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BUSHFIRE HAZARD ASSESSMENT

PROPOSED SUBDIVISION OF

Lots 1-80, 83, 84, 86-88
DP791199 & Lots 90-95
DP805549
"Le `Clos Verdun Estate"
Sancrox NSW

For: Hopkins Consultants

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1.0 INTRODUCTION

As requested a bushfire hazard assessment has been carried out for the proposed subdivision of Lots 1-80,83,84, 86-88 DP791199 and Lots 90-95 DP805549, Le Clos Verdun Estate, Sancrox. It is proposed to subdivide the subject lots into 144 separate rural residential lots.

The report is based on a site assessments carried out on 6th and 10th June 2007.

The report is to demonstrate that the bushfire risk is manageable for the proposed subdivision.

The proposed development will be an integrated development and has a requirement for a Bush Fire Safety Authority under section 100B of the *Rural Fires Act 1997*.

NOTE

The report has been prepared with all reasonable skill, care and diligence.

The information contained in this report has been gathered from field survey, experience and has been completed in consideration of the following legislation.

1. Rural Fires Act 1997
2. Environmental Planning and Assessment Act 1979/Building Code of Australia 1996.
3. Council Local Environment Plans and Development Control Plans where applicable.
4. NSW Rural Fire Services, Planning for Bushfire Protection, 2006.
5. AS 3959-1999 Construction of Buildings in Bushfire Prone Areas.

The report recognizes the fact that no property and lives can be guaranteed to survive a bushfire attack. The report examines ways the risk of bushfire attack can be reduced where the site falls within the scope of the legislation.

The report is confidential and the writer accepts no responsibility of whatsoever nature, to third parties who use this report or part thereof is made known. Any such party relies on this report at their own risk.

This report has been based upon the vegetation characteristics observed at the time of site inspection. No responsibility is taken where the vegetation characteristics of the subject site or surrounding areas is changed or modified beyond that which is presented within this report.

1.1 Objectives

The objectives of this report are to:

- Ensure that the proposed subdivision of the land has measures sufficient to minimize the impact of bushfires; and
- Reduce the risk to property and the community from bushfire.

1.2 Location

The blocks that are the subject of this report are located at Lots 1-80,83,84, 86-88 DP791199 and Lots 90-95 DP805549, Le Clos Verdun Estate, Sancrox and are situated within the Port Macquarie-Hastings Council local government area. The site location can be seen in **Appendix 1**, (1:25,000 scale topographic map).

Sancrox is a geographical location that is located approximately 12km to the northwest of Port Macquarie and 5.5km northeast of the township of Wauchope.

The locality is characterized by rural and rural residential properties with dairying, grazing and grape growing being the predominant agricultural activities. The subject site is currently being used for cattle grazing activities. An abandoned vineyard that is located in the southeastern aspect of the site is currently being dismantled.

Being a mixture of rural and rural residential properties the Sancrox locality provides for limited community infrastructure with a general store/service station being the main service facility for the area. The close proximity of Wauchope and Port Macquarie provides for significant access to infrastructure and services for the residents of the Sancrox area.

As can be seen in **Appendix 1,** Sancrox Road adjoins portion of the southern boundary with the remainder of the southern boundary adjoining rural residential lots which front Sancrox Road.

The southeastern and southwestern boundaries adjoin rural sized allotments with the north western and northern boundaries of the site adjoining the meander of the Hastings River whilst the northeastern and eastern boundaries of the subject site adjoin Haydons Creek and its tributaries.

The site has been cleared of the majority of native vegetation with scattered trees and small remnant areas of vegetation remaining in the western and northern portions of the property. Larger vegetated areas are present in the eastern portion of the site with sections of this vegetation extending across into the centre of the site particularly in the southern portion.

The topography of the site and surrounds is gently undulating with a variety of topographic features providing for slopes ranging from 1˚- 5˚. In general slopes on the site fall towards the main hydraulic features which are present on and adjacent to the site being the Hastings River in the north and northwest and Haydons Creek in the eastern aspect of the site.

Access to the subject site is currently available via Sancrox Road which is connected to existing internal road infrastructure that was provided in conjunction with the original subdivision and use of the subject site.

The closest Rural Fire Service is located within the rural residential area of Sancrox approximately 2.5km to the west of the subject site, with the closest Fire Control Center being at Wauchope.

1.3 Site History

The site is approximately 186 hectares in size and includes 7 dwellings that have been erected on some of the lots that are the subject of this report.

The subject site was established as a joint residential and vineyard development with dwelling allotments, (approximately 1500m^2 in size), providing for residential occupation with most dwelling lots having a separate vineyard lot entitlement which provided for the production of grapes as part of the Cassegrain winery operation. The vineyard lots in most cases where not joined to the dwelling lots.

The vineyard concept of the original development proposal has not proved to be viable and as such the maintenance of the vines has ceased with some of the growing infrastructure being in the process of removal at the time of site inspection. Consequently apart from the southeastern portion of the subject site the majority of the study area consists of managed grasses that are being used predominately for cattle grazing purposes.

Some areas of remnant vegetation have been retained on the site however in the main these are confined to the lower elevated areas of the site adjacent to the main hydraulic features of the site, (Hastings River and Haydons Creek).

An existing tar sealed road infrastructure serves the western portion of the site with its construction being undertaken as part of the original development concept for the site.

In addition to the dwellings that have been erected other improvements on the subject site consist of a disused office and machinery shed, three farm dams and stock fencing.

1.4 Proposed Development

The proposal is to subdivide Lots 1-80, 83, 84, 86-88 DP791199 and Lots 90-95 DP805549, Le Clos Verdun Estate, Sancrox into 144 separate rural residential lots, refer to **Appendix 2**.

The sizes of the majority of the proposed rural residential lots range from approximately 0.7 hectares to approximately 2.7 hectares. It is also proposed to create a number of larger parcels of land ranging from 4 hectares to approximately 15 hectares in size. These larger lots being located on the eastern fringes of the subject site and encompass large areas of the native vegetation remaining on the subject site.

The proposed development also provides for the creation of two (2) private recreation lots that it is presumed will provide for public open space opportunities for the residents of the proposed subdivision.

The development concept plan provides for the use of the existing internal road infrastructure as the basis of access and egress to the rural residential estate however it will be necessary to provide a number of new roads which will connect to the existing road network.

As can be seen in **Appendix 2** the proposal to subdivide the subject site encompasses the entire site area.

2. BUSHFIRE HAZARD

2.1 Procedure

Several factors need to be considered in determining the bushfire hazard for the block they are slope, vegetation type, distance from vegetation and access/egress. Each of these factors has been reviewed in determining a bushfire hazard rating for the subject site.

2.2 Slope

Slope is a major factor to consider when assessing the bushfire risk of the proposed subdivision. Therefore the slope of the subject site and surrounding area, (to a distance of 100m), was measured using a Suunto PM-5/360 PC Clinometer.

The subject site is gently undulating with higher elevated land located in the western and southern aspects of the site. Lower elevated land is present adjacent to the main hydraulic features of the site being the Hastings River and Haydons Creek.

In general the topography of the site falls from a relatively level north to south central ridge and from connecting side ridges. These ridges are generally defined by the alignment of the existing road infrastructure. Slopes in the order of 3˚- 5˚ have been measured on the ridge side slopes. Slopes on the subject site flatten to 0˚- 2˚ on the alluvial flats, which are adjacent to the Hastings River and the low-lying areas adjacent to Haydons Creek and its tributaries.

