3.2 Slope by Degrees

A slope degree assessment has been produced for land within 100m of the Development Estates by using survey accurate contours of 2 metres to determine the slope that will affect bushfire behaviour. The Slope Degree Tables (Table 3-1 – Table 3-6) have been created to determine APZ's using the APZ Calculator (RFS, 2007) and determining the slope that will most likely influence bushfire behaviour.

The slope of vegetation surrounding each development estate to 100m is documented in the below Table 3-1 – Table 3-6.

Table 3-1 Slope Degree Assessment for Development Estate 1

Direction from Development Estate		Slope
Development Estate 1 (a)		
Drainage Line (40m)		Flat
Drainage Line (20m)		Flat
East	North	Cross-slope
	South	Upslope 3.4 degrees
South		Cross-slope
Development Estate 1 (b)		
North		Downslope 5.7 degrees
East		Downslope 4 degrees
South	East	Cross-slope
		Upslope 4.8 degrees
	West	Cross-slope
West		Downslope 8.5 degrees

Table 3-2 Slope Degree Assessment for Development Estate 2

Direction from Development Estate		Slope
Drainage Lines (40-80m)		Flat
South Western Drainage Line		Upslope 8 degrees
South	East	Cross
		Upslope 4.1 degrees
		Upslope 9.1 degrees
	West	Upslope 8.2 degrees
West		Cross
		Upslope 5.7 degrees
		Upslope 8.2 degrees

Table 3-3 Slope Degree Assessment for Development Estate 3

Direction from development Estate		Slope
Drainage Lines (40-80m)		Flat
South	East	Cross-slope
		Upslope 7.9 degrees
		Cross-slope
		Upslope 2.3 degrees
		Cross-slope
		Upslope 11.3 degrees
	West	Upslope 7.9 degrees
East		Flat
		Cross-slope

Table 3-4 Slope Degree Assessment for Development Estate 4

Direction from Development Estate		Slope
East	North	Cross-slope
		Flat
		Cross-slope
		Downslope 2.3 degrees
		Cross-slope
		Downslope 4.5 degrees
		Downslope 6.8 degrees
	South	Downslope 7.9 degrees
		Cross-slope
North		Flat
West	North	Downslope 3.4 degrees
		Downslope 6.8 degrees
		Downslope 4.5 degrees
		Downslope 6.8 degrees
		Downslope 4.5 degrees
		Downslope 11.3 degrees
	South	Cross-slope
South	East	Upslope 11.3 Degrees
	West	Upslope 2.8 Degrees
		Upslope 5.7 Degrees

Table 3-5 Slope Degree Assessment for Development Estate 5

Direction from Development Estate		Slope
Development Estate 5 (a)		
North	East	Upslope 5.7 degrees
		Cross-slope
		Downslope 3.4 degrees
	West	Cross-slope
South	East	Upslope 11 degrees
		Upslope 9.1 degrees
		Upslope 6.3 degrees
		Upslope 10.2 degrees
		Upslope 13.5 degrees
		Upslope 13.5 degrees
	West	Upslope 13.5 degrees
		Upslope 15.6 degrees
West	North	Downslope 4.6 degrees
	South	Cross-slope
		Downslope 8 degrees
East		Flat
Development Estate 5 (b)		
North	East West	Downslope 19.8 degrees
		Downslope 19.8 degrees
East		Flat
South		Cross-slope
Development Estate 5 (c)		
North	East	Downslope 13.5 degrees
	West	Downslope 15.6 degrees

South	East	Upslope 4.6 degrees
	West	Upslope 4.6 degrees
Development Estate 5 (d)		
North	East	Upslope 5.7 degrees
		Upslope 11.9 degrees
		Cross-slope
		Upslope 2.9 degrees
		Cross-slope
	West	Upslope 8 degrees
		Upslope 5.7 degrees
South	East	Upslope 3.4 degrees
		Upslope 11.3 degrees
	West	Upslope 9.6 degrees
		Upslope 5.1 degrees

Table 3-6 Slope Degree Assessment for Development Estate 6

Direction from Development Estate		Slope
Drainage Lines (40m)		Flat
North	East	Upslope 4.6 degrees
	West	Upslope 9 degrees
East	North	Downslope 12.5 degrees
		Cross-slope
		Downslope 5.5 degrees
	South	Cross-slope
South	East	Downslope 7.4 degrees
		Cross-slope
	West	Upslope 9.1 degrees
West	North	Upslope 5.7
		Upslope 3.4
	South	Upslope 6.8

4 ASSET PROTECTION ZONES

4.1 Definitions

4.1.1 APZ's

An APZ is defined as an area surrounding a development zone that is managed to reduce the bushfire hazard to an acceptable level. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA). The respective IPA and OPA widths for the APZ's required under this proposal are as detailed in Section 4.2 and Figure 4-1.

An APZ can include the following:

- Lawns;
- discontinuous gardens;
- swimming pools;
- driveways;
- detached garages;

- open space / parkland;
- car parking;
- swales; and
- cycleways and formed walkways.

4.1.2 Inner Protection Area (IPA)

The IPA extends from the edge of the development to the OPA. The IPA aims to ensure that the presence of fuels which could contribute to a fire event / intensity, are minimised close to the development. The performance of the IPA must be such that:

- there is minimal fine fuel at ground level which could be set alight by a bushfire; and

- any vegetation in the IPA does not provide a path for the transfer of fire to the development – that is, the fuels are discontinuous.

The presence of a few shrubs or trees in the IPA is acceptable provided that they:

- do not touch or overhang any buildings;

- are well spread out and do not form a continuous canopy;

- are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and

- are located far enough away from any dwelling so that they will not ignite the dwelling by direct flame contact or radiant heat emission.

Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc. should not be permitted in the IPA.

Refer to Appendix A for further information on the performance requirements of IPA's.

4.1.3 Outer Protection Area (OPA)

The OPA is located adjacent to the hazard. Within the OPA any trees and shrubs should be maintained in a manner such that the vegetation is not continuous. Fine fuel loadings should be kept to a level where the fire intensity expected will not impact on adjacent developments.

