

BUSHFIRE RISK HAZARD ANALYSIS
Teviot Downs, North of Pub Lane

Prepared for:

TEVIOT DOWNS ESTATE PTY LTD

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PLANS AND DOCUMENTS
referred to in the ULDA
APPROVAL dated 1-1-10

Summary of Issues

Teviot Downs can be conveniently divided into areas either north or south of Pub Lane. Previously, in the area north of Pub lane (NPL) there were three proposed development nodes comprising 275 allotments over what was planned as Stages 35-38. A Reconfiguring a Lot Development Approval was given on 6 October 2010 (Logan City Development Permit RL/57/2009) with conditions for ensuring permanent access to adequate water supply for fire fighting, which stated:

22 BUSHFIRE HAZARD AREA

- 22.1 Design and implement the development in accordance with the recommendations of the "bushfire Management Plan", prepared by Development Ecology Pty Ltd dated 1 February 2010.
- 22.2 Provide for permanent access to an adequate water supply for fire fighting purposes for each Lot. The permanent water supply must be in the form of a 31,500L water tank that:
 - 22.2.1 has a minimum of 5000litres available for fire-fighting purposes at all times;
 - 22.2.2 is provided with adequate vehicle access for a fire-fighting vehicle;
 - 22.2.3 is fitted with water supply outlet pipes of 55mm diameter fitted with a male camlock; and
 - 22.2.4 positions the normal tank outlet to reserve 5,000 litres in the bottom for fire-fighting purposes only; and
 - 22.2.5 is in a place at the time of the completion of the new dwelling.

These conditions are now redundant with the new application to the ULDA for a redesigned precinct north of Pub Lane where allotments will be greatly reduced in size and dwellings will have connections to the water supply and sewerage network. Previous approvals by Beaudesert Shire Council, and now Logan City Council, have controls for water supply including 'Fire Provision' under *Guidelines for Planning and Design of Urban Water Supply Schemes* (Water Resources, 1989). Now these have been revised by DERM as *Planning Guidelines for Water Supply & Sewerage* (April, 2010) and relevant sections to guide design in the new proposal NPL are *Chapter 6 Network Modelling, Section 5.0 Key Elements, Sub-Section 5.7 Fire Provision*.

In the new guidelines (DERM April, 2010) it states:

5.7.1 Intent of Fire Provision

Provision of network capacity to fight fires in the community is an important part of the water supply network. Most water supply reticulation systems are designed to meet some level of fire protection, however the level provided is variable and depends on the available system capacity.

To comply with this guideline, a service provider must develop a policy detailing the fire fighting provisions required for water supply reticulation systems in its area. Cooperation with the fire authority is essential for the continuing provision of reliable fire service.

It follows that any design and planning for 'Fire Provision' referencing water required for fire fighting is now outside the scope of any considerations in this document, and clearly in the realm of the water authority in concert with the local fire authority. However, the fundamental principles of reducing fire risk through measuring fire hazard, as in the State Planning Policy Guideline (SPP1/03) – *Mitigating the Adverse Impacts of Flood, Bushfire & Landslide (June 2003)* remain as foundations in reducing bushfire hazard by guiding development design principles.

In SPP1/03 methodologies are prescribed, which are approved by the Queensland Fire and Rescue Service (QFRS). This assessment has been carried out in accordance with the SPP 1/03 Guideline

In past development applications, the master plan NPL has dictated design fundamentals for fire hygiene, and the alignment and density of housing was of secondary consideration to vegetation communities neighbouring and the required setback(s) from such vegetation. As this current development scenario has emerged, the principal factors in assessing bushfire risk changed, and now principal in this are:

- (i) The size of allotments which have been progressively reducing (now <<2500m²), concurrent with an increase in the number of allotments;
- (ii) Reticulated mains water supply;
- (iii) Orientation of smaller allotments with roadways and cleared verges to what are now 'linear parks' conserving gully lines of Regionally Endangered Regional Ecosystems;
- (iv) Isolation of any vegetation so conserved in gully lines from any significant vegetation in areas offsite.

This meant that the previous Bushfire Hazard Assessment for parkland residential development (Development Ecology, 24 October 2011) will change where there is an interface with Remnant vegetation as the risk from bushfire is now greatly reduced e.g. in the NE corner, and onsite water reserves for fire fighting will not be a consideration as in the Development Approval (RL/57/2009) with conditions, this is now a risk element in *Network Modelling* as set out in *Planning Guidelines for Water Supply & Sewerage* (Development Ecology, April 2010) i.e. fire fighting capacity in water mains as designed in engineering, considering local fire authority advice.