Slopes on land adjoining the subject site are similar in grade being undulating responding to the hydraulic features that are present in these aspects.

Looking from the southern boundary of the subject site towards the north. Note: gentle undulation of the site and predominant vegetation of managed grasses

Undulating land with scattered trees and managed grasses

The hazard vegetation on adjacent land was also identified and the slopes within the vegetation measured. The following table shows the results.

Given the size of the subject site and the variation in slope that exists, the slope assessment for each aspect of the site is representative of worst case scenarios measured over the site and on adjacent land.

Table 1
Summary of Slope Characteristics

Direction of Hazard	Slope (Degrees)	Upslope/down slope
Northern Aspect	0˚	Flat
Northwestern Aspect	0˚ - 15˚**	Down slopes
Western Aspect	4˚ - 5˚	Down slope
Southern Aspect	2˚ - 3˚	Down slope
Northeastern Aspect	0˚	Flat
Eastern	1˚ - 2˚	Down slope

Aspect		

***Note: The majority of slope in this aspect was flat however there is an area of remnant bush land on proposed lot 54 which has down slopes of between 10˚ - 15˚. These slope characteristics are however only for a short distance 40m to 50m.*

All the above slopes were considered when assessing the Asset Protection Zone and category of bushfire attack requirements for each of the subject lots.

2.3 Vegetation

The vegetation on and surrounding the site was assessed over a distance of 140m from the proposed new lots. The vegetation formations were classified using the system adopted as per Keith (2004).

As indicated previously in this report the site has been cleared of the majority of native vegetation with the western portion of the subject site being actively used for grazing purposes. The managed grasses that are present onsite are not considered to represent a bushfire hazard. (The grasses which are present on the site have not been specifically identified by Port Macquarie – Hastings Council as representing a bushfire hazard, refer to page 52 of NSW Rural Fire Services**, *Planning for Bushfire Protection*, 2006,** and they are not indicated on the bushfire prone land maps as representing a potential hazard, refer to **Appendix 3**).

As can be seen in **Appendix 3** Port Macquarie-Hastings Councils bushfire prone land mapping identifies the vegetation fringing Haydons Creek and its tributaries and vegetation on land adjoining the subject site to the west as being of potential bushfire significance.

Managed grasses in the middle section of the subject site looking towards the northwest towards the riparian vegetation on the banks of the Hastings River.

Some small remnant areas of native vegetation are present within the western portion of the site however these areas are less than 1 hectare in size with the under storeys being actively managed to create managed woodland areas. Consequently these areas have not been deemed to represent a bushfire hazard to any of the proposed lots.

Small stand of trees adjacent to proposed lots 28 – 31 and 36 – 38. Area of vegetation is small (0.7 hectares) with all under storey removed and subject to ongoing maintenance. A further portion of this vegetation will be removed to accommodate new road infrastructure

A small, (0.7 hectares), unmanaged area of remnant vegetation is however present on proposed Lot 54. This area consists of a variety of vegetation structures however given its remnant state this area has been considered to be similar in specification to a rainforest vegetation classification.

The eastern portion of the site also contains cleared areas, which are being used for grazing purposes. Abandoned vineyards are also present in this aspect of the site which at the time of site inspection was being removed. The eastern portion of the site does however contain some large areas of bush land that are located primarily on low lying land adjacent to Haydons Creek and some small tributaries which adjoin the creek. The vegetation, which is present, consists predominantly of swamp oaks that appear to be recolonizing areas that have previously been cleared. In addition to the swamp oaks there are also a variety of eucalypt trees present in some areas that in the absence of the prolific presence of the swamp oaks would have formed areas of wet sclerophyll forest adjacent to Haydons Creek. *Melaleuca quinquenervia,* (Broad-leaved paper bark), was also noted within some areas of the bush land that is present in the eastern portion of the site. Given the variety of vegetation structures that are present and the size of the area concerned it is considered that a conservative approach is required in relation to the vegetation classification for the vegetation in the eastern portion of the subject site. Accordingly it is considered that the areas of vegetation in the eastern portion of the site are similar in specification to wet sclerophyll forest.

Sclerophyll forest vegetation present adjacent to Haydons Creek in the southeastern aspect of the subject site

Looking towards the northeast towards the wet sclerophyll vegetation on the subject site and on land adjoining to the east of the subject site.

Swamp oak and scattered eucalypts to the east of the abandoned vineyard – southeastern portion of the subject site

Areas of vegetation of bushfire significance adjacent and/or adjoining the subject site are summarized as follows;

North and Northwest

Adjoining the subject site in these aspects are thin areas of remnant riparian vegetation that are present on the adjoining Crown Reserve which separates the subject site from the banks of the Hastings River. The vegetation is sparse in formation and narrow in width, (being less than 20 – 25m wide), however does provide for a level of continuity along the northern and northwestern boundaries of the site. Vegetation within this area includes elements of the original coastal low lands rainforest that occurred on the alluvial flats adjacent to the River.

In accordance with NSW Rural Fire Service, ***Planning for Bushfire Protection*, 2006** this area, due to its width and size, is considered to be a remnant area of vegetation and as such is considered to be similar in specification to rainforest.

Remnant riparian vegetation adjacent to the Hastings River - northern and northwestern aspects of the subject site

West

Land adjoining the western boundary consists of areas of dry sclerophyll forest that are present beyond an electrical supply easement that is present along the western boundary of the subject site. In the southwest corner of the subject site are developed rural residential allotments that contain areas of managed vegetation. No areas of bushfire hazard vegetation were identified on the southwestern properties.

Looking along the western boundary of the subject site towards the north – note managed grasses of the subject site (to the right of the photo) with dry sclerophyll forest on adjoining land to the west

South

To the south of the subject site is the Sancrox Road reserve with a large rural property present beyond the road to the south. This area of land contains pasture grasses immediately adjacent to the road reserve with areas of dry sclerophyll forest beyond the pasture grasses. Forest vegetation formations are also present fringing the creek line of Haydons Creek that is present in the southwestern aspect.

Managed grasses and dry sclerophyll forest on land to the south of Sancrox Road

East

The eastern aspect of the subject site contains areas of the same bush land that are present on the eastern portion of the subject site. Beyond these areas of bushfire vegetation are managed grasslands.

Sclerophyll forest formations adjacent to a tributary of Haydons Creek – southeastern aspect of the subject site

The southeastern aspect of the site also adjoins developed rural residential allotments that contain areas of managed vegetation. Due to the managed nature of these properties no areas of bushfire hazard vegetation were deemed to exist on these adjoining lots.

The following table summarizes the various vegetation structures of bushfire significance to the subject site. Given the size of the subject site and the variability in vegetation structures the worst case vegetation classification for each aspect has been used

Table 2
Summary of Vegetation Characteristics

ASPECT	VEGETATION DESCRIPTION	LOCATION
On the subject site	Remnant areas of remnant vegetation on the subject site. To be considered similar in specification to rainforests	In the northern aspect of the site on proposed Lot 54
North/Northwest	Riparian vegetation fringing the southern bank of the	Within the Crown Reserve which separates the subject

	Hastings River	site from the Hastings River
West	Dry sclerophyll forest	On adjoining land to the west of the subject site
South	Dry sclerophyll forest	On land to the south of the Sancrox Road reserve
East	Various vegetation structures considered to be similar in specification to wet sclerophyll forest	On the subject site and adjoining land to the east

It should be noted that there are significant areas of the site which would not be bushfire prone as these areas would be greater than 140m from any vegetation of bushfire significance.