4.2 Determining APZ's

The subject site lies within the Lake Macquarie and Newcastle Government Area and therefore is assessed under an FDI (Fire Danger Index) rating of 100. The APZ Calculator has been used to determine the minimum width of APZ's as well as the widths of its components, that is the IPA and the OPA. This version of the APZ Calculator is based on the APZ requirements as prescribed in PBP (RFS, 2006). It provides for a more performance based assessment and can be used as an alternative to Appendix 2 of PBP (RFS, 2006) outlined above.

The APZ Calculator is reliant on slope. The alternative APZ's have been determined using the vegetation found within 140m of the Development Estates and the slopes/ gradient that will affect bushfire behavior as determined by the Slope Degree Map. Refer to the tables below for Alternative APZ widths for proposed residential development within the Development Estates.

Refer to Table 4.1 to Table 4.6 and Figure 4-1 for APZ widths for proposed residential development within the site.

Table 4-1 APZ widths for Development Estate 1 per RFS Calculator

Development Estate 1				
Direction from Development Estate		**Vegetation Type**	**Slope**	**APZ**
Development Estate 1 (a)				
Drainage Line (40m)		Open Forest	Flat	20m
Drainage Line (20m)		Reduced	Flat	10m
East	North	Open Forest	Cross-slope	20m
	South	Open Forest	Upslope 3.4 degrees	17m
South		Open Forest	Cross-slope	20m
Development Estate 1 (b)				
North		Open Forest	Downslope 5.7 degrees	27m
East		Open Forest	Downslope 4 degrees	24m
South	East	Open Forest	Cross-slope	20m
		Open Forest	Upslope 4.8 degrees	15m
	West	Open Forest	Cross-slope	20m
West		Open Forest	Downslope 8.5 degrees	31m

Table 4-2 APZ widths for Development Estate 2 per RFS Calculator

Development Estate 2				
Direction from Development Estate		**Vegetation Type**	**Slope**	**APZ**
Drainage Lines (40-80m)		Open Forest	Flat	20m
South Western Drainage Line		Open Forest	Upslope 8 degrees	13m
South	East	Open Forest	Cross	20m
		Open Forest	Upslope 4.1 degrees	16m
		Open Forest	Upslope 9.1 degrees	12m
	West	Open Forest	Upslope 8.2 degrees	13m
West		Open Forest	Cross	20m
		Open Forest	Upslope 5.7 degrees	15m
		Open Forest	Upslope 8.2 degrees	13m

Table 4-3 APZ widths for Development Estate 3 per RFS Calculator

Development Estate 3				
Direction from development Estate		**Vegetation Type**	**Slope**	**APZ**
Drainage Lines (40-80m)		Open Forest	Flat	20
South	East	Open Forest	Cross-slope	20m
		Open Forest	Upslope 7.9 degrees	13m
		Open Forest	Cross-slope	20m
		Open Forest	Upslope 7.9 degrees	13m
	West	Open Forest	Cross-slope	20m
East	North	Open Forest	Flat	20m
	South	Open Forest	Cross-slope	20m

Table 4-4 APZ widths for Development Estate 4 per RFS Calculator

Development Estate 4				
Direction from Development Estate		**Vegetation Type**	**Slope**	**APZ**
East	North	Open Forest	Cross-slope	20m
		Open Forest	Flat	20m
	Drainage Line (40m)	Open Forest	Flat	20m
North		Open Forest	Flat	20m
West	Drainage Line (40m)	Open Forest	Flat	20m
South	East	Open Forest	Upslope 11.3 Degrees	11m
		Open Forest	Upslope 2.8 Degrees	17m
	West	Open Forest	Upslope 5.7 Degrees	15m

Table 4-5 APZ widths for Development Estate 5 per RFS Calculator

Development Estate 5				
Direction from Development Estate		**Vegetation Type**	**Slope**	**APZ**
Development Estate 5 (a)				
North	East	Open Forest	Upslope 5.7 degrees	15m
		Open Forest	Cross-slope	20m
		Open Forest	Downslope 3.4 degrees	24m
	West	Open Forest	Cross-slope	20m
South	East	Open Forest	Upslope 11 degrees	11m
		Open Forest	Upslope 9.1 degrees	12m
		Open Forest	Upslope 6.3 degrees	14m
		Open Forest	Upslope 10.2 degrees	11m
		Open Forest	Upslope 13.5 degrees	10m
		Open Forest	Upslope 13.5 degrees	10m
	West	Open Forest	Upslope 15.6 degrees	9m
West	North	Open Forest	Downslope 4.6 degrees	25m
		Open Forest	Cross-slope	20m
	South	Open Forest	Downslope 8 degrees	30m

Development Estate 5				
Direction from Development Estate		**Vegetation Type**	**Slope**	**APZ**
East		Open Forest	Flat	20m
Development Estate 5 (b)				
North	East	Open Forest	Downslope 19.8 degrees	64m
	West	Open Forest	Downslope 19.8 degrees	64m
East		Open Forest	Flat	20m
South		Open Forest	Cross-slope	20m
Development Estate 5 (c)				
North	East	Open Forest	Upslope 5.7 degrees	15m
		Open Forest	Upslope 11.9 degrees	10m
		Open Forest	Upslope 2.9 degrees	17m
		Open Forest	Upslope 8 degrees	13m
	West	Open Forest	Upslope 5.7 degrees	15m
South	East	Open Forest	Upslope 3.4 degrees	17m
		Open Forest	Upslope 11.3 degrees	11m
		Open Forest	Upslope 9.6 degrees	12m
	West	Open Forest	Upslope 5.1 degrees	15m

Table 4-6 APZ widths for Development Estate 6 per RFS Calculator

Development Estate 6				
Direction from Development Estate		**Vegetation Type**	**Slope**	**APZ**
Drainage Lines (40m)		Open Forest	Flat	20m
		Open Forest	**SFPP** - Flat	60m
North	East	Open Forest	Upslope 4.6 degrees	15m
	West	Open Forest	Upslope 9 degrees	12m
East	North	Open Forest	Downslope 12.5 degrees	40m
		Open Forest	Cross-slope	20m
		Open Forest	Downslope 5.5 degrees	26m
	South	Open Forest	Cross-slope	20m
South	East	Open Forest	Downslope 7.4 degrees	29m
		Open Forest	Cross-slope	20m
		Open Forest	**SFPP** - Cross-slope	60m
		Open Forest	Cross-slope	20m
	West	Open Forest	Upslope 9.1 degrees	12m
West	North	Open Forest	Upslope 5.7	15m
		Open Forest	Upslope 3.4	17m
	South	Open Forest	Upslope 6.8	14m

For the majority of the development a perimeter road has been implemented between bushfire hazards and future dwellings, this will form all or part of the required APZ's. Any remaining APZ or part of APZ will be established within allotments where required. A strategic approach was undertaken over the concept design process to predictively design allotments to provide for an adequate building envelope within allotments requiring an APZ.