In previous development scenarios, important influences in bushfire management were the spatial extent of the bushland interfacing the development NPL e.g. the NE corner, and its offsite links with other vegetation. In the current proposal, the vegetation contiguous with housing when constructed will be linear and < approximately 60m in width, this being vegetation in ephemeral watercourse/drainage features, and some with a more permanent 'chain of ponds' i.e. the vegetation understorey will be usually 'green' grasses. The bushfire risk is greatly lessened in the current proposal due to the reduced spatial extent of any vegetation now proposed to be retained, and the observation that any vegetation is not in a corridor linking with significant vegetation offsite.

The slopes NPL are gentle and generally are less than or very close to five percent, and as stated the vegetated areas around proposed development areas are normally

narrow. However during any staging sequence, some development areas may be contiguous with remnant vegetation and a firebreak of 32m will need to be maintained on the boundary of the advancing development. A consequence is that there is little opportunity for fire to burn up-slope into the planned residential areas, and a 'hot' fire would not eventuate in this narrow, 'green' linear vegetation landscape. The proposed fire buffers calculated in this report are based on height of mature vegetation on site and these heights are therefore resultant from site edaphic factors.

The vegetated areas conserved NPL are proportionately, when compared with the previous parkland residential lots, not only very small, but are easily accessed by road and will have mains water available for fire fighting. *The very small lots proposed will not be large enough to carry enough woody vegetation to pose a fire risk in themselves.*

The Development Constraints Overlay in the Beaudesert Shire Planning Scheme 2007 (which is largely consistent with the Rural Fire Service mapping from 2002) identifies that much of the site is contained in a "Medium Bushfire Hazard Area", however, this is based on old aerial photography and will not be an accurate assessment of site conditions post development with the small allotments proposed (median size category 400 – 600m²) with roadways separating allotments from retained vegetation.

This report provides a more detailed assessment of the bushfire risk affecting the site. The report has found that the planned estate is largely low-medium fire risk, and no longer has some areas that must be assessed as of medium risk due to the interface with significant Remnant vegetation. Therefore, in an overall hazard condition, analysis of bushfire hazard applying SPP Guideline 1/03 demonstrates that the fringes of the development nodes of NPL (formerly Stages 35-38) of Teviot Downs must be considered as **medium bushfire hazard** areas on this interface (although a low score in this category) i.e. SPP1/03 states that a 50m safety buffer should be allowed where remnant vegetation remains and of sufficient width to pose a bushfire risk, or modified according to local conditions.

However, as stated in the code requirements set out in Appendix 5 - Table B 1.2(b) of the SPP 1/03 guideline, future dwellings should be separated from conserved "hazardous" vegetation i.e. where there is remnant vegetation with sufficient width and fuel potential, by a setback of 1.5 x site canopy height as determined by site mature trees i.e. buffer width 1.5 x 22m = 33m.

Required Bushfire Buffers

- *A 33m setback is required between dwellings along the interface of Stages with the Remnant vegetation in the drainage gullies.*
- *Where development interfaces with vegetation in easements on the estate boundary i.e. Stages 21, 23 & 26 and allotments 217 – 227, then a bushfire hazard management plan by others will need to be verified.*
- *In the NE portion during a staged development without clearing of the development footprint prior to commencement of works, there will need to be a progressive firebreak constructed on the development boundary.*

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The Site

The site to be occupied by relatively high-density precincts/Stages north of Pub Lane (NPL), Teviot Downs, consists of generally flat to undulating slopes with shallow drainage features. Some remnant or regrowth vegetation is present along these drainage features and in the northeast portion of the site. As an underlying general fire condition, the high density residential lots proposed are small and will not in themselves be large enough to carry enough woody vegetation to pose a fire risk i.e. the only consideration for Bushfire Hazard Analysis is a setback from conserved vegetation in gully lines ('linear parkland') (vegetation on the western boundary associated with the sports grounds and Lavelle Lagoon is too narrow, and also maintained as linear parkland, to warrant any consideration as a fire risk).

Therefore, NPL the proposed development areas will have an interface with only limited patches of natural vegetation left conserved in what is now termed 'linear parkland', and there is little opportunity for intense fire to build up in these scattered remnants with small fetch. However, the risk that even small fires can cause damage to property and place life at risk remains real.