The relationship of vegetation to the subject site and can be seen in **Appendix 4**.

2.4 Fire Danger Index

The fire weather for the site is assumed on the worst-case scenario. In accordance with NSW Rural Fire Services**, *Planning for Bushfire Protection*, 2006** the fire weather for the site is based upon the 1:50 year fire weather scenario and has a Fire Danger Index (FDI) of 80.

3.0 BUSHFIRE THREAT REDUCTION MEASURES

In order to reduce the bushfire threat it is suggested the following measures be included in any strategy developed for the subdivision.

3.1 Asset Protection Zones

The objectives of an Asset Protection zone (APZ) as described by NSW Rural Fire Services are, 'to protect human life, property and highly valued public assets and values', (Planning for Bushfire Protection, 2001). The APZ is an area surrounding a development, managed to reduce the bushfire hazard to an acceptable level. The APZ should incorporate an Outer Protection Area (OPA) and Inner Protection Area (IPA).

The following table indicates the required APZ between the various hazards and a dwelling positioned on each of the proposed lots deemed to be impacted upon by the vegetation of bushfire significance. As previously mentioned in this report given the size of the site and the variation which exists in relation to vegetation structures a worst case approach to the determination of APZ requirements has been taken and is presented as follows;

Table 3
Asset Protection Zone Requirements (PfBP 2006)

Direction of Hazard	Vegetation Type	IPA	OPA	Total APZ
On subject site	Remnant bush land areas - Rainforest specification to be used	10m	-	10m
North and Northwest	Remnant riparian vegetation adjacent to Hastings River-	10m	-	10m

	Rainforest specification to be used			
West	Dry Sclerophyll Forest	15m	5m	20m
South	Dry Sclerophyll Forest	15m	5m	20m
East	Wet Sclerophyll Forest	15m	5m	20m

In accordance with NSW Rural Fire Service, ***Planning for Bushfire Protection*, 2006** the following fuel loadings are to be maintained within the Inner Protection Area and the Outer Protection Areas applicable to each of the proposed allotments.

Inner Protection Area

The performance of the inner protection area must be such that:

- *There is minimal fuel at ground level, which could be set alight by a bushfire.*
- *Any vegetation in the inner protection area must not provide a path for the transfer of fire to the development - that is fuels are discontinuous.*

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

- *Do not touch or overhang the building.*
- *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 a danger period.*
- *Are located far enough away from the house so they will not ignite the house by direct flame contact or radiant heat emission.*

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

Outer Protection Area

Within the outer protection area any trees and shrubs should be maintained in such a manner that the vegetation is not continuous.

Fine fuel loadings within the OPA should be kept at a level where the fire intensity expected will not impact on the adjacent developments. In the absence of any policy to the contrary, 8 tonnes per hectare of fuel is commonly used.

Given the configuration of the proposed subdivision and the width and length of the proposed rural residential allotments it is possible for dwellings to be located on each of the proposed allotments such that asset protection zones can be provided in compliance with the acceptable solutions contained in section 4.1.3 of NSW Rural Fire Service**, *Planning for Bushfire Protection*, 2006** and summarized as follows**;**

Table 4
APZ Requirements (PfBP 2006)

Intent of measures: to provide sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels at buildings are below critical limits and to prevent direct flame contact with a building.	
The intent may be achieved where:	
Performance Criteria	**Acceptable Solutions**
• radiant heat levels at any point on a	• an APZ is provided in accordance with

proposed building will not exceed 29 kW/m2	the relevant tables/ figures in Appendix 2 of NSWRFS Planning for Bushfire Protection 2006 • the APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply (see section 3.3 of NSWRFS Planning for Bushfire Protection 2006)
• APZs are managed and maintained to prevent the spread of a fire towards the building.	• in accordance with the requirements of Standards for Asset Protection Zones (RFS, 2005) *Note: A Monitoring and Fuel Management Program should be required as a condition of development consent.*
• APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	• the APZ is located on lands with a slope less than 18 degrees.

As previously indicated, given the size of the subject site and the spatial separation of lots from the areas of bushfire hazard vegetation there are a number of proposed lots which will not be burdened with the requirement for the provision of asset protection zones.

Compliance with the requirements for the provision of APZ's to the subject lots is demonstrated conceptually in **Appendix 5**.

It is also noted that the proposed subdivision does not compromise the provision of asset protection zones to the existing residential buildings that are present on the subject site.

It is also noted that the proposed subdivision layout provides for the creation of private recreation areas that at present consist of managed and pasture grasses. In this regard it will be necessary to develop property management plans for these parcels of land so as to provide for there ongoing management as bushfire hazard vegetation free areas. Given that these areas are nominated as private recreation areas the responsibility for the ongoing implementation of the property management plans is to be imposed upon the land owners via a positive covenant pursuant to section 88B of the Conveyancing Act, 1919.

3.2 Category of bushfire attack

The methods used in Appendix 2 of NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006 have been used in determining the minimum set back distances for the proposed new lot.

The following construction requirements in accordance with AS 3959 – 1999 is required for the bushfire attack categories.

Table 5
Summary of Category of Bushfire Attack Categories (PfBP 2006)

Bushfire attack category	Level of construction (AS 3959-1999)
Low	No construction requirements under AS 3959-1999
Medium	Level 1 construction
High	Level 2 construction
Extreme	Level 3 construction
Flame Zone	Outside the scope of AS 3959-1999

The following table indicates the required setbacks from vegetation to achieve the various AS 3959-1999 levels of construction.

The table is based upon the achievement of the minimum APZ requirements for each aspect of a dwelling located on each proposed allotment and as such represents the worst case scenario for the erection of dwellings on the proposed lots. It should also be noted that a number of the proposed lots will contain areas of low lying land which is flood prone with these areas not being suitable for the erection of dwellings. These areas are generally located adjacent to Haydons Creek. Not withstanding this each of the proposed lots has areas which will be suitable for residential occupation.

Table 6
Category of Attack and Construction Requirements for Each Proposed Lot

ASPECT	VEGETATION TYPE	SLOPE	DISTANCE TO VEGETATION (Closest lots)	CATEGORY OF BUSHFIRE ATTACK	LEVEL OF CONSTRUCTION
On the subject site (adjacent proposed lot 53)	Remnant dry sclerophyll forest (Rainforest requirements to be applied)	15˚ Down slope	>15m	Extreme	Level 3 construction requirements
			>23m	High	Level 2 construction requirements
			>33m	Medium	Level 1 construction requirements
			>50m	Low	No construction requirements
North and Northwest	Riparian vegetation in Crown Reserve	0˚	>15m	Extreme	Level 3 construction requirements
			>23m	High	Level 2 construction requirements
			>33m	Medium	Level 1 construction requirements
			>50m	Low	No construction requirements
South	Dry sclerophyll forest on land to the south of the Sancrox Road reserve	2˚ - 3˚ Down slope	>22m	Extreme	Level 3 construction requirements
			>31m	High	Level 2 construction requirements
			>42m	Medium	Level 1 construction requirements
			>100m	Low	No construction requirements
West	Dry sclerophyll forest on private land to the west	1˚ - 2˚ Down slope	>22m	Extreme	Level 3 construction requirements
			>31m	High	Level 2 construction requirements
			>42m	Medium	Level 1 construction requirements

			>100m	Low	No construction requirements
East	Wet sclerophyll forest	3˚ - 4˚ Down slope	>22m	Extreme	Level 3 construction requirements
			>31m	High	Level 2 construction requirements
			>42m	Medium	Level 1 construction requirements
			>100m	Low	No construction requirements

The above table is based upon the achievement of the minimum APZ requirements for each aspect of the development site as identified in section 3.1 of this report. The achievement of the minimum required APZ's which are applicable to each of the subject lots will provide for the erection of a dwelling on each of the proposed lots which can be constructed in accordance with either the low, medium, high or extreme category of attack requirements provided for by AS 3959 -1999. Under absolute worst-case scenarios future dwellings will be exposed to an extreme category of bushfire attack with the level 3 construction requirements (AS 3959 – 1999) applying.