The Concept Plan indicates that these proposed roadways provide a buffer between the adjacent vegetation and the development estate and vegetation to be retained within the site, including open space parks, riparian buffers and vegetation buffers. The proposed perimeter and public roads within the development estate are therefore likely to provide either the entire or majority of the required APZs, with any remaining part of the APZ (if required) being able to be established within the allotments.

The primary school precinct located within the southern section of Estate 6 will have an APZ imposed upon the eastern and north-eastern boundaries. An APZ for the southern boundary will be imposed onto the adjacent lands and require a section 88B of the *Conveyancing Act 1919.*

Estate 1b will have an APZ imposed within the perimeter road, with any remaining APZ or part of APZ to be established within adjacent lands outside of the allotments. Any APZ within the adjacent lands will be imposed through a section 88B of the *Conveyancing Act 1919.*

A Core Riparian Zone (CRZ) and Vegetated Buffer (VB) from 10 metres to 40 metres, inclusive, will be established for all riparian corridors around creek lines. This merit assessment will be based upon the order and riparian functionality of the watercourse, the site and long term land use. These corridors have been included within the Concept Plan and APZ designed upon these.

The ongoing site bushfire management will be implemented under an overarching Bushfire Management Plan (that will be prepared under the Statement of Commitments). Management activities including APZ maintenance will be the role and responsibility of the end user, depending on location this may be:

- Council;
- DECC/NPWS; or
- The land owner.

WARNING

No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from Harper Somers O'Sullivan Pty Ltd.

LEGEND

- Parks / Bushland / Open Space
- Creeks
- APZ's

0 350 700m

TITLE: Figure 4-1 Development Estate APZ's Minmi-Link Road

CLIENT: Coal & Allied Operations Pty Ltd

PLANNING SURVEYING ECOLOGY

HARPER SOMERS O'SULLIVAN

SCALE: 1: 13000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** M.Doherty

DATUM: MGA Zone 56 (GDA 94) **DATE:** 4/11/2008

LAYOUT REF:J:\JOBS\24k\24530 Hunter Valley\Drafting\Bushfire\Northern Lands\ ALL WORKSPACES\Report Figures\24530-2 Figure 4-1 APZ map A A3

CONTOUR INTERVAL: N/A

JOB REF: 24530-2

241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4961 6500 F: 02 4961 6794 E: survey@hso.com.au W:www.hso.com.au ABN 11 093 343 858

5 WATER SUPPLY

Associated with any kind of development upon the land, it is expected that water mains will be extended into the development estate. Provision of access to this supply should be provided for fire-crews in the form of readily accessible and easily located fire hydrants. Fire hydrant spacing, sizing and pressure should comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Hydrants are not to be located within any road carriageway.

6 ACCESS / EGRESS (EVACUATION)

PBP (RFS, 2006) recommends a perimeter road be designed for any future residential development. A perimeter road forms part of the APZ and will provide a separation between the building and the boundary of the bush fire hazard.

Any perimeter road should be fully sealed and have a minimum road reserve width of 8m minimum kerb to kerb with the following design specifications:

- roads should be two wheel drive, all weather roads;
- roads should be two-way: i.e. at least two traffic lane widths with shoulders on each side, allowing traffic to pass in opposite directions;
- roads should be through roads where possible, any dead end roads should not be more than 200m in length with a 12m radius turning circle and clearly sign posted as such;
- the capacity of road surfaces and bridges should be sufficient to carry fully loaded fire fighting vehicles (approximately 28 tonnes or 8 tonnes per axle); and
- roads should be clearly sign posted and buildings clearly numbered.

The Concept Plan indicates that a perimeter road has been proposed for the majority of the development estate. The perimeter roads comply with the above requirements. The perimeter roads will allow a defendable space between vegetation and housing whilst also acting as an APZ.

According to PBP (2006), the design specifications for **internal public road** require that roads:

- be two-wheel drive all weather roads;
- non perimeter roads comply with Table 6-1 (below) – Road widths for Category 1 Tanker;

Table 6-1 Minimum widths for fire fighting access of non-perimeter public roads

Curve radius (inside edge metres)	Swept Path (metres width)	Single land (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40 – 69	3.0	3.9	7.5
70 – 100	2.7	3.6	6.9
>100	2.5	3.5	6.5

- the perimeter road is linked to the internal road system at an interval of no greater than 500m in urban areas;
- not be hindered by an overuse of traffic calming devices such as speed humps and chicanes;
- public roads do not have a cross fall not exceeding 3 degrees;
- all roads are through roads, but if unavoidable then dead ends should be not more than 200m in length, incorporate a minimum 12m turning circle and should be clearly sign posted as dead ends;
- curves of roads (other than perimeter roads) are a minimum inner radius of 6 metres and minimal in number, to allow for rapid access and egress;
- the minimum distance between inner and outer curves is 6m;
- maximum grade for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o} of other gradient specified by road design standards, whichever is the lesser gradient;
- there is a minimum vertical clearance to a height of 4m above the road at all times;
- the capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicate load rating;
- public roads between 6.5m and 8m wide are no parking on one side with the services (hydrants) located on the side to ensure accessibility to reticulated water for suppression;
- one way public access roads are no less than 3.5m wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression;
- parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays; and
- public roads directly interfacing the bush fire hazard vegetation should provide roll top kerbing to the hazard side of the road.