In Teviot Downs access to the vegetated areas for fire control is good with paved streets planned and mains water close at hand (as determined by application of the DERM *Planning Guidelines for Water Supply & Sewerage* (April, 2010)).

Formal Bushfire Hazard Risk Assessment

Risk factors have been quantified for formal analysis in *Bushfire Hazard Planning in Queensland - June 2003*. This process is applied here.

The development now proposed (Refer **Figure 1**) will have when completed a boundary where there will be an interface with a narrow, linear vegetation landscape along a drainage line i.e. linear parkland conserving RERE in gully lines (Refer **Figures 2a & b**).

Fire risk hazard components are calculated for the conserved RERE interface only, as the high density residential lots proposed are small and will not in themselves be large enough to carry enough woody vegetation to pose any bushfire risk, using tables in SPP Guideline 1/03.

Three factors are involved in this calculation: **vegetation**, **slope** and **aspect**. Comment on site-specific conditions follows, with reference to the interface with the Remnant vegetation.

1. Vegetation

In general, NPL the vegetation of the site comprises two basic assemblages, very lightly wooded grassy areas, which are to be subdivided into medium to high-density residential building lots, and Remnant or regrowth natural vegetation in drainage features and in the NE corner.



Figure 2a: Arrow (blue) showing example of interface on boundary along Stages 2 & 5 with linear parkland vegetation i.e. RERE conservation landscape < approximately 60m width. Arrow (red) shows the larger vegetated area in the NE, which is isolated from offsite vegetation by clearing. If this area is not initially cleared, a 33m fire break will need to be maintained on any advancing development boundary.



Figure 2b: Aerial image showing that the vegetation is isolated from vegetated areas offsite by neighbourhood clearing. Note previous development 'nodes' termed 'A' 'B' & 'C'.

Remnant vegetation conserved in the drainage features i.e. thin linear vegetated corridors.

The natural vegetation is grassy eucalypt forest, usually with an *Acacia leiocalyx* mid-story. The woodland is variable in species composition with *Eucalyptus crebra* and

Corymbia citriodora dominating on ridges and *Eucalyptus seeana*, *Eucalyptus tereticornis* and *Corymbia citriodora* in lower lying areas. Most of this has previously been maintenance thinned and does not resemble the original vegetation community. The open areas, previously referred to as Areas A, B & C (Refer **Figure 2b**), have a tree canopy cover of less than 12% with a grassy understorey developing as a result of periodic slashing. This is non Remnant and therefore poses very little bushfire hazard threat on the boundaries of development in these areas and will not be considered further, as periodic maintenance slashing by the developer negates any risk.

Melaleuca quinquenervia is dominant in the drainage feature proper.

The Hazard score associated with the woodlands is 6 (this is very conservative as the canopy cover is < 12%), and of the slashed grass 2 (although this is under the control of the developer and could be reduced to 0), according to table **A3.1** of SPP guideline 1/03.

Estimate of Mature Canopy Height for this Site

The vegetation of the site comprises regrowth following clearing for development some decades ago. Some of the site has now achieved the status of remnant vegetation of least concern. The area is appropriately described as eucalypt woodland with a variable understorey of *Acacia* or low shrubs and grass. Beneath the power lines the vegetation has been reduced to slashed grasses.

Within the vegetation some trees can be found that are remnants of the pre-clearing vegetation. These were apparently left as landscape trees in the proposed estate (area cleared for 4000m² allotments in 2002 by Forester Kurtz leaving only the vegetation in the gullies intact). It is likely, therefore, that they were trees of stature at that time, and now, twenty or thirty years later, can be treated as mature trees. Some of the larger trees appear to have died in recent years. The most prominent of these older trees still living were located and both diameter at 1.5m above soil level and height measured. DBH was determined using a tape to measure circumference. Height was measured using a clinometer and a tape.