Given the size and layout of the proposed lots there will be significant opportunities for the level of construction required to be reduced depending upon the positioning of dwellings and the nature of ongoing vegetation maintenance activities on the allotments. The actual construction requirements that will be applicable to each proposed lot is to be determined through the preparation of a bushfire hazard assessment for the development of each of the proposed allotments.

Due to the spatial separation of the proposed subdivision to the areas of bushfire hazard vegetation a large number of the proposed lots, particularly in the centre north of the subject site, will be subject to a low category of attack and as such no specific bushfire construction standards will be applicable to these lots.

Based upon the spatial separation of the proposed lots from the bushfire hazard vegetation and the size and configuration of the proposed lots it is considered that the intent of the requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection,* 2006** for the siting, design and construction of the dwellings can be satisfied. The relevant requirements are summarized as follows;

Table 7
Design, Siting and Construction Requirements (PfBP 2006)

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
in relation to siting and design: • buildings are sited and designed to minimize the risk of bush fire attack.	• buildings are designed and sited in accordance with the siting and design principles
in relation to construction standards: • it is demonstrated that the proposed building can withstand bush fire attack in the form of wind, smoke, embers, radiant heat and flame contact .	• construction determined in accordance with Appendix 3 and the *Requirements for attached garages and others structures*

3.3 Access and Egress

Access to the proposed subdivision is proposed to be via the existing road infrastructure that already services a large proportion of the subject site. The existing road infrastructure connects with Sancrox Road, (to the west of Haydons Creek), and meanders centrally to the north with a number of side roads providing access to the existing dwellings on the site. Sancrox Road is the main connecting road to the existing rural residential areas which are present to the west of the subject site and the Pacific Highway which is present to the east. Travel in either direction provides for movement to and from areas that would be protected from the impacts of bushfire.

All existing roads are tar sealed. The central location of the main road 'spine' provides that a large proportion of the road is greater than 140m from bushfire hazard vegetation and as such would not be subject to bushfire mitigation measures.

The proposed subdivision will however require the construction of additional road infrastructure in order to provide access and egress from some of the proposed lots. The additional road infrastructure is summarized as follows;

- A number of small cul de sacs in the northern portion of the site.
- The extension of an existing cul de sac to form a loop road in the middle section of the site.
- The construction of a new main access road to connect the eastern portion of the site with the main access road that is present to the west. A number of cul de sacs will also be constructed so as to provide for lot access from the main easterly access road.

It is considered that the existing road infrastructure and the proposed new public road infrastructure will comply with the purposes for same as specified by NSW Rural Fire Service, ***Planning for Bushfire Protection,* 2006** as demonstrated below;

Table 8
Public Road Purpose Requirements (PfBP 2006)

PURPOSE OF PUBLIC ROADS	COMPLIANCE COMMENTS
Provide fire fighters with easier access to structures, allowing more efficient use of fire fighting resources	The proposed public road infrastructure makes use of the existing access road 'spine' which originates at Sancrox Road in the south and traverses the subject site to the north. This access 'spine' provides for easy and safe access to areas containing bushfire hazard vegetation. The proposed easterly public road system again provides for a high level of access for fire fighting activities. It is also noted that the easterly road provides for a possible future connection with land to the east should it be the subject of redevelopment as rural residential lots in the future.
Provide for a safe retreat for firefighters	Given the size of the subject site and the spatial relationship of bushfire hazard vegetation there are large areas of the subject site that would be greater than 100m from bushfire hazard vegetation and therefore would be outside the requirements of the bushfire management requirements. These large areas provide for significant opportunities for the safe retreat of fire fighters.

Provide a clear control line from which to conduct hazard reduction or back burning operations	The central existing public road system and the proposed easterly road system provides numerous access opportunities to undertake hazard reduction and back burning operations whilst providing fire fighters with safe egress to areas protected from the effects of bushfire. The incorporation and connection of fire trails with the public road infrastructure will also provide significant opportunities to provide clear control lines.

In order to comply with the requirements for access to defendable spaces it will be necessary to provide for a number of fire trails on the proposed lots adjacent to the perimeters of the bushfire hazard vegetation in the eastern and western aspects of the subject site, refer to **Appendix 6**. Given the presence of only remnant riparian vegetation in the northern and northwestern aspects it is considered that fire trails are not required due to the extremely low level of risk posed by this vegetation. Sancrox Road in the south and a number of developed and maintained rural residential allotments provide for perimeter access or a lack of bushfire hazard vegetation in this aspect.

The provision of fire trials is considered appropriate given the distances involved to the hazard vegetation and the nature of the hazard vegetation. Fire trials should extent across the rear of the proposed lots that adjoin areas of bushfire vegetation, refer to **Appendix 6**. It should be noted that the fire trail concept plan shown in **Appendix 6** has been based upon;

- The likely location of dwelling envelopes for sites which contain flood prone land.
- The presence of existing perimeter road infrastructure such as the existing gravel access road which is present along the southwestern boundary of the site.

The ongoing maintenance of the fire trails should be a requirement imposed upon the owners of the adjacent residential lots via a positive covenant pursuant to section 88B of the Conveyancing Act, 1919.

The public roads and fire trails will need to comply with the relevant acceptable solutions which are applicable to public roads and fire trails as specified in section 4.1.3 of NSW Rural Fire Services**, *Planning for Bushfire Protection*, 2006** and summarized as follows;

Table 9
Public Road Requirements (PfBP 2006)

Intent of measures: to provide safe operational access to structures and water supply for emergency services, while residents are seeking to evacuate from an area.	
The intent may be achieved where:	
Performance Criteria	**Acceptable Solutions**
• firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	• public roads are two-wheel drive, all weather roads.
• public road widths and design that allow safe access for firefighters while residents are evacuating an area.	• urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non-perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid

	Vehicle). • the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas. • traffic management devices are constructed to facilitate access by emergency services vehicles. • public roads have a cross fall not exceeding 3 degrees. • all roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard. • curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress. • the minimum distance between inner and outer curves is six metres. • maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient. • there is a minimum vertical clearance to a height of four metres above the road at all times.
• the capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles.	• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting 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.
• roads that are clearly sign- posted (with easily distinguishable names) and buildings/properties that are clearly numbered.	• public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression. • public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression.
• there is clear access to reticulated water supply	• public roads up to 6.5 metres wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression. • one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.

Table 10
Fire Trail Requirements (PfBP 2006)

Intent of measures: to provide suitable access for fire management purposes and maintenance of APZs	
The intent may be achieved where:	
Performance Criteria	**Acceptable Solutions**
• the width and design of the fire trails enables safe and ready access for firefighting vehicles	• a minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass) is provided. • the trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed. • a minimum vertical clearance of four metres to any

	overhanging obstructions, including tree branches is provided. • the crossfall of the trail is not more than 10 degrees. • the trail has the capacity for passing by: - reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and/or - a passing bay every 200 metres, 20 metres long by three metres wide, making a minimum trafficable width of seven metres at the passing bay. *Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed.*
• fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non-authorized persons.	• the fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land. • appropriate drainage and erosion controls are provided. • the fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200 metres or less. • fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge). • gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.
• fire trails designed to prevent weed infestation, soil erosion and other land degradation	• fire trail design does not adversely impact on natural hydrological flows. • fire trail design acts as an effective barrier to the spread of weeds and nutrients. • fire trail construction does not expose acid-sulphate soils.

Given the size of the proposed lots there are a number of property access options available to each of the proposed lots upon the development of dwellings. In this regard it will be necessary to provide for access and egress to dwellings on each of the proposed lots which complies with the acceptable solutions which are applicable to property access roads as specified in section 4.1.3 of NSW Rural Fire Services**, *Planning for Bushfire Protection*, 2006** and summarized as follows;

Table 11
Access Road Requirements (PfBP 2006)

Intent of measures: to provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupants faced with evacuation.	
The intent may be achieved where:	
• access to properties is provided in recognition of the risk to fire fighters and/ or evacuating occupants.	• at least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 metres from a public through road
• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles. • all weather access is provided.	• bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes • roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).

• road widths and design enable safe access for vehicles	• a minimum carriageway width of four metres for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70 metres from the nearest hydrant point to the most external part of a proposed building (or footprint). *Note: No specific access requirements apply in a urban area where a 70 metres unobstructed path can be demonstrated between the most distant external 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 firefighting vehicles (i.e. a hydrant or water supply)* • in forest, woodland and heath situations, rural property access roads have passing bays every 200 metres that are 20 metres long by two metres wide, making a minimum trafficable width of six metres at the passing bay. • a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches. • internal roads for rural properties provide 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 minimum distance between inner and outer curves is six metres. • the crossfall is not more than 10 degrees. • maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads. *Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.* • access to a development comprising more than three dwellings have formalized access by dedication of a road and not by right of way.

The provision of compliant property access roads will be addressed through the preparation of lot specific bushfire hazard assessments upon the development of each proposed lot.

3.4 Water Supply and Service Provision

As set out in section 4.1.3 of NSW Rural Fire Services**, *Planning for Bushfire Protection***, **2006**, developments in bushfire prone areas must maintain a water supply reserve dedicated to fire fighting purposes.

Given that the proposed subdivision provides for rural residential allotments all lots will have access to the reticulated water supply that services the Sancrox area. In this regard access to a reticulated supply will provide a water supply reserve, which is compliant with the acceptable solutions of NSW Rural Fire Services**, *Planning for Bushfire Protection***, **2006**

Opportunities also exist for the provision of compliant non-reticulated water supplies to any dwellings erected on the larger proposed lots if necessary.

Electricity supply is available and will be accessible to each of the proposed lots.

Reticulated gas services are not available to the site.

Compliance with the following acceptable solutions as provided for by 4.1.3 of NSW Rural Fire Services, ***Planning for Bushfire Protection***, **2006** will ensure compliance with the intent for the provision of services to each of the proposed lots.

Table 12
Service Provision Requirements (PfBP 2006)

Intent of measures: to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building	
The intent may be achieved where:	
Performance Criteria	**Acceptable Solutions**
Reticulated water supplies • water supplies are easily accessible and located at regular intervals	• reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. • fire hydrant spacing, sizing and pressures 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. • hyrdrants are not located within any road carriageway • all above ground water and gas service pipes external to the building are metal, including and up to any taps. • the provisions of parking on public roads are met.
Non-reticulated water supply areas • for rural-residential and rural developments (or settlements) in bush fire prone areas, a water supply reserve dedicated to firefighting purposes is installed and maintained. The supply of water can be an amalgam of minimum quantities for each lot in the subdivision (community titled subdivisions), or held individually on each lot	• the minimum dedicated water supply required for firefighting purposes for each occupied building excluding drenching systems, is provided in accordance with Table 4.2. • a suitable connection for firefighting purposes is made available and located within the IPA and away from the structure. A 65mm Storz outlet with a Gate or Ball valve is provided. • or Ball valve and pipes are adequate for water flow and are metal rather than plastic. • underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank. A hardened ground surface for truck access is supplied within 4 metres of the access hole. • above ground tanks are manufactured of concrete or metal and raised tanks have their stands protected. Plastic tanks are not used. Tanks on the hazard side of a building are provided with adequate shielding for the protection of fire fighters. • all above ground water pipes external to the building are metal including and up to any taps. Pumps are shielded.
Electricity Services • location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings • regular inspection of lines is undertaken to ensure they are not fouled by branches.	• where practicable, electrical transmission lines are underground. • where overhead electrical transmission lines are proposed: - lines are installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas; and - no part of a tree is closer to a power line than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002).
Gas services	• reticulated or bottled gas is installed and maintained in

• location of gas services will not lead to ignition of surrounding bush land or the fabric of buildings	accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used. • all fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation. • if gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. • polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.

3.5 Landscaping

Landscaping is a major cause of fire spread to dwellings and therefore any landscaping on the proposed new lots and throughout the subdivision will need careful planning to produce gardens that do not contribute to the spread of a bushfire.

Appendix 5 of NSW Rural Fire Services, ***Planning for Bushfire Protection*****, 2006,** contains standards that are applicable to the provision and maintenance of landscaping. Any landscaping proposed to be undertaken in conjunction with the proposed subdivision is to comply with the principles contained in Appendix 5 of NSW Rural Fire Services**,** ***Planning for Bushfire Protection,*** **2006.**

Compliance with Appendix 5 of NSW Rural Fire Services**,** ***Planning for Bushfire Protection,*** **2006,** will satisfy the intent of the bush fire protection measures that are applicable to the provision of landscaping.

4.0 RECOMMENDATIONS

The following recommendations are provided in response to the proposed subdivision layout provided as **Appendix 2**;

1. Adopt Landscaping principals in accordance with section 3.5 of this report.

2. The attached Bushfire Risk Management Plan (see **Appendix 7**) should be implemented with the proposed subdivision and any proposed dwellings on the new allotments on the site.

3. Assessments in relation to Asset Protection Zones are to be adopted with the construction of any dwellings on the proposed new lots.

4. Fire trials should be provided between areas of bushfire hazard vegetation and the areas of the proposed lots suitable to accommodate dwellings generally in accordance with the concept plan provided in **Appendix 6**.

5. The ongoing maintenance of the fire trails should be a requirement imposed upon the owners of the rural residential lots via a positive covenant pursuant to section 88B of the Conveyancing Act, 1919.

6. The design and construction of the public roads and fire trails are to comply with the acceptable solutions provided for in section 4.1.3 of NSW Rural Fire Services**,** ***Planning for Bushfire Protection*****, 2006.**

7. Water and other services are to be provided to the proposed lots in accordance with the requirements detailed in section 3.4 of this report.

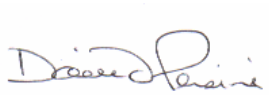
8. Property management plans are to be prepared for the areas of the proposed subdivision nominated as private recreation areas. The property management plans are to provide for the ongoing management of these areas as bushfire hazard vegetation free areas. In this regard given that these areas are nominated as private recreation areas the ongoing implementation of the property management plans is to be imposed upon the land owners via a positive covenant pursuant to section 88B of the Conveyancing Act, 1919.

5.0 CONCLUSION

It is considered that the proposed subdivision of Lots 1-80,83,84, 86-88 DP791199 and Los 90-95 DP805549, Le Clos Verdun Estate, Sancrox is at risk of bushfire attack; however it is in our opinion that with the implementation of the bushfire threat reduction measures and consideration of the recommendations in this report, the bushfire risk is manageable for the proposed subdivision.

With the implementation of the preliminary recommendations it is considered that it will be possible for the proposed subdivision to meet the applicable acceptable solutions as provided for in NSW Rural Fire Service**, *Planning for Bushfire Protection*, 2006.**

Regards



David Pensini
Mid Coast Environmental Services

6.0 REFERENCES

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Cheney P and Sullivan A 1997, ***Grassfires, fuel, weather and fire behaviour***, CSIRO Publishing

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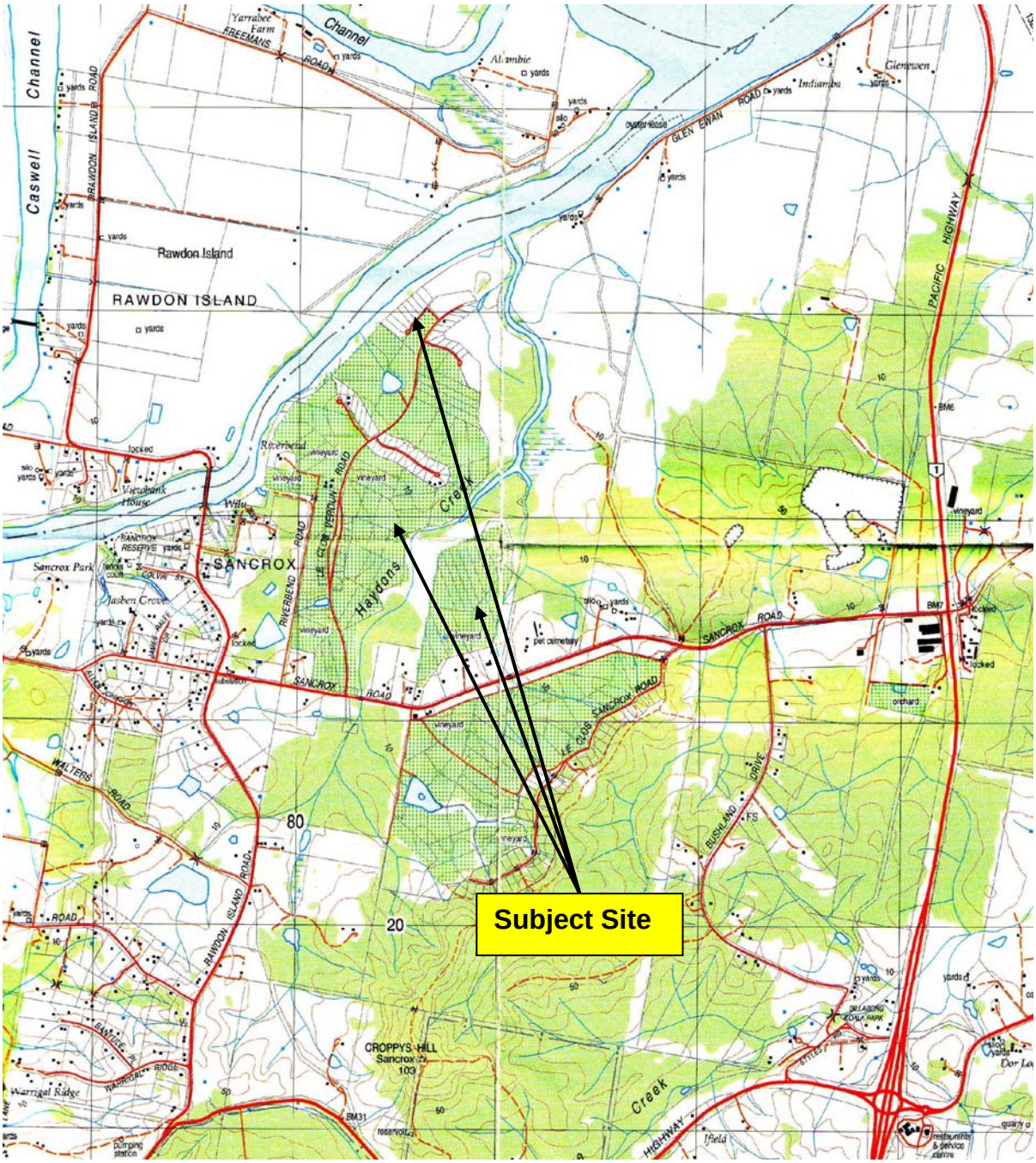
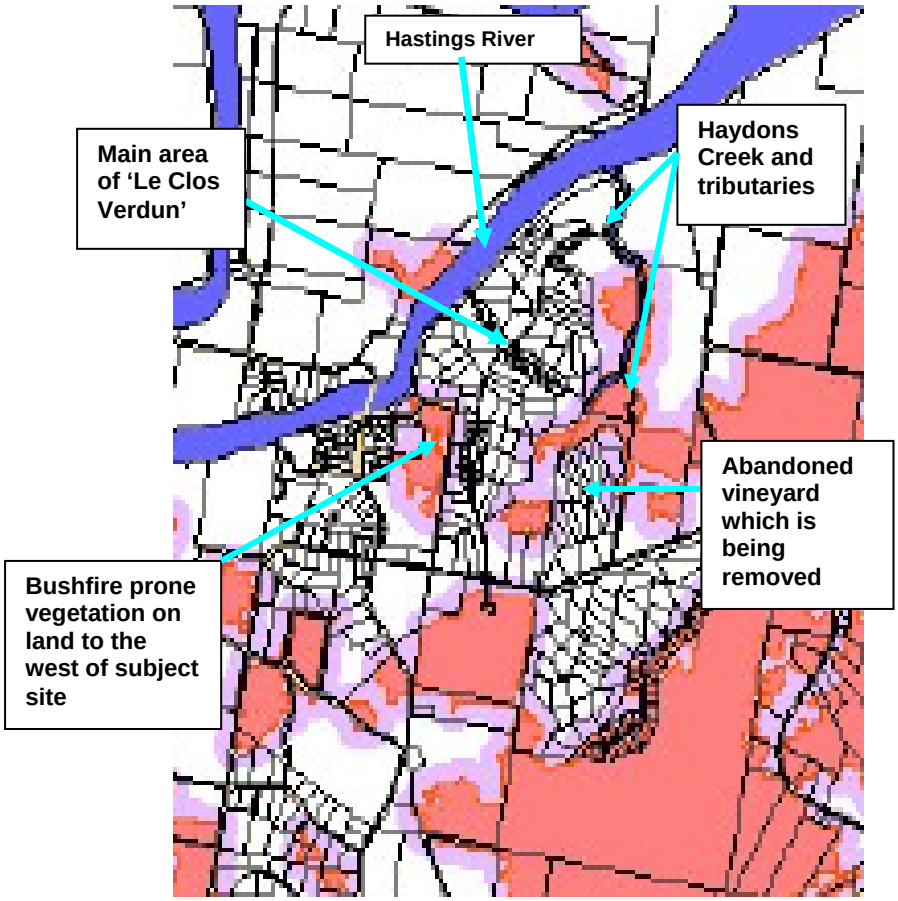
APPENDIX 1
Site Location

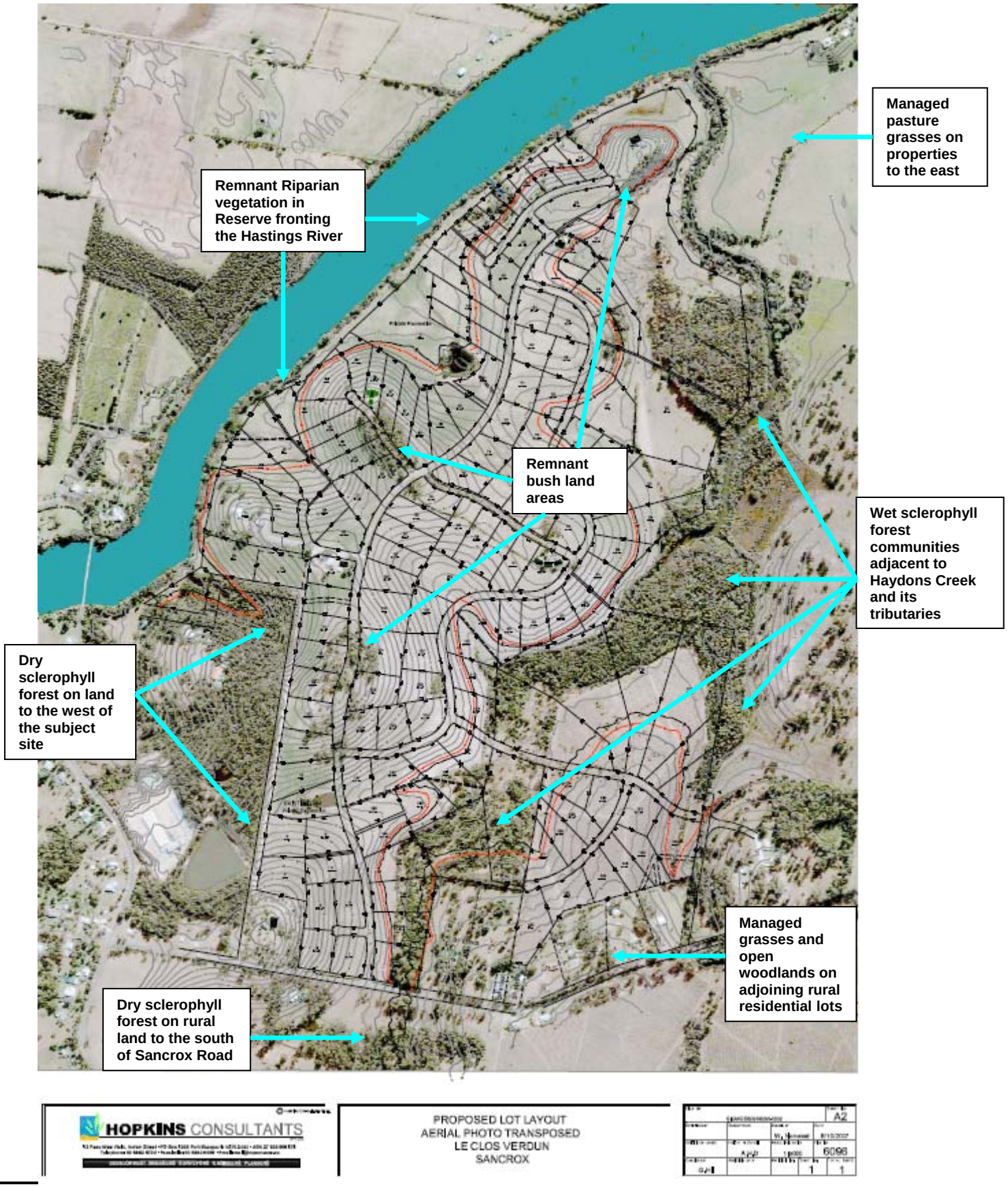


APPENDIX 2
Proposed Lot Layout

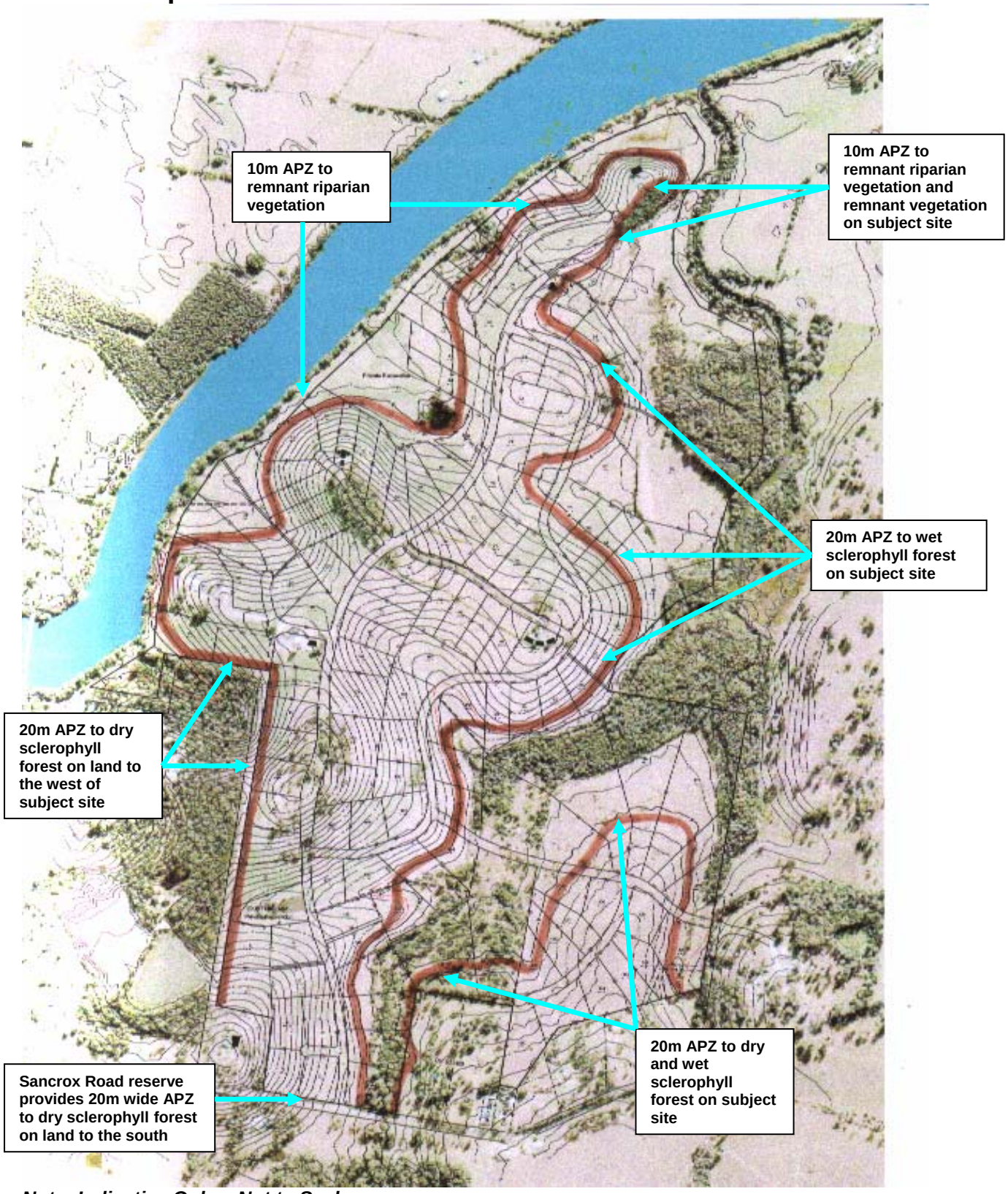
APPENDIX 3
Bushfire Risk Mapping



APPENDIX 4
Site Features and Vegetation Relationships



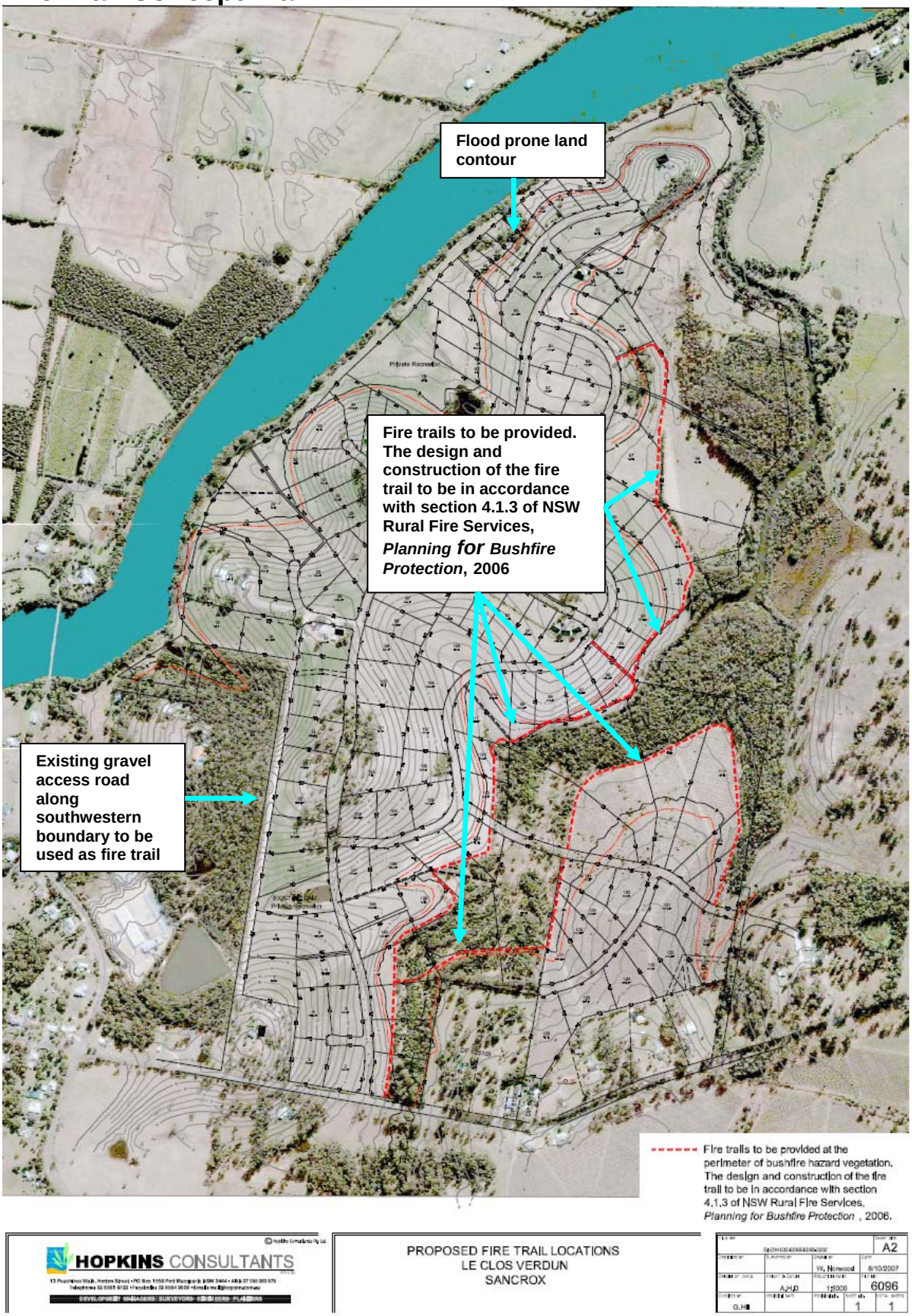
APPENDIX 5
APZ Concept Plan



Note: Indicative Only – Not to Scale

***** APZ position on some lots based upon likely building envelope where defined by flood prone land contour***

APPENDIX 6
Fire Trail Concept Plan



Note: Indicative Only – Not to Scale

APPENDIX 7
Bushfire Risk Management Plan

Management Plan for Bushfire Risk Reduction

1. Preparation of the Property and Building

- Clear ground fuels around the house eg. long dry grass, dead leaves and branches and thick undergrowth.
- Reduce fire fuels (take rubbish to tip regularly)
- Plant a combination of fire resistant plants on your property. A list of suitable species can be obtained from NSW Rural Fire Services and The Society for Growing Australian Plants.
- Clear gutters regularly, especially after windy weather.
- Run and maintain sprinkler system on a monthly basis during the fire season, to ensure that sprinklers are working satisfactorily.
- Prepare firebreaks (a well watered lawn can act as a fire break). Keep pasture growth down.
- Remove flammable items from around the house (eg. Door mats, woodpile and obvious flammable materials such as paper, boxes, crates, hanging baskets, wooden garden furniture etc).
- Vent LPG gas tanks away from the house.
- Compile emergency phone list and leave near phone.
- Store battery operated radio and torches in an accessible position of the house in case of electricity failure during a fire event.

2. Preparation of Water Supply

- Check water, taps and hoses. Ensure that hoses with metal fittings are long enough to reach all sides of the house when attached to the taps.
- Install heavy duty hoses with wide-spray nozzles, if possible.
- Ensure protected water supply for fire is maintained.
- Gather buckets (preferably metal), mops, spray backpack units, ladders, rakes and shovels in one place for ready access during a fire.

3. Preparation for Approaching Fire

- Listen to the radio for news of the fire's progress, rather than calling emergency services for information.
- Ensure shutters are in the closed position.
- Organize and pre-pack.
- Dress in protective clothing, drink water frequently.
- Wet-down roof, house and garden, especially on the side of the approaching fire.
- Stop down pipes and fill gutters with water.
- Fill baths, sinks and buckets with water for extinguishing small fires and drinking water.
- Bring in hoses so they don't get burnt
- If the fire is fast approaching start pump to activate sprinkler system.
- As the fire approaches, go inside and remain inside until the fire has passed.
- Place wet towels and blankets against gaps under doors and windows.
- Close heavy curtains, and shutters, if you have them.
- After the fire has passed and for several hours after the fire has passed, patrol your property and put out spot fires started by flying embers.
- Check roof cavity frequently for spot fires.