The Concept Plan provides for internal public roads within the development estate. Many of the proposed internal public roads are dead ends, and thereby will need to comply with the PBP requirements. According to PBP 2006 dead end roads should be not more than 200m in length, incorporate a minimum 12m turning circle and should be clearly sign posted as a dead end. The proposed design of the road network will need to comply with the requirements of PBP 2006. Deviations from the 200m maximum length may be considered (depending on the situation) through a performance-based assessment at the future project application stage for subdivision.

According to PBP (2006), the design specifications for **property access roads** require that roads:

- where possible at least one alternative property access is provided for individual dwellings (or group of dwellings) that are located more than 200m from a public through road;

- a minimum carriageway width of four metres for rural-residential areas, rural landholdings or urban area with a distance greater than 70 metres from the nearest hydrant point to the most external part of the proposed building;

Note: No specific access requirements apply in a urban area where a 70m unobstructed path can be demonstrated between the most distant part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency fighting vehicles (i.e. a hydrant or water supply).

- a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches;

- on forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20 metres long by two metres wide;

- internal roads for rural properties have a loop road around any dwelling or incorporate a turning circle with a minimum 12 metre outer radius;

- curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress;

- the crossfall is not more than 10^{o};

- maximum grades for sealed roads do not exceed 15^{o} and not more than 10^{o} for unsealed roads; and

- access to a development comprising more than three dwellings have formalised access by dedication of a road and not by right of way. In the case of a right of way, unconstrained access to the NSW Rural Fire Service must be provided for at all times.

The above road specifications are the acceptable solutions as detailed within PBP (RFS, 2006). Deviations from the above acceptable solutions for access may be considered (depending on the situation) through a performance-based assessment.

6.1 Emergency Evacuation

The draft Traffic and Transport Report (Parsons Brinckerhoff, 2007) states that the forecasts indicate that the proposal will result in a small impact on overall traffic generated in the long-term on the existing network. Therefore, it is anticipated that in the case of an emergency evacuation the road network will adequately manage the resultant increase in traffic volume.

7 FIRE FIGHTING CAPABILITY

Any fire within the development estate would be attended in the first instance by the Wallsend NSW Fire Brigade. Response time would be expected to be approximately eight to ten minutes.

Consideration must be given to the provision of adequate turning circles for any fire tanker that services the development estate. The proposed perimeter roads and internal public roads within the Concept Plan would satisfactorily serve such a function.

To facilitate quick and efficient action by the Fire Brigade upon arrival, it is recommended that all necessary connections / pumps etc be clearly marked and visible, and in good working order.

8 DWELLING DESIGN AND CONSTRUCTION

The design of the dwellings should have due regard to the specific considerations given in the Building Code of Australia (BCA), which makes specific reference to Australian Standard 3959 (AS 3959-1999) 'Construction of Buildings in Bushfire-Prone Areas'. This standard aims to provide ways to improve the design and construction of a building by minimising the likelihood of the consequences of bushfire attack.

The design of any future dwelling and the materials used for construction should be chosen based on the information contained within this standard, and accordingly the relevant architect should be made aware of this recommendation. It may be necessary to have dwelling plans checked by the architect involved to ensure that the proposed dwelling meets the relevant construction level criteria. If appropriate criteria are not being met, then either the design will have to be amended or the APZ setback distances may have to increase accordingly.

The determinations of the appropriate levels of construction are based upon categories of bushfire attack. This follows the site assessment methodology outlined in Appendix 3 of PBP (RFS, 2006) based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the construction level is derived by assessing the:

- predominant vegetation type contained within the hazard;
- predominant slope class within the identified vegetation type; and
- distance of the extensions from the hazard.

Using the information relating to vegetation, slope and according to Table A3.3 PBP (RFS, 2006) the following table (Table 8-1) illustrates the required construction standards for any future dwellings within the development estate:

Table 8-1 Recommended Construction Standards for Development Estate 1

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	Flat	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Reduced	Flat	9 – 13m	Level 3 AS3959-1999
		13 – 19m	Level 2 AS3959-1999
		19 – 50m	Level 1 AS3959-1999
Open Forest	Cross-slope	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	3.4° upslope	17 - 25m	Level 3 AS3959-1999
		25 – 35m	Level 2 AS3959-1999
		35m – 100m	Level 1 AS3959-1999
Open Forest	4° downslope	24 - 34m	Level 3 AS3959-1999
		34 – 46m	Level 2 AS3959-1999
		46m – 100m	Level 1 AS3959-1999
Open Forest	4.8° upslope	15 - 22m	Level 3 AS3959-1999
		22 – 31m	Level 2 AS3959-1999
		31m – 100m	Level 1 AS3959-1999
Open Forest	5.7° downslope	26 - 37m	Level 3 AS3959-1999
		37 – 50m	Level 2 AS3959-1999
		50 – 100m	Level 1 AS3959-1999
Open Forest	8.5° downslope	31 - 41m	Level 3 AS3959-1999
		41 – 55m	Level 2 AS3959-1999
		55 – 100m	Level 1 AS3959-1999

Table 8-2 Recommended Construction Standards for Development Estate 2

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	Flat	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	Cross-slope	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	4.1° upslope	16 – 23m	Level 3 AS3959-1999
		23 – 32m	Level 2 AS3959-1999
		32 – 100m	Level 1 AS3959-1999
Open Forest	5.7° upslope	15 – 21m	Level 3 AS3959-1999
		21 – 30m	Level 2 AS3959-1999
		30 – 100m	Level 1 AS3959-1999
Open Forest	8° upslope	13 - 19m	Level 3 AS3959-1999
		19 – 27m	Level 2 AS3959-1999
		27m – 100m	Level 1 AS3959-1999
Open Forest	8.2° upslope	13 - 19m	Level 3 AS3959-1999
		19 – 27m	Level 2 AS3959-1999
		27m – 100m	Level 1 AS3959-1999
Open Forest	9.1° upslope	12 - 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26m – 100m	Level 1 AS3959-1999