Trees more than 20m tall are quite uncommon (Refer **Figure 3: Appendix 1**)

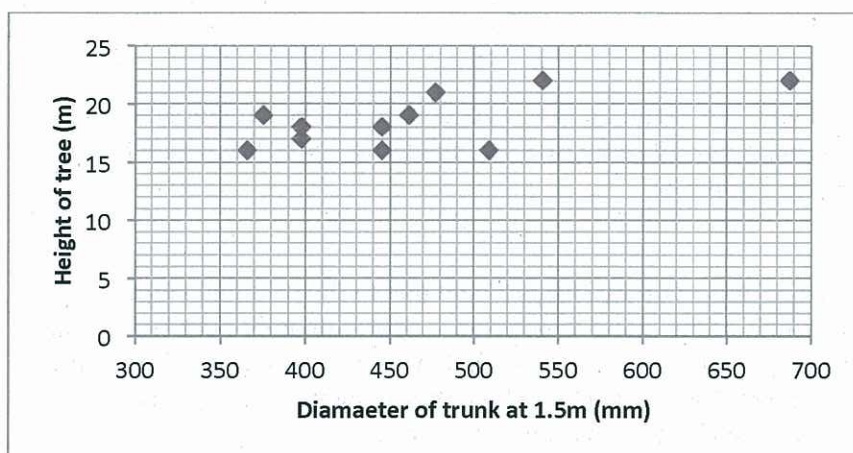


Figure 3: The relationship between trunk diameter at 1.5m (DBH) above soil level and tree height for the eleven tallest trees found in or near Stages 16, 17, 18A, 18B, 19, 24, 25 & 26, Teviot Downs.

It seems likely that edaphic (mostly soil fertility) factors limit the height to which trees grow in this area, although it is well established that eucalypts show considerable genetic difference over small distances and it is possible that the trees in this area of low soil fertility are genetically limited in their height.

Nevertheless, it is concluded therefore that, the mature tree canopy in Stages 16, 17, 18A, 18B, 19, 24, 25 & 26 are measured to have a **maximum height of 22m**, not often exceeding 20m. This is considered to be indicative of species across this site as edaphic factors are largely consistent across this site. The DBH indicates that at this height these mature trees display growth relationships consistent with these species, and coupled with the Eucalypts' fire resistant bark, these trees would not readily fall during bushfire on this estate.

Therefore, as stated in the code requirements set out in Appendix 5 - Table B 1.2(b) of the SPP 1/03 June 2003 guideline, future dwellings should be separated from conserved "hazardous" vegetation i.e. remnant vegetation, by a setback of 1.5 x site mature canopy height (22m) of mature species present (33m) i.e. $1.5 \times 22\text{m} = 33\text{m}$.

Understorey in/near gullies in NE corner

The environment of stages 16,17, 18A, 18B, 19, 24, 25 & 26 all has a moderate bushfire hazard risk, but mostly at the low end of that hazard risk category.

The vegetation close to the proposed staged development is a small area in total, limiting the potential for a fire to reach a high intensity. That the vegetation is confined to narrow tongues after development further restricts any bushfire hazard.

In these tongues, typical understorey vegetation i.e. potential fuel, is surviving on a nutrient poor soil, which has limited penetration by weeds (Refer **Figure 4: Appendix 2**) and even those present, have not grown vigorously. *Lanatana camara*, for example is present only as a few small plants. This further reinforces the bushfire hazard assessment that the risk will be low in the moderate classification i.e. a 33m buffer to dwellings will be conservative.

2. Slope

Slope on the interface with the Remnant linear vegetation can be categorised as plain (less than 5%), which has a hazard score of 1, or undulating (5-10%), which has a hazard score of 2 (Refer **Figure 4**).

3. Aspect

Aspect has no significant impact on fire hazard here due to the minimal slope (approximately 5%), width of the linear vegetation < approximately 60m width, and that the proposed development is medium to high density residential lots which are small (median size category 400 – 600m²) and will not in themselves be large enough to carry enough woody vegetation to pose any fire risk.

