Dynamics and Fire Behaviour. Ensis – CSIRO, Canberra ACT
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- Standards Australia 2005. *AS2419.1 – 2005 Fire Hydrant installations – System design, installation and commissioning*

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