Table 8-3 Recommended Construction Standards for Development Estate 3

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	Flat	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	Cross-slope	20 – 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40 – 100m	Level 1 AS3959-1999
Open Forest	7.9° upslope	13 – 19m	Level 3 AS3959-1999
		19 – 28m	Level 2 AS3959-1999
		28 – 100m	Level 1 AS3959-1999
Open Forest	5.7° downslope	26 - 37m	Level 3 AS3959-1999
		37 – 50m	Level 2 AS3959-1999
		50 – 100m	Level 1 AS3959-1999
Open Forest	6.8° downslope	28 - 39m	Level 3 AS3959-1999
		39 – 52m	Level 2 AS3959-1999
		52 – 100m	Level 1 AS3959-1999
Open Forest	7.9° downslope	30 - 41m	Level 3 AS3959-1999
		41 – 55m	Level 2 AS3959-1999
		55 – 100m	Level 1 AS3959-1999
Open Forest	9° downslope	32 - 42m	Level 3 AS3959-1999
		42 – 57m	Level 2 AS3959-1999
		57 – 100m	Level 1 AS3959-1999
Open Forest	11.3° downslope	38 - 47m	Level 3 AS3959-1999
		47 – 62m	Level 2 AS3959-1999
		62 – 100m	Level 1 AS3959-1999

Table 8-4 Recommended Construction Standards for Development Estate 4

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	Flat	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	Cross-slope	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	2.3° upslope	18 – 26m	Level 3 AS3959-1999
		26 – 36m	Level 2 AS3959-1999
		36 – 100m	Level 1 AS3959-1999
Open Forest	5.7° upslope	15 – 21m	Level 3 AS3959-1999
		21 – 30m	Level 2 AS3959-1999
		30 – 100m	Level 1 AS3959-1999
Open Forest	11.3° upslope	11 - 16m	Level 3 AS3959-1999
		16 – 24m	Level 2 AS3959-1999
		24 – 100m	Level 1 AS3959-1999
Open Forest	2.3° downslope	23 - 32m	Level 3 AS3959-1999
		32 – 43m	Level 2 AS3959-1999
		43 – 100m	Level 1 AS3959-1999
Open Forest	3.4° downslope	24 - 34m	Level 3 AS3959-1999
		34 – 46m	Level 2 AS3959-1999
		46 – 100m	Level 1 AS3959-1999
Open Forest	4.5° downslope	25 - 36m	Level 3 AS3959-1999
		36 – 49m	Level 2 AS3959-1999
		49m – 100m	Level 1 AS3959-1999

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	6.8° downslope	28 - 39m	Level 3 AS3959-1999
		39 – 52m	Level 2 AS3959-1999
		52 – 100m	Level 1 AS3959-1999
Open Forest	7.9° downslope	30 - 41m	Level 3 AS3959-1999
		41 – 55m	Level 2 AS3959-1999
		55 – 100m	Level 1 AS3959-1999
Open Forest	11.3° downslope	38 - 47m	Level 3 AS3959-1999
		47 – 62m	Level 2 AS3959-1999
		62 – 100m	Level 1 AS3959-1999
Open Forest	2.8° downslope	17 – 25m	Level 3 AS3959-1999
		25 – 35m	Level 2 AS3959-1999
		35 – 100	Level 1 AS3959-1999

Table 8-5 Recommended Construction Standards for Development Estate 5

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	Flat	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	Cross-slope	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	2.9° upslope	18 – 26m	Level 3 AS3959-1999
		26 – 36m	Level 2 AS3959-1999
		36 – 100m	Level 1 AS3959-1999
Open Forest	3.4° upslope	17 - 25m	Level 3 AS3959-1999
		25 – 35m	Level 2 AS3959-1999
		35m – 100m	Level 1 AS3959-1999
Open Forest	5.7° upslope	15 – 21m	Level 3 AS3959-1999
		21 – 30m	Level 2 AS3959-1999
		30 – 100m	Level 1 AS3959-1999
Open Forest	6.3°upslope	13 – 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26 – 100m	Level 1 AS3959-1999
Open Forest	8° upslope	13 – 19m	Level 3 AS3959-1999
		19 – 28m	Level 2 AS3959-1999
		28 – 100m	Level 1 AS3959-1999
Open Forest	9.1° upslope	12 - 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26m – 100m	Level 1 AS3959-1999
Open Forest	10.2° upslope	10 – 15m	Level 3 AS3959-1999
		15 – 22m	Level 2 AS3959-1999
		22m – 100m	Level 1 AS3959-1999
Open Forest	11.3° upslope	10 – 15m	Level 3 AS3959-1999
		15 – 22m	Level 2 AS3959-1999
		22m – 100m	Level 1 AS3959-1999
Open Forest	11.9° upslope	10 – 14m	Level 3 AS3959-1999
		14 – 21m	Level 2 AS3959-1999
		21m – 100m	Level 1 AS3959-1999
Open Forest	13.5° upslope	9 – 13m	Level 3 AS3959-1999
		13 – 20m	Level 2 AS3959-1999
		20m – 100m	Level 1 AS3959-1999
Open Forest	15.6° upslope	8 – 12m	Level 3 AS3959-1999
		12 – 18m	Level 2 AS3959-1999

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
		18m – 100m	Level 1 AS3959-1999
Open Forest	3.4° downslope	24 - 34m	Level 3 AS3959-1999
		34 – 46m	Level 2 AS3959-1999
		46 – 100m	Level 1 AS3959-1999
Open Forest	4.6° downslope	25 - 36m	Level 3 AS3959-1999
		36 – 49m	Level 2 AS3959-1999
		49m – 100m	Level 1 AS3959-1999
Open Forest	8° downslope	30 - 41m	Level 3 AS3959-1999
		41 – 55m	Level 2 AS3959-1999
		55 – 100m	Level 1 AS3959-1999
Open Forest	9.6 °upslope	12 – 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26 – 100m	Level 1 AS3959-1999
Open Forest	5.1 °upslope	15 – 21m	Level 3 AS3959-1999
		21 – 30m	Level 2 AS3959-1999
		30 – 100m	Level 1 AS3959-1999
Open Forest	19.8 °upslope	52 - 58m	Level 3 AS3959-1999
		58 – 75m	Level 2 AS3959-1999
		75 – 100m	Level 1 AS3959-1999