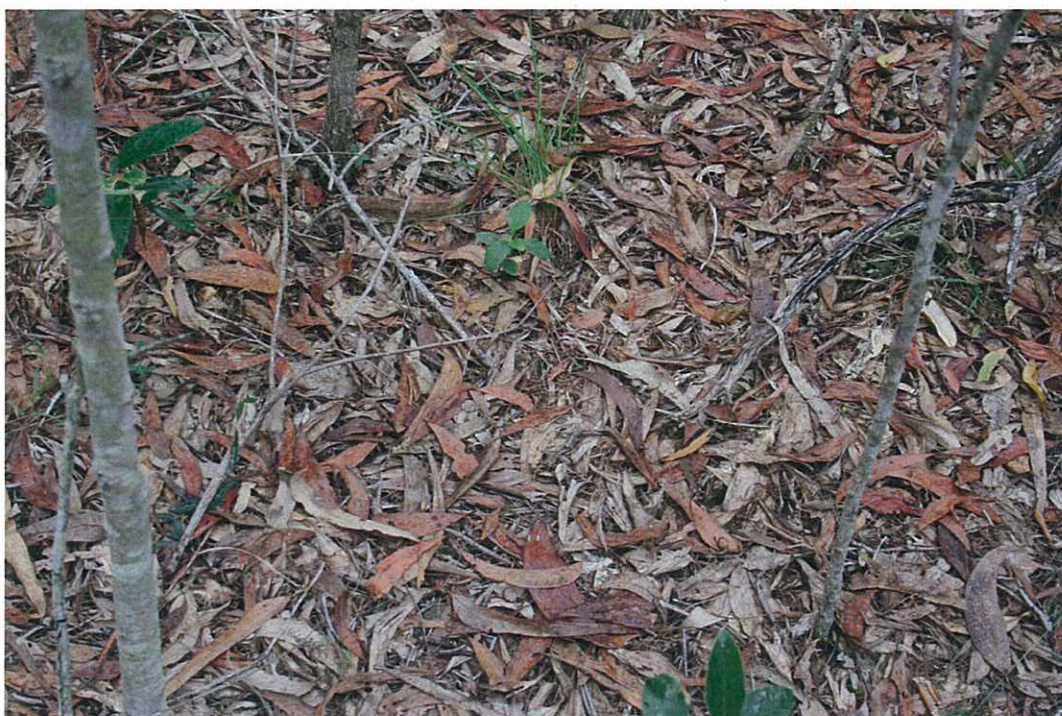


Figure 3: Ground layer within the community north of the proposed development showing its open, mostly weed-free nature. Where the over-storey is less dense a grassy layer usually dominated by fine native grasses establishes in dry areas and native sedges or the native grass *Imperator cylindrica* in swales. This constitutes a low risk in the moderate classification of bushfire assessment and supports a bushfire buffer of 33m to dwellings being conservative.

Hazard Score

From the above, a *Hazard Score* can be calculated and this will then trigger the provision for a safety buffer of set width where the score is > 5.5 (Refer **Table 1**).

Table 1: Hazard score ranges to identify the severity of bushfire hazard. (Table A 3.5 from SPP Guideline 1/03)

Total hazard score	Severity of bushfire hazard	Width of safety buffer
13 or greater	High	100 metres
6 to 12.5	Medium	50 metres
1 to 5.5	Low	Not applicable

The assessment that follows links the hazard with the proposed development sequence/stages.

