



Department of Public Works – Project Services

Final Report

Bushfire Hazard Assessment Spring Creek, Gatton

Monday, 4 June 2007

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Quality Assurance Statement				
Revision No.	Author	Reviewer	Approved for Issue	
			Name	Date
1.0	Brad Dreis Tyrone Lavery Nicole Lechner Rob Friend	Rob Friend	Rob Friend	16 May 2007

NATURAL SOLUTIONS ENVIRONMENTAL CONSULTANTS PTY LTD	
Brisbane Office: Suite 16, Level 2 Central Brunswick, Cnr Brunswick & Martin Streets FORTITUDE VALLEY QLD 4006 PO Box 1156, Fortitude Valley Qld 4006 Tel: (07) 3124 9400 Fax: (07) 3124 9499	Cairns Office: Level 2, 26 Florence Street CAIRNS QLD 4870 PO Box 6935, Cairns Qld 4870 Tel: (07) 4041 3522 Fax (07) 4051 4141
Sunshine Coast Office - Steve Dudgeon PO Box 1522 NOOSA HEADS QLD 4567 Mob: 0437 545 528	Townsville Office - Shayne Lowe Level 4, Northtown Tower 280 Flinders Mall (access via Ogden Street) TOWNSVILLE QLD 4810 PO Box 279, Townsville Qld 4810 Tel: (07) 4772 5033 Fax: (07) 4772 5044 Mob: 0418 783 560

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	SITE INFORMATION.....	2
2.1	General Location	2
2.2	Surrounding Land Uses	2
2.3	Vegetation Communities.....	2
2.4	Slope and Aspect.....	4
2.5	Fire History.....	4
2.6	Site Infrastructure.....	4
3.0	LEGISLATION.....	8
3.1	State.....	8
3.1.1	Qld Fire and Rescue Service Act 1990.....	8
3.1.2	Vegetation Management Act 1999.....	9
3.1.3	State Planning Policies	10
3.2	Local	11
4.0	BUSHFIRE HAZARD ASSESSMENT.....	14
4.1	Vegetation	14
4.2	Slope.....	15
4.3	Aspect	15
4.4	Field Assessment	15
5.0	BUSHFIRE HAZARD REDUCTION MEASURES.....	19
5.1	Bushfire Hazard Management Specifications	19
5.2	Planning Methodology	19
5.3	Pre-development.....	21
5.4	During Development.....	21
5.5	Post-development.....	22
6.0	REFERENCES	23

FIGURES

Figure 1	Site Locality	5
Figure 2	Aerial Photograph	6
Figure 3	Vegetation Communities	7
Figure 4	Bushfire Hazard Severity	18

TABLES

Table 1	Property Descriptions.....	2
Table 2	Site Vegetation Communities.....	3
Table 3	Bushfire Hazard Performance Criteria.....	12
Table 4	SPP1/03 Vegetation Categories and Hazard Ratings	14
Table 5	SPP1/03 Slope Hazard Ratings.....	15
Table 6	SPP1/03 Aspect Hazard Ratings	15
Table 7	SPP1/03 Hazard Rating Assessment	16
Table 8	Development Phases.....	20

1.0 INTRODUCTION

Natural Solutions Environmental Consultants Pty Ltd (Natural Solutions) has been commissioned by the Queensland Department of Public Works – Project Services to prepare a bushfire management plan for a proposed correctional facility site at Spring Creek, Gatton.

Fire is a natural part of many Australian ecosystems and as such is an essential element to ensure these ecosystems are maintained and the biodiversity they support is also maintained.

However, when fire comes into conflict with infrastructure such as residential houses and other infrastructure, an assessment of the hazard is required to properly understand this conflict and to develop a set of measures to minimise the risk to that infrastructure from fire which may burn through a given vegetated area.

Fire is influenced primarily by three main factors; vegetation, slope and aspect. Other climatic factors such as wind speed and relative humidity also influence the intensity and rate of spread of a fire however vegetation, slope and aspect in particular, are those which have a primary affect.

In response to natural hazards and the mitigation of the effects of bushfire on infrastructure, the State Government developed a State Planning Policy (SPP1/03) titled Mitigating the Adverse Impacts of Flood, Bushfire and Landslide in November 2003. This document was then adopted in various forms by Local Government in their IPA (1997) Planning Schemes.

The SPP1/03 provided guidelines and a methodology for the assessment of homogeneous areas based on vegetation, slope and aspect to determine the level of bushfire hazard within an area as well as solutions to mitigate the risk to infrastructure from a bushfire event.

Vegetation provides the fuel, slope provides a determinate on the rate of spread of a bushfire and aspect contributes to the degree of dryness or moisture which may influence the intensity and rate of spread of a bushfire.

The information provided below has been derived from the SPP1/03 guideline on bushfire hazard.

This plan includes:

- A description of site characteristics, including surrounding land uses, topography, vegetation, fire history and bushfire season (**Section 2**);
- An assessment of bushfire risk (**Section 3**);
- A description of bushfire hazard reduction measures (**Section 4**);
- A Management/Maintenance Plan for the proposed development (**Appendix A**); and
- Extract of relevant provisions of the *Queensland Fire and Rescue Act 1990* (**Appendix B**).

2.0 SITE INFORMATION

2.1 GENERAL LOCATION

The Spring Creek area is located within Gatton Shire and is located to the North of Gatton and west of the Gatton – Esk Road (**Figure 1**). The site is comprised of four parcels of land identified in **Table 1** below.