Table 8-6 Recommended Construction Standards for Development Estate 6

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
Open Forest	Flat	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	Cross-slope	20 - 29m	Level 3 AS3959-1999
		29 – 40m	Level 2 AS3959-1999
		40m – 100m	Level 1 AS3959-1999
Open Forest	3.4° upslope	17 - 25m	Level 3 AS3959-1999
		25 – 35m	Level 2 AS3959-1999
		35m – 100m	Level 1 AS3959-1999
Open Forest	4.6° upslope	16 – 23m	Level 3 AS3959-1999
		23 – 32m	Level 2 AS3959-1999
		32 – 100m	Level 1 AS3959-1999
Open Forest	5.7° upslope	15 – 21m	Level 3 AS3959-1999
		21 – 30m	Level 2 AS3959-1999
		30 – 100m	Level 1 AS3959-1999
Open Forest	6.8° upslope	13 – 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26 – 100m	Level 1 AS3959-1999
Open Forest	9° upslope	12 - 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26m – 100m	Level 1 AS3959-1999
Open Forest	9.1° upslope	12 - 18m	Level 3 AS3959-1999
		18 – 26m	Level 2 AS3959-1999
		26m – 100m	Level 1 AS3959-1999
Open Forest	5.5° downslope	26 - 37m	Level 3 AS3959-1999
		37 – 50m	Level 2 AS3959-1999
		50 – 100m	Level 1 AS3959-1999
Open Forest	7.4° downslope	30 - 41m	Level 3 AS3959-1999
		41 – 55m	Level 2 AS3959-1999
		55 – 100m	Level 1 AS3959-1999
Open Forest	12.5° downslope	33 - 43m	Level 3 AS3959-1999

Vegetation Type	Slope	Distance from Vegetation	Level of Construction
		43 – 57m	Level 2 AS3959-1999
		57 – 100m	Level 1 AS3959-1999

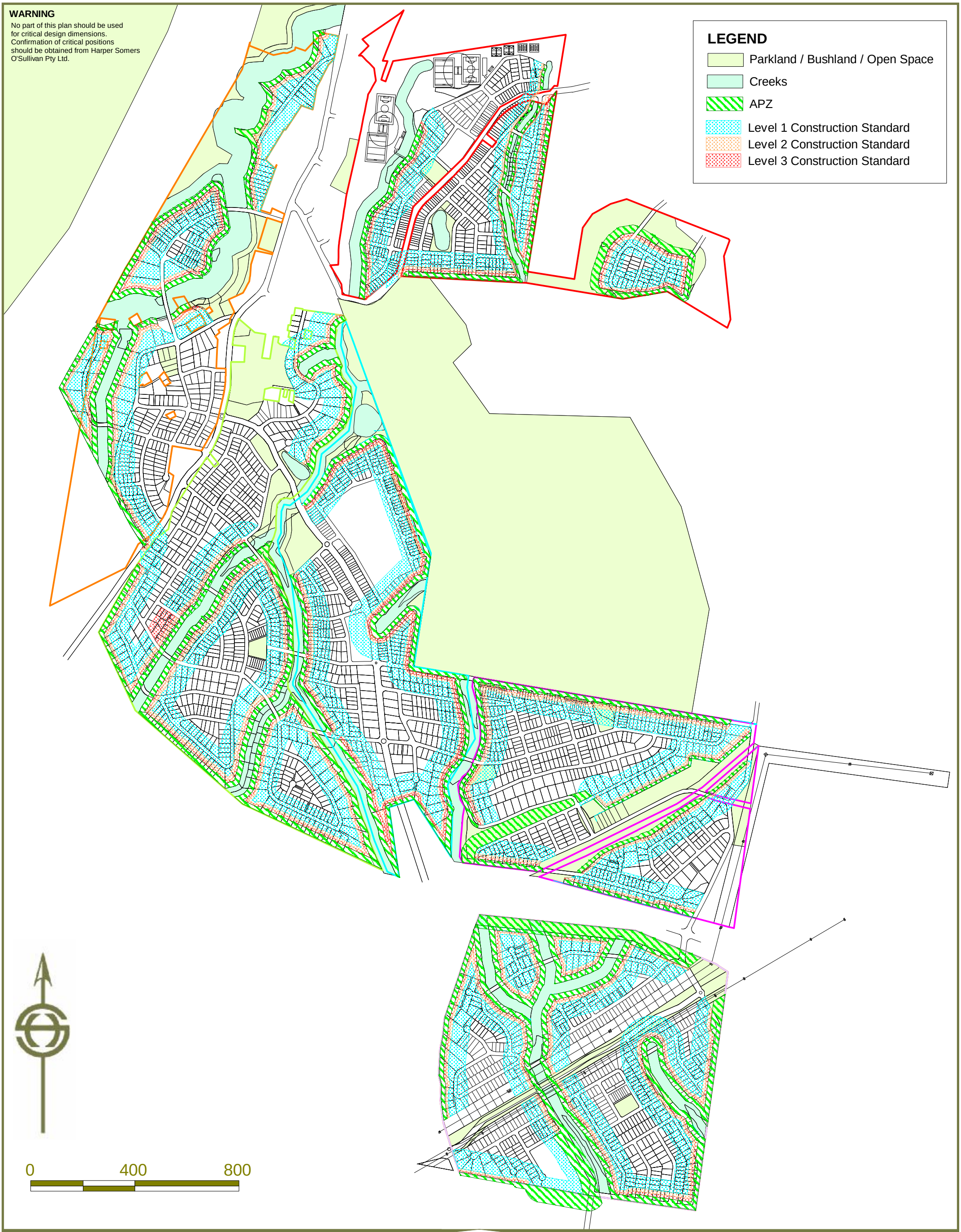
No Level of construction (AS3959-1999) applies for any dwelling built greater than 100m from the Open forest.

Given the information in Tables 8-1 to 8-6, all future dwellings within the proposed allotments will comply with AS3959-1999.