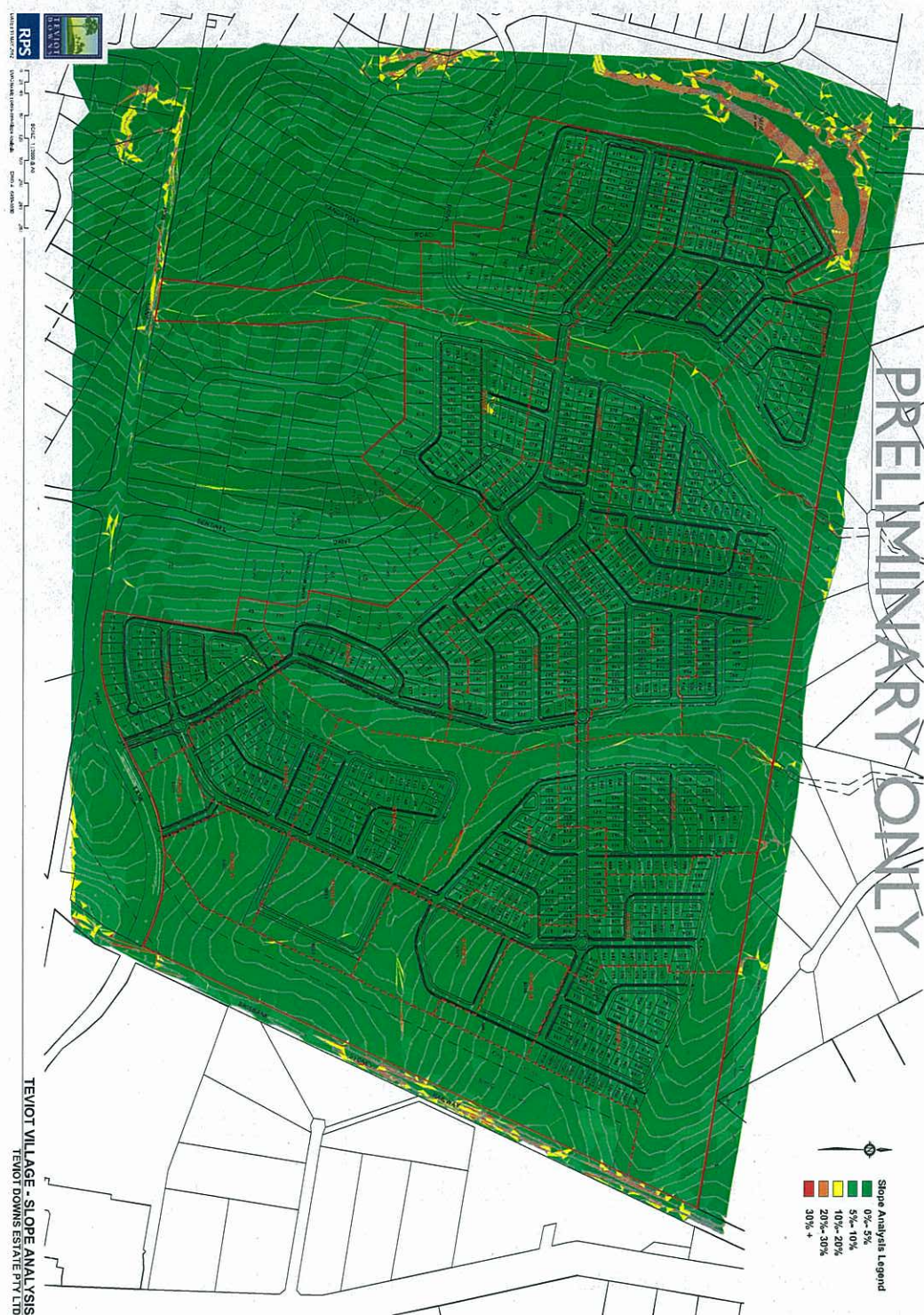


Figure 4: Map showing slope analysis across Precinct 1. Dark green areas are <5% slope, pale green areas 5 – 10% slope, and yellow 10 – 20% slope which is restricted to the railway cutting, creek banks, and a borrow pit contiguous with Lavelle lagoon.

Boundaries of Stages

In the developed configuration, all Stages except 21, 23 & 26, along with allotments 216 – 227, will have only one important area with regard to bushfire hazard risk assessment and that is on the interface with the Remnant linear vegetation in gully lines now retained as linear parks.

In the NE portion during a staged development without clearing of the development footprint prior to commencement of works, there will need to be a progressive firebreak constructed on the development boundary. This firebreak should be maintained at a width of 1.5 x mature height of trees i.e. 1.5 x 22m = 33m.

Across the balance of the proposed development NPL, slopes of any interface with a drainage feature are well below 10% and generally less than 5%. This does not pose a significant bushfire risk with maintenance slashing of the proposed buffers.

Table 2: Fire risk analysis for lots on the interface with Remnant vegetation in the drainage feature and NE portion/corner (from SPP Guideline 1/03).

Element	Data	Hazard Score
Vegetation	Eucalypt woodland	6
Slope	Less than 10%	2
Aspect	North to East and less than 5%	0 - 1
Total		8 - 9

- *This equates to a medium bushfire hazard risk (Refer **Table 1**) and therefore a bushfire hazard buffer of 33m from this vegetation is required along the RERE conservation areas in 'linear parks'.*

Internal development areas

The fundamental feature in this area is that it will be covered by medium to high-density housing and, therefore, the allotments will not in themselves be large enough to carry enough woody vegetation to pose a bushfire risk (Refer **Table 3**).

Table 3: Fire risk analysis for plain lots Stages 1 – 19 urban sites.

Element	Data	Hazard Score
Vegetation	Gardens	0
Slope	Less than 10%	2
Aspect	Not applicable	0
Total		2

- *This equates to no bushfire hazard risk (Refer **Table 1**) and requires no buffer(s) or other treatments.*

Stages 21, 23 & 26, along with allotments 216 – 227

These areas on the eastern side of the development NPL do not have a perimeter boundary road and front directly to a pipeline and power easement.