TABLE 1 PROPERTY DESCRIPTIONS

PROPERTY DESCRIPTION	AREA (HA)
Lot 238 on CA31519	258.89
Lot 240 on CA31519	258.79
Lot 242 on CA31612	101.17
Lot 244 on CA31710	64.75
Total	683.60

The site abuts the Lockyer Forest Reserve along its western boundary and private land holdings to the east. Krugers and Millers Roads form the northern and southern boundaries respectively.

2.2 SURROUNDING LAND USES

The site is within a rural area with surrounding rural allotments containing a patchwork of cleared grazing areas, orchards and crops, remnant and regrowth vegetation. The Lockyer Forest Reserve, managed for conservation purposes by the Queensland Parks and Wildlife Service, also adjoins the western boundary and southern boundary of the site. This is an extensive area vegetated with remnant open forest that steeply rises away from the site.

Millers Road and Krugers Road form the southern and northern boundaries respectively. These roads provide a minimum 10m separation of the site from surrounding tracts of vegetation. An aerial photograph of the site is included as **Figure 2**.

2.3 VEGETATION COMMUNITIES

Twelve broad vegetation communities were identified during the field assessment completed in April 2007. The descriptions of these are provided in **Table 1** and locations and extents of each vegetation community presented as **Figure 3**.

The vegetation map for the site shows twelve vegetation communities are mapped across the site. Due to past land uses, large areas of the site have been cleared for farming / grazing uses. Therefore, a large proportion of the site is regrowth, non-remnant open forest dominated by various eucalypt and acacia species. Large areas of the site are also dominated by grasslands with isolated trees.

The majority of remnant vegetation is located within the north-western and central areas of the site. The dominant remnant vegetation type is a Eucalypt Open Forest dominated by Brown bloodwoods

(*Corymbia trachyphloia*), Spotted gum (*Corymbia citriodora* subsp. *variegata*) and Swamp box (*Lophostemon suaveolens*) (RE 12.9-10.5 Not of Concern). The creek which runs through the site contains RE 12.3.7 (Not of Concern), dominated by Qld blue gum (*Eucalyptus tereticornis*) with Broad-leaved paperbark (*Melaleuca quinquenervia*).

The distribution of various communities has been used as the basis for dividing the site into various assessment areas. A description of each community is provided in **Table 2**.

TABLE 2 SITE VEGETATION COMMUNITIES

AREA	COMMUNITY DESCRIPTION	APPLICABLE VMA CODE/STATUS
1a	<p>Eucalypt Open Forest dominated by Brown bloodwoods (<i>Corymbia trachyphloia</i>) and Swamp box (<i>Lophostemon suaveolens</i>). Other canopy species include Gum-topped box (<i>Eucalyptus moluccana</i>), Smoothbark Apple (<i>Angophora leiocarpa</i>) and Red Ash (<i>Alphitonia excelsa</i>). The sub canopy is dominated Red Ash, Swamp box, Hickory Wattle (<i>Acacia disparrima</i>) and Lamb's Tail Wattle (<i>Acacia leiocalyx</i>).</p> <p>The understorey is dominated by Red Ash but other common understorey species include <i>Lantana camara</i>, Swamp box and Lamb's Tail Wattle with occasional Black She Oak (<i>Allocasuarina littoralis</i>) and Dogwood (<i>Jacksonia scoparia</i>). Groundcover species included <i>Imperata cylindrica</i>, <i>Aristida</i> sp, <i>Lomandra filiformis</i> subsp. <i>filiformis</i>, <i>Themeda triandra</i>, various <i>Panicum</i> sp, <i>Entolasia stricta</i> and <i>Dianella</i> sp.</p> <p>Also within this area two threatened plants were located <i>Grevillea quadricauda</i> and <i>Grevillea singuliflora</i>.</p>	12.9-10.5 Not Of Concern
1b	As above however Spotted Gum (<i>Corymbia citriodora</i> subsp. <i>variegata</i>) was more dominate through here. Also Bailey's Stringybark (<i>E. baileyana</i>) and Broad-leaved White Mahogany (<i>Eucalyptus carnea</i>) were found within this area.	12.9-10.5 Not Of Concern
2	This community consists of riparian vegetation found along the creek which runs through the site. Qld Blue Gum (<i>Eucalyptus tereticornis</i>) dominates the canopy with Broad-leaved Paperbark (<i>Melaleuca quinquenervia</i>) was also heavily present within this community.	12.3.7 Not Of Concern
3	This area is similar to Area 1 however Spotted Gum (<i>Corymbia citriodora</i> subsp. <i>variegata</i>) had a higher presence through here.	12.9-10.5 Not Of Concern
4	This area is similar to Area 1 however Spotted Gum (<i>Corymbia citriodora</i> subsp. <i>variegata</i>) had a higher presence through here	12.9-10.5 Not Of Concern
5 & 6	<p>The vegetation community at this site is tall woodland dominated by Spotted Gum (<i>Corymbia citriodora</i> subsp. <i>variegata</i>), Brown bloodwoods (<i>Corymbia trachyphloia</i>) and Narrow-leaved Ironbark (<i>Eucalyptus crebra</i>). Other canopy species include Swamp box (<i>Lophostemon suaveolens</i>) and Red Ash (<i>Alphitonia excelsa</i>).</p> <p>The sub canopy is dominated Red Ash, Swamp box, Spotted Gum, Qld Blue Gum (<i>E. tereticornis</i>) and Narrow-leaved Ironbark. The rare (under State legislation) <i>Eucalyptus taurina</i> (a ironbark) is also found in this community.</p> <p>The understorey is dominated by Red Ash but other common understorey species include Dogwood (<i>Jacksonia scoparia</i>), Narrow-leaved Ironbark and Spotted gum. Groundcover species included <i>Imperata cylindrica</i>, <i>Cymbopogon refractus</i>, <i>Aristida</i> sp, <i>Lomandra filiformis</i> subsp. <i>filiformis</i>, and <i>Pimelea linifolia</i>.</p>	12.5.1 Not Of Concern