Figure 8-1 shows the construction standards required for any future dwelling within the development estate. Key components of these construction standards are outlined in Appendix C – Building Requirements.

WARNING

No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from Harper Somers O'Sullivan Pty Ltd.



TITLE: Figure 8-1 Construction Standards
Minmi-Link Road - Overall

CLIENT: Coal & Allied Operations Pty Ltd

PLANNING SURVEYING ECOLOGY

HARPER SOMERS O'SULLIVAN

SCALE: 1: 13000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** M.Doherty

DATUM: MGA Zone 56 (GDA 94) **DATE:** 4/11/2008

LAYOUT REF:J:\JOBS\24k\24530 Hunter Valley\Drafting\Bushfire\Northern Lands\ALL WORKSPACES\Report Figures\24530-2 Fig8-1 construction estate overall A A3

CONTOUR INTERVAL: N/A

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LEGEND

- Parks / Bushland / Open Space
- Creeks
- APZ's
- Level 1 Construction Standard
- Level 2 Construction Standard
- Level 3 Construction Standard

0 175 350m

TITLE: Figure 8-1 Construction Standards
Estate 1A & B

CLIENT: Coal & Allied Operations Pty Ltd

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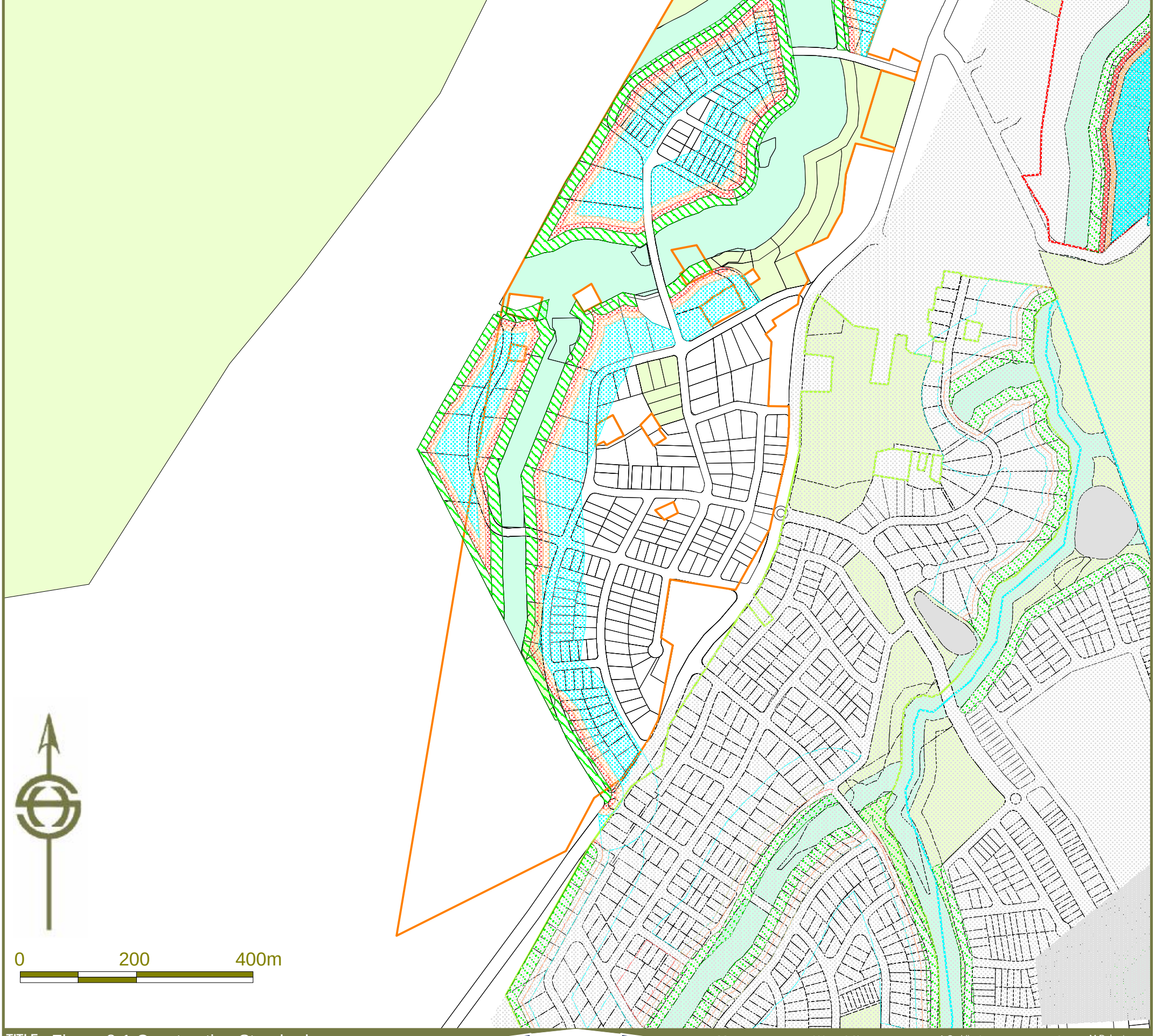
LEGEND

- Parkland / Bushland / Open Space
- Creeks
- APZ
- Level 1 Construction Standard
- Level 2 Construction Standard
- Level 3 Construction Standard



TITLE: Figure 8-1 Construction Standards Estate 2

CLIENT:

SCALE: 1: 7000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** M.Doherty

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WARNING

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LEGEND

- Parkland / Bushland / Open Spac
- Creeks
- APZ
- Level 1 Construction Standard
- Level 2 Construction Standard
- Level 3 Construction Standard