Fire hazard management in these easements is the responsibility of others and review of maintenance slashing/clearing in this area would need to be sourced and provided to owners/body corporates on this development offsite interface so as to ensure vigilance of fire risk and timely management of vegetation regrowth.

Field Verification

The slopes into the drainage gullies with Remnant vegetation are gentle and generally are less than or very close to five percent, and the vegetated areas (RERE) narrow i.e. a linear park ~60m width.. A consequence is that there is little opportunity for fire to burn up-slope into the planned residential areas. The proposed fire buffers can, therefore, be considered conservative i.e. 33m.

The vegetated areas are not only small, but are easily accessed by roads, which function both as a firebreak and have mains water available for fire fighting. The very small lots proposed will not be large enough to carry enough woody vegetation to pose a fire risk in themselves, and the areas for subdivision now carry only very sparse tree cover.

The planned estate is largely low fire risk, but has some areas that must be assessed as of moderate risk.

Fire History

There has not been a fire in the region north of Pub Lane for some years.

Required Bushfire Buffers

Analysis of bushfire hazard scores shows that the margins (i.e. 50m zone) of the interface with natural vegetation are within a medium bushfire hazard area. Accordingly, as stated in the code requirements set out in Appendix 5 - Table B 1.2(b) of the SPP 1/03 June 2003 guideline, future dwellings should be separated from conserved “hazardous” vegetation i.e. remnant vegetation, by a setback of 1.5 x site mature canopy height (22m) of mature species present (33m).

- *A 33m setback is required between dwellings along the interface of Stages with the Remnant vegetation in the drainage gullies.*
- *Where development interfaces with vegetation in easements on the estate boundary i.e. Stages 21, 23 & 26 and allotments 217 – 227, then a bushfire hazard management plan by others will need to be verified.*
- *In the NE portion during a staged development without clearing of the development footprint prior to commencement of works, there will need to be a progressive firebreak constructed on the development boundary.*

APPENDIX 1

*Species and their morphometrics
as measured from mature trees on the site NPL*

Large trees found in the site.

Species	Location (WGS 84 : UTM – UPS)		circumference (mm)	dbh (mm)	height (m)
<i>Eucalyptus crebra</i>	56J0498015	6932793	1250	398	18
<i>E. crebra</i>	56J0498011	6932748	1600	509	16
<i>E. crebra</i>	56J0497986	6932817	1250	398	17
<i>E. crebra</i>	56J0497911	6932812	1500	477	21
<i>E. crebra</i>	56J0487910	6932813	1400	445	16
<i>E. crebra</i>	56J0497857	6932798	1450	461	19
<i>E. crebra</i>	56J0497836	6932798	1700	541	22
<i>E. crebra</i>	56J0498004	6932671	1180	375	19
<i>E. crebra</i>	56J0498023	6932716	1400	445	18
<i>E. crebra</i>	56J0498025	6932754	1150	366	16
<i>Corymbia intermedia</i>	56J0497815	6932540	2160	687	22
<i>E. tereticornis</i>	56J0497892	6932546	1120	356	15
<i>Lophostemon suaveolens</i>	56J0497968	6932609	1150	366	11

APPENDIX 2

*Plants recorded from the regrowth area in the NE corner –
predominantly in/near the gullies to be conserved.*

This is a list compiled during observations on 16th April 2012.

Species

Acacia irrorata
Acacia leiocalyx
Allocasuarina littoralis
Alloteropsis semialata
Alphitonia excelsa
**Bidens pilosa*
Chrysocephalum apiculatum
Commelina diffusa
Corymbia citriodora
Corymbia intermedia
Crassipedium sp.
Dianella caerulea
**Digitaria didactyla*
Eragrostis aff brownii
Eucalyptus crebra
Eucalyptus seeana
Eucalyptus tereticornis
Gahnia aspera
Goodenia hederacea
Goodenia rotundifolia
Hybanthus stellarioides
Imperator cylindrica
**Lantana camara*
Lepidosperma laterale
**Lobelia purpuracens*
Lomandra longifolia
Melaleuca bracteata
Murdannia graminea
Paspalidium sp.
**Paspalum dilatatum*
**Paspalum urvillei*
Petalostigma pubescens
Pimelia linifolia
Poranthera sp.
Themeda triandra
Wahlenbergia gracilis