AREA	COMMUNITY DESCRIPTION	APPLICABLE VMA CODE/STATUS
7 & 8	The vegetation community at this site is a Eucalypt Open Forest with Qld Blue Gum (<i>E. tereticornis</i>) and Swamp box (<i>Lophostemon suaveolens</i>). Other canopy species include Smoothbark Apple (<i>Angophora leiocarpa</i>), Lamb's Tail Wattle (<i>Acacia leiocalyx</i>) and Red Ash (<i>Alphitonia excelsa</i>). The understorey is dominated by Lamb's Tail Wattle and Swamp box but other understorey species include Red Ash and Cheese Tree (<i>Glochidion ferdinandi</i>). Groundcover species included <i>Cymbopogon refractus</i> , <i>Imperata cylindrica</i> , <i>Aristida</i> sp, <i>Entolasia stricta</i> and <i>Dianella</i> sp.	12.5.2 Endangered
9	This vegetation community is a low open forest dominated by Bush-house Paperbark (<i>Melaleuca irbyana</i>) with emergent <i>C. citriodora</i> , <i>E. tereticornis</i> and <i>E. crebra</i> . Groundcover species included various <i>Panicum</i> sp, <i>Lobelia purpurascens</i> , <i>Entolasia stricta</i> , <i>Aristida</i> sp, and <i>Cyperus</i> sp.	12.3.3c Endangered
10	This vegetation community is woodland dominated by Qld blue gum (<i>Eucalyptus tereticornis</i>). The community is grazed by domestic and thus the understorey is largely limited to pasture grasses.	Non-remnant
11	Grasslands with isolated trees.	Non-remnant
12	These areas contain non-remnant vegetation typically consisting of Spotted Gum (<i>C. citriodora</i>), Brown bloodwoods (<i>Corymbia trachyphloia</i>), Gum-topped box (<i>Eucalyptus moluccana</i>), Swamp box (<i>Lophostemon suaveolens</i>) and Red Ash (<i>Alphitonia excelsa</i>).	Non-remnant

2.4 SLOPE AND ASPECT

The site consists of very gentle sloping land generally less than 5% with a predominantly easterly aspect. A waterway rises within the Lockyer Forest Reserve to the west (managed by Qld Parks and Wildlife Service) and drains toward the southern boundary, bisecting the site.

2.5 FIRE HISTORY

During the site inspection observations were made of fire scars on a number of trees. Additionally, some aged Acacias and other understorey plants also indicated a fire history.

The evidence suggests that a fire has not occurred within the area for at least 3 – 7 years.

2.6 SITE INFRASTRUCTURE

The only allotment which has existing structures (apart from cattle yards) is Lot 244 on CA31710 which contains a number of dwelling structures and associated buildings. A house is also located in the south eastern corner of Lot 238 on CA31519.

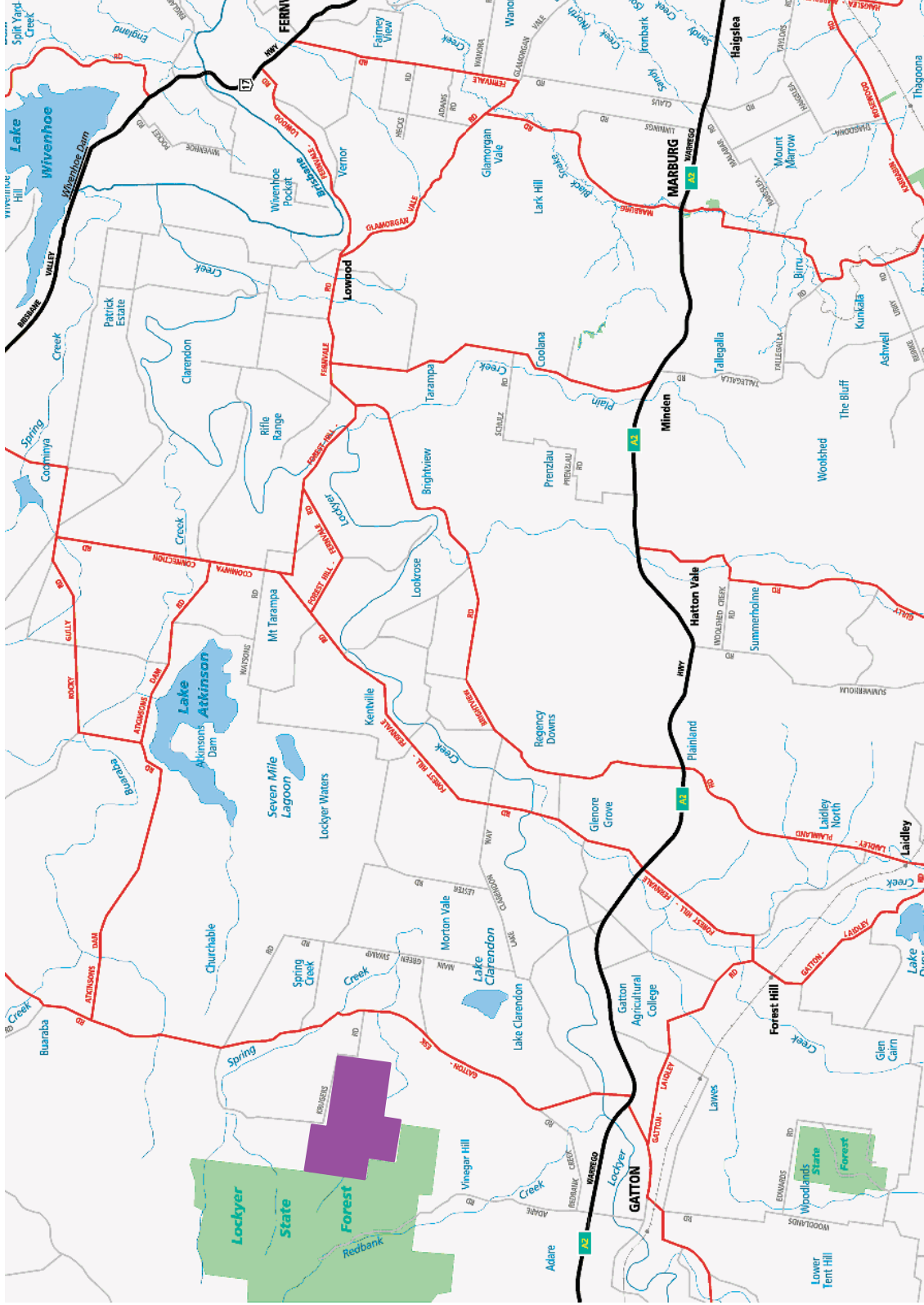


Figure 1: Site Location

Department of Public Works –
Project Services

Scale	Not to Scale	Size	A3
Author	TL	Project Manager	RF
Reference	UBS	Checked	RF
Date	10-05-07	Issue	1
Our Reference			J07-035 FIG 1

natural solutions
environmental consultants
NATURAL SOLUTIONS ENVIRONMENTAL CONSULTANTS
BRISBANE-CARINS-TOOWOOMBA-SUNSHINE COAST
ABN: 38 03 132 716
Ph: 07 3124 9400
Fax: 07 3124 9499
www.naturalsolutions.com.au



Legend
Subject site

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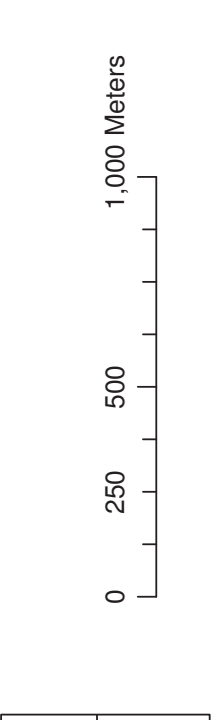
NATURAL SOLUTIONS CONSULTANTS
BRISBANE, QUEENSLAND, AUSTRALIA
ABN: 98 110 152 716
Fax: 07 4651 5322
www.naturalsolutions.com.au

Issue Final
Date May 2007
Drawing No. Figure 2

Figure 2 - Aerial Photograph

Department of Public Works -
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Scale	1:12,723	Size	A3	Program	ArcGIS
Drawn	TL	Project Manager	RF	Checked	



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3.0 LEGISLATION

3.1 STATE

There are a number of pieces of State Legislation which relate to either the management and responsibilities of bushfire within Queensland or the management of vegetation and/or flora and fauna with respect to fire. These pieces of legislation and the relevant sections are outlined below.

The principal piece of legislation which concerns the regulation of fire is the *Qld Fire and Rescue Service Act 1990*.

3.1.1 Qld Fire and Rescue Service Act 1990

There are various pieces of State Legislation which relate to the management of fire hazards within the State. The principal piece of State Legislation is the *Qld Fire and Rescue Service Act (QFRS Act) 1990*. The act provides for a requirement by the "Occupier of land" to take all reasonable steps to extinguish or control a fire within their property.

The relevant sections of the *QFRS Act (1990)* are provided below.

Section 67 - Occupier to extinguish fire

Where a fire is burning on any land and the lighting of the fire is not authorised by or under this or any other Act, the occupier of the land, immediately upon becoming aware of the fire (regardless of who lit it):

- a) must take all reasonable steps to extinguish or control the fire; and
- b) must, as soon as is practicable, report the existence and location of the fire to a fire officer, an officer of a rural fire brigade, a chief fire warden or fire warden, a forest officer (within the meaning of the *Forestry Act 1959*), a conservation officer within the meaning of the *Nature Conservation Act 1992* or a police officer.

Section 68 - Powers of occupier of entry etc

- 1) Subject to subsections (2) and (3), an occupier of land, who believes on reasonable grounds that a grass fire (that is, a fire that predominantly consumes vegetation) burning within 1.6km of that land constitutes a fire risk to that land may, together with persons acting at the direction of the occupier:
 - a) enter the land on which the fire is burning and any other land in order to gain access to the land on which the fire is burning; and
 - b) take on to that land equipment for extinguishing or controlling the fire; and
 - c) take all reasonable measures to extinguish or control the fire.
- 2) An occupier of land must not do or direct the doing of any act referred to in subsection (1) if prior notice (oral or written) of the intention to light the fire has been given to the occupier by the person lighting it or by a prescribed person unless the occupier believes on reasonable grounds that the fire has been unlawfully lit or is out of control.
- 3) If it is practicable to contact a prescribed person, an occupier of land -
 - a) must not do or direct the doing of any act referred to in subsection (1) unless the prescribed person has been notified of the situation; and

- b) must comply with any direction given by the prescribed person in respect of the doing of any act.
- 4) In this section:
“prescribed person” means a fire officer, an officer of a rural fire brigade, a chief fire warden or fire warden, a forest officer (within the meaning of the *Forestry Act 1959*), a conservation officer within the meaning of the *Nature Conservation Act 1992* or a police officer.

3.1.2 Vegetation Management Act 1999

In addition to the QFRS Act 1990 the other relevant piece of legislation which is relevant to the development of land upon which remnant vegetation exists is the *Vegetation Management Act 1999* (VMA).

Guidelines, for the VMA stipulate that for all circumstances where remnant vegetation exists on a property, structures must be a minimum of 1.5 times the tallest vegetation adjacent to the infrastructure or 20 metres whichever is the greater¹ away from the edge of that remnant vegetation. The Act also imposes restrictions on the clearing of remnant vegetation. This can have important implications for development planning on a site including the siting of buildings and other combustible infrastructure.

The *Vegetation Management Act (VMA) 1999* is to be read in conjunction with the *Integrated Planning Act (IPA) 1997* with respect to the protection of remanent vegetation or category 1, category 2, category 3 or category X vegetation.

The act restricts its reference to the removal of vegetation to section 22A:
22A Particular vegetation clearing applications may be assessed

- 2) A vegetation clearing application is for a relevant purpose under this section if the applicant satisfies the chief executive that the development applied for is –
- d) for establishing a necessary fence, firebreak, road or other built infrastructure, if there is no suitable alternative site for the fence, firebreak, road or infrastructure;

The guidelines associated with the *VMA 1999* provides for the removal of vegetation protected under the *VMA 1999* without a permit where that vegetation removal is for “Essential Management”. Essential management is defined by the Act as:

Exemptions for clearing defined in Schedule, Part 1 of the Integrated Planning Act 1997

Exemptions on freehold land and indigenous land

- c) necessary for essential management

Essential management means clearing native vegetation –

- a) for establishing or maintaining a necessary fire break to protect infrastructure other than a fence or road, if the maximum width of the fire break is equivalent to 1.5 times the height of the tallest vegetation adjacent to the infrastructure, or 20 metres, whichever is the greater or

¹ http://www.nrm.qld.gov.au/vegetation/pdf/info_sheets/veg_man_exemptions.pdf

- b) for establishing a necessary fire management line if the maximum width of the clearing for the fire management line is 10 metres or
- c) by fire under the *Fire and Rescue Service Act* to reduce hazardous fuel load

It is also important to note the Vegetation Management Officers also use the 1.5 times the height of the tallest vegetation adjacent to the infrastructure, or 20 metres whichever is the greater as the setback rule for infrastructure from remnant vegetation. This means the closest wall of a building (infrastructure) is to be located no closer than 1.5 times the height of the tallest vegetation adjacent to the infrastructure or 20 metres, whichever ever is the greater, to remnant vegetation protected under the VMA 1999. This may have implications for the location of perimeter fence lines, as DNRW will seek to ensure that fence lines are located a suitable distance from existing remnant vegetation such that no future clearing of this vegetation will be required for fire management purposes.

3.1.3 State Planning Policies

The State Government released in 2003 a State Planning Policy 1/03, titled Mitigating the Adverse Impacts of Flood, Bushfire and Landslide. The purpose of this policy was to ensure that the State interests with respect to Flood, Bushfire and Landslide were being taken into account with respect to development application under the *Integrate Planning Act 1997*.

The state interest included development decisions which did not place infrastructure and people into hazardous areas within the State.

The SPP1/03 contained a number of “Outcomes” which a development application ought to meet as part of its approval process by a Local Government. Additionally, the SPP1/03 was to be used in the absence of a planning scheme which did not contain codes or planning Scheme Policies which did not deal with flood, bushfire and/or landslide.

The SPP1/03 seeks to satisfy a number of “outcomes”. Outcome 1 and Outcome 2 are generally applied to development applications in an area which has been identified as containing Hazardous Vegetation (and therefore require an assessment of the bushfire hazard status using the SPP1/03).

Outcome 1 states:

Within natural hazard management areas, development to which this SPP applies is compatible with the nature of the natural hazard, except where:

- the development proposal is a development commitment; or
- there is an overriding need for the development in the public interest and no other site is suitable and reasonably available for the proposal.

Outcome 2 states:

Development that is not compatible with the nature of the natural hazard but is otherwise consistent with Outcome 1:

- minimises as far as practicable the adverse impacts from natural hazards; and
- does not result in an unacceptable risk² to people or property

The SPP1/03 defines a natural hazard as:

² Unacceptable risk: a situation where people or property are exposed to a predictable hazard event that may result in serious injury, loss of life, failure of community infrastructure, or property damage that would make a dwelling unfit for habitation.

“**Natural hazard:** a naturally occurring situation or condition with the potential for loss or harm to the community, property or environment. The natural hazards addressed in this SPP are flood, bushfire and landslide.”

Additionally the SPP1/03 also defines a Natural Hazard Management Area:

“**Natural hazard management area:** an area that has been defined³ for the management of a natural hazard (flood, bushfire or landslide), but may not reflect the full extent of the area that may be affected by the hazard (e.g. land above the 1% AEP flood line may flood during a larger flood event). Natural hazard management areas for flood, bushfire or landslide are described in Annex 3.”

Annex 3 provides an additional explanation of a Natural Hazard Management Area: -

A3.3 - A natural hazard management area (bushfire) is:

- a) an area identified by a local government in its planning scheme consistent with the conclusions of a bushfire hazard assessment prepared in accordance with Appendix 3 of the SPP Guideline or other methodology approved by the Queensland Fire and Rescue Service (QFRS); or
- b) where such a study has not been undertaken, an area identified by a local government in its planning scheme, reflecting the Medium and High hazard area of the Bushfire Risk Analysis maps produced by the QFRS, suitably modified following a visual assessment of the accuracy of the maps by the local government; or
- c) where an area has not been identified by a local government, the Medium and High hazard areas on the Bushfire Risk Analysis maps produced by the QFRS.

3.2 LOCAL

Gatton Shire Council has produced an IPA Draft Planning Scheme. The relevant sections in the planning scheme which are relevant to bushfire hazard assessment and management planning include section 5.10 - Bushfire Risk Area Overlay Code.

The Code outlines a set of performance criteria that must be met when making a development application and also provides a set of acceptable measures that may be used to satisfy the criteria. An excerpt from the Gatton Planning Scheme outlining bushfire hazard performance criteria and acceptable measures is included as **Table 3**.

³ A natural hazard management area may be defined using a different term (e.g. bushfire prone area; flood affected area).

TABLE 3 BUSHFIRE HAZARD PERFORMANCE CRITERIA

PERFORMANCE CRITERIA	ACCEPTABLE MEASURES
1. Development Design and Location	
<p>P1.Design and location of buildings in Bushfire Risk Areas minimizes risk to life and property .</p>	<p>AS 1.1 Buildings and structures are not located on land in a Level 1, high bushfire hazard area.</p> <p>OR</p> <p>AS 1.2 Where it is not possible to locate buildings and structures on land outside a Level 1, high bushfire hazard area or buildings and structures are located on land in a medium bushfire hazard area, buildings and structures are:-</p> <ul style="list-style-type: none"> a) established on land with an area of greater than 2500m²; b) setback from hazardous vegetation 1.5 times the predominant mature canopy tree height or 20m, whichever is the greater; c) located on a site that faces north to south west (preferably between east and south) and d) with a slope less than 15%; e) located to avoid ridge tops, upper slopes, narrow ridge crests and the top of narrow gullies; and f) located within a 20m wide asset protection zone on the site (measured from the outermost projection of the building or structure). <p>AS 1.3 Buildings and structures:-</p> <ul style="list-style-type: none"> a) have continuous rooflines that do not provide areas that will catch and congregate debris (e.g. avoids combinations of flat and pitched roofs in the same building, roof valleys and multiple hips) see Planning Scheme Figure 5.1; and b) have low pitched roofs between 12 and 21 degrees see Planning Scheme Figure 5.2; and c) are constructed on concrete slabs where the site reasonably allows; or d) raised above ground have any external openings between the ground and floor sealed to prevent entry of embers or debris.
2. Water Supply	
<p>P2. Land uses established in Bushfire Risk Areas include on site a reliable water supply to enable effective fire fighting if and when required.</p>	<p>AS 2.1 The site is connected to a reticulated water supply that has a minimum pressure and flow of 10 litres a second at 200kPa at all times.</p> <p>OR</p> <p>AS 2.2 If the site is not connected to a reticulated water supply, an on-site water storage containing at least 22,500 litres (solely for fire fighting purposes) is available on each site in the asset protection zone and directly accessible by fire fighting appliances.</p> <p>AND</p> <p>AS 2.3 Tanks used for fire fighting water storage are fitted with a Queensland Round Thread 50mm male camlock coupling and a 50mm gate or ball valve to enable connection by the rural fire brigade.</p> <p>AND</p> <p>AS 2.4 Above ground devices for the storage and supply of fire fighting water have a fire resistant level</p>

	<p>(FRL) for purposes of structural adequacy and integrity of no less than 60 minutes, or are protected by construction having an equivalent FRL. AND AS 2.5 Non-reticulated on-site fire fighting water supply is supported by petrol or diesel powered pump or pumps.</p>
3. Revegetation	
<p>P3. Where revegetation of previously cleared areas is undertaken in Bushfire Risk Areas, species used are those which minimise bushfire hazard.</p>	<p>AS 3 Where revegetation is undertaken, the species used in the revegetation have one or more of the following attributes:- (1) high salt content in the leaves; (2) high moisture content in the leaves; (3) low volatile oil content in the leaves; (4) thick bark protecting conductive tissue and dormant buds; (5) seeds enclosed in woody capsules; (6) dense crown; and (7) lowest branches out of reach of ground fires.</p>

4.0 BUSHFIRE HAZARD ASSESSMENT

The guidelines associated with SPP1/03 contain a bushfire hazard assessment methodology which uses three characteristics, these being vegetation, slope and aspect.

In the SPP1/03 vegetation is used as the primary determinate and is scored out of 10. If an area has a vegetation score of 2 or less then the guidelines state that no further assessment of the bushfire hazard is required as vegetation scored as two or less is not deemed to be hazardous vegetation.

If the vegetation characteristic is scored greater than 2, slope and aspect are also scored to provide a rating out of 5 for each characteristic. The three scores are then totalled to provide a bushfire hazard score.

4.1 VEGETATION

The SPP1/03 nominates 9 different categories of vegetation with varying hazard ratings under which site vegetation can be classified. Each of these categories and its respective hazard rating are listed in **Table 4**. The majority of remnant vegetation present on the site falls under the category of eucalypt forest with dry ladder fuels (hazard rating 8). The site also contains significant areas of grassy eucalypt forest (hazard rating 6) and grazed grasslands (hazard rating 2).

TABLE 4 SPP1/03 VEGETATION CATEGORIES AND HAZARD RATINGS

VEGETATION COMMUNITIES	FIRE BEHAVIOUR HAZARD	SCORE
Wet sclerophyll forest, tall eucalypts (>30m), with grass and mixed shrub understorey.	Infrequent fires under severe conditions, flame lengths may exceed 40m, floating embers attack structures for 1 hour, radiant heat and direct flame are destructive for 30 minutes.	10
Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	Fire intensity depends on fuel accumulation, but can be severe, with flame lengths to 20m, spot fires frequent across firebreaks, radiant heat and direct flame for 15 minutes.	8
Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	Fire intensity may be severe with flame lengths to 20m, but less attack from embers.	6
Native grasslands (ungrazed), open woodlands, canefields.	Fast moving fires, available to fire annually to 4 years. Usually no ember attack, radiant heat for >10m, duration <2 minutes.	5
Intact acacia forests, with light grass to leaf litter, disturbed rainforest.	Fires infrequent, usually burn only under severe conditions, relatively slow fires, usually little ember attack.	4
Orchards, farmlands, kikuyu pastures.	Fires very infrequent, slow moving, may be difficult to extinguish, frequent fire breaks.	2
Grazed grasslands, slashed grass.	Grazing reduces intensity and rate of spread of fire, duration <2 minutes.	2
Desert lands (sparse fuels), mowed grass.	Gaps in fuel, usually slow fire spread.	1
Intact rainforest, mangrove forest, intact riverine rainforest.	Virtually fireproof.	0

4.2 SLOPE

The slopes within each area have been determined using 'Mapview' aerial photography and topographic layer. The SPP1/03 classifies slope to within five different categories of varying hazard (**Table 5**)

Slopes on the site were generally less than 10% and thus the topography is best described as undulating, presenting a low degree of bushfire hazard.

TABLE 5 SPP1/03 SLOPE HAZARD RATINGS

SPP CATEGORY	HAZARD SCORE
Gorges and mountains (>30%)	5
Steep Hills (>20% to 30%)	4
Rolling Hills (>10% to 20%)	3
Undulating (>5% to 10%)	2
Plain (0% to 5%)	0

4.3 ASPECT

Aspect has important implications for moisture content of vegetation and thus bushfire hazard. In accordance with the SPP1/03, the hazard score for various aspects is provided in **Table 6** below. The site generally has slopes less than 5% and thus aspect does not become a significant factor that determines bushfire hazard. Generally though, aspects within the vegetated areas of the site are predominately easterly and southerly and in addition to considerations of slope, have a fairly low aspect hazard rating.

TABLE 6 SPP1/03 ASPECT HAZARD RATINGS

SPP CATEGORY	HAZARD SCORE
North – north-west	3.5
North-west to west	3
West to south	2
North to east	1
All land under 5% slope	0

4.4 FIELD ASSESSMENT

Using the SPP 1/03 methodology, there were 12 areas of unique slope, vegetation and aspect identified that can be assessed for bushfire hazard. Values were determined through field and desktop assessment of vegetation communities, slope and aspect. The subject site has been split into twelve areas for the purpose of assessing the bushfire hazard severity (**Figure 4**).

These areas are:

- Area 1 is located in the north western corner of the site within Lot 244 on CA31710. The area is recognised as a mixture open forest and eucalypt regrowth on a plain (>5% slope) supporting no aspect;
- Area 2 is located in the north eastern portion of Lot 244 on CA31710 and Lot 240 on CA31519. It is an area of cleared grazing land on a plain (>5% slope) supporting no aspect;
- Area 3 is located in the north eastern portion of Lot 244 on CA31710. It is a Eucalypt regrowth with a dry shrub layer on a plain (>5% slope) supporting no aspect;
- Area 4 is located in the central western portion of Lot 240 on CA31519. It is a Eucalypt open forest with a dry shrub layer on a plain (>5% slope) supporting no aspect;
- Area 5 is located in the south western corner of Lot 240 on CA31519. It is a Eucalypt open forest with a dry shrub layer on a plain (5% slope) supporting an easterly aspect;
- Area 6 is located in the central western portion of Lot 240 on CA31519. It is a mixture of Eucalypt and Acacia regrowth on a plain (>5% slope) supporting no aspect;
- Area 6 is located in the central western portion of Lot 240 on CA31519. It is a mixture of Eucalypt and Acacia regrowth on a plain (>5% slope) supporting no aspect;
- Area 7 is located on the eastern boundary of Lot 240 on CA31519. It is comprised of Eucalypt open forest on a plain (>5% slope) supporting no aspect;
- Area 8 is located in the south eastern corner of Lot 240 on CA31519. It is an area of Eucalypt open forest on a plain (>5% slope) supporting no aspect.
- Area 9 is located in the northern and western portions of Lot 238 on CA31519. It is Eucalypt and Acacia regrowth on a plain (>5% slope) supporting no aspect;
- Area 10 is located in the south eastern corner of Lot 238 on CA31519. It is an area of cleared grazing land on a plain (>5% slope) supporting no aspect;
- Area 11 occupies the southern allotment (Lot 242 on CA31612. It is an area of cleared grazing land with isolated patches of Eucalypt woodland on a plain (>5% slope) supporting no aspect; and
- Area 12 occupies the drainage line that traverses the site in a south easterly direction. It is an area of Eucalypt open forest on a plain (>5% slope) supporting no aspect.

These areas are assessed against the indexes provided within the Guideline (SPP 1/03) and the severity of the bushfire hazard of a site can be assessed and relevant management practices identified and employed. **Table 7** assesses the areas bushfire hazard severity.

TABLE 7 SPP1/03 HAZARD RATING ASSESSMENT

AREA	ELEMENT	BHR	TOTAL	BHS
1	Vegetation – Open forest with eucalypts and mixed shrub understorey	8	8	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
2	Vegetation – Grazed grassland	2	2	Low
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		

AREA	ELEMENT	BHR	TOTAL	BHS
3	Vegetation – Eucalypt forest with dry shrub layer	8	8	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
4	Vegetation – Eucalypt forest with dry shrub layer	8	8	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
5	Vegetation – Eucalypt forest with dry shrub layer	8	10	Medium
	Slope – Undulating 5% - 10%	1		
	Aspect – East	1		
6	Vegetation – grassy Eucalypt and Acacia regrowth forest	6	6	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
7	Vegetation – Eucalypt forest with dry shrub layer	8	8	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
8	Vegetation – Eucalypt forest with dry shrub layer	8	8	Medium
	Slope – Plain 0% - 5%	0		
	Aspect – Flat	0		
9	Vegetation – grassy Eucalypt and Acacia regrowth forest	6	6	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
10	Vegetation – grazed grassland	2	2	Low
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
11	Vegetation – grazed grassland and Eucalypt forest with grassy understorey	2	2	Low
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		
12	Vegetation – Eucalypt forest with dry shrub layer	8	8	Medium
	Slope – Plain 0% - 5%	0		
	Aspect - Flat	0		

BHR – Bushfire Hazard Rating BHS – Bushfire Hazard Severity (The State Planning Policy Guideline: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide 2003)

Given the vegetation, aspect and slope, the subject site as a whole carries a Low to Medium Bushfire Hazard as shown in **Figure 4**.

5.0 BUSHFIRE HAZARD REDUCTION MEASURES

5.1 BUSHFIRE HAZARD MANAGEMENT SPECIFICATIONS

As has been previously described, the site supports twelve areas of varying bushfire hazard severity. However this can be broken down into two broad areas of similar hazard rating that will require management for bushfire hazard mitigation. These are the areas classified as Low and Medium bushfire hazard.

A review of aerial photography over the site clearly identifies areas of continuous vegetation to the west and south of the site which is identified as Lockyer Forest Reserve that abuts the subject site.

The site supports slopes of less than 5%, thus no areas of High bushfire hazard were recognised on the site. Areas of Eucalypt forest with dry ladder fuels provide the greatest bushfire hazard on the site, however due to slopes of less than 5% and resultant lack of aspect, they are recognised as being of Medium bushfire hazard. Measures will be required to mitigate the bushfire risk to these areas. Neighbouring properties to the east are currently cleared pasture and croplands.

To mitigate the site bushfire hazard, actions/principles will be implemented within each phase of development. These will primarily focus on providing hazard reduction measures for the subject site such that the bushfire hazard associated with Lockyer Forest Reserve which abuts the site to the west will be appropriately managed.

5.2 PLANNING METHODOLOGY

A Correctional Facility has been proposed for the site to be completed in a number of stages. The northern portion of Area A is likely to be the first area to be developed.

The fire management plan has been divided into three phases which relate to the development of the property as described in the development proposal. The purpose of identifying the various phases of development is to provide fire hazard management guidance throughout the entire development.

It is envisaged that Queensland Correctional Services (QCS) will be the property owner following the acquisition of the four properties from their current owners. Under the QFRS Act 1990, the QCS will be considered to be the "occupier" and as such will be responsible for the management of fire and bushfire hazards within their property. However, as the Department of Public Works will have responsibilities in the development of the site, they have a duty of care to ensure the activities being undertaken within the site during construction works do not increase the threat of fire hazard within the site or neighbouring properties.

The three development phases identified are:

- Pre-development
- During development
- Post development

Each phase has a different set of desired outcomes and management principles based on activities and changes to natural state. **Table 8** describes each phase and the desired objectives of that phase in relation to bushfire management.

TABLE 8 DEVELOPMENT PHASES

PHASE	GENERAL DESCRIPTION	OBJECTIVES
Pre-development	<p>This phase encompasses the management of the site subsequent to acquisition of the land by the Queensland government prior to the initiation of the development.</p> <p>The owner has responsibilities under the <i>QFRS Act 1990</i> to ensure fire is managed and that fire hazards e.g. fuel loads do not exceed levels that would increase the risk of a fire being able to have adverse impacts on surrounding property and the environment.</p>	<ul style="list-style-type: none"> ▪ To manage fuel loads within the property; ▪ To maintain existing fire breaks and establish new fire breaks deemed to be necessary for bushfire management; and ▪ To ensure property managers/owners comply with the provisions of the <i>QFRS Act 1990</i>.
During Development	<p>This phase encompasses the development phase of the property.</p> <p>During development it is assumed that areas of vegetation and open space to be retained are fenced off and protected from disturbances associated with the development.</p>	<ul style="list-style-type: none"> ▪ Maintain conserved open space areas as to assist in control of spread of a bushfire within vegetated areas of the open space; ▪ Restrict activities which may increase risk of fire in the area such as; <ul style="list-style-type: none"> ○ Central refuelling area to restrict spread of flammable chemicals and materials; ○ Cleared vegetation that is to be burned off done in a controlled environment during acceptable weather conditions; and ○ Any incidents are reported immediately to responsible parties.
Post-development	<p>The phase includes the on maintenance period for the site where the developer remains responsible for some aspects of the development. This may include vegetation management, stormwater quality monitoring and bushfire hazard management.</p> <p>At the conclusion of the on maintenance period the responsibility for ongoing management of fire hazards becomes the responsibility of QCS.</p>	<ul style="list-style-type: none"> ▪ To manage fuel within the property below 12 tonnes per hectare; ▪ To maintain fire breaks between vegetation and infrastructure; ▪ Conserve and promote the expansion of <i>Melaleuca irbyana</i> communities present on the site; ▪ Promote the regeneration of open forest within the 100m buffer area and retained open space; and ▪ To have ongoing maintenance which reduces fuel loads, including slashing of grasses and open space areas.

5.3 PRE-DEVELOPMENT

During the pre-development phase the management strategies to be employed by QCS are :-

- 1) Identify portions of