0 125 250m

TITLE: Figure 8-1 Construction Standards
Estate 5 A, B, C & D

CLIENT: Coal & Allied Operations Pty Ltd

PLANNING SURVEYING ECOLOGY

HARPER SOMERS O'SULLIVAN

SCALE: 1: 4000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** M.Doherty

DATUM: MGA Zone 56 (GDA 94) **DATE:** 4/11/2008

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CONTOUR INTERVAL: N/A

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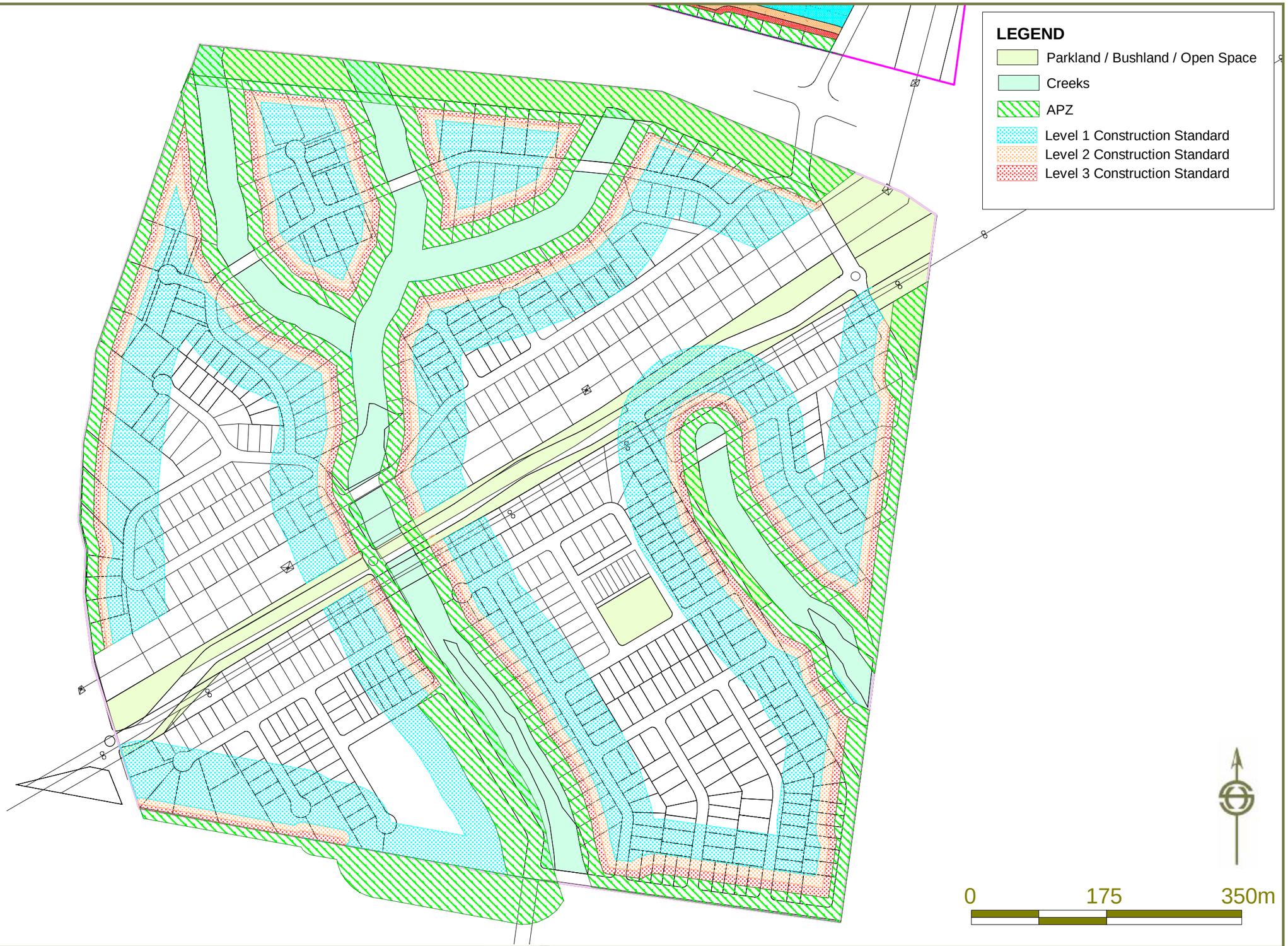

TITLE: Figure 8-1 Construction Standards Estate 6

CLIENT: Coal & Allied Operations Pty Ltd

SCALE: 1: 5000 at A3 Size **DRAWN:** A.Saddington **APPROVED:** M.Doherty

DATUM: MGA Zone 56 (GDA 94) **DATE:** 4/11/2008

LAYOUT REF:J:\JOBS\24k\24530 Hunter Valley\Drafting\Bushfire\Northern Lands\ ALL WORKSPACES\Report Figures\24530-2 Fig8-1 construction estate 6 A A3

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9 CONCLUSION & RECOMMENDATIONS

It is clear from this investigation and assessment that the Minmi Link Road constitutes BFPL. Therefore, the proposed future development estate will have to be carried out in accordance with the specifications contained within PBP 2006 as assessed and presented within this report.

If the recommendations contained within this report are duly considered and incorporated, it is considered that the fire hazard present is containable to a level considered necessary to provide an adequate level of protection to life and property on the development estate.

In summary, the following key recommendations have been generated to enable the development estate to meet the relevant legislative requirements:

- APZ's from 9 metres to 64 metres will be for adequate protection from vegetation external to the development estate. The Concept Plan indicates proposed roadways around parts of the development to provide a buffer between the adjacent vegetation and the development estate. The proposed perimeter and public roads within the development estate are therefore likely to provide for the majority of the required APZ's, with the remainder of the APZ being accommodated within the allotments.

- Any proposed development be linked to the existing mains pressure water supply and that suitable hydrants be clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure should comply with AS2419.1, 2005.

- Roads be constructed in accordance with section 4.1.3 (1), PBP 2006 as outlined in section 6 of this report. Any lessening of these requirements will require a performance-based assessment to be undertaken with the future project applications for the subdivision of land.

- Any future dwelling within the development estate should have due regard to the specific considerations given in the BCA, which makes specific reference to the Australian Standard (AS3959 – 1999) construction of buildings in bushfire prone areas. Assessment in accordance with AS3959-1999 has shown that any future dwelling will be able to comply with this standard.

Finally, it is believed that the implementation of the measures and recommendations forwarded within this report would contribute to the amelioration of the potential impact of any bushfire upon the development estate, but they do not and cannot guarantee that the area will <u>not</u> be affected by bushfire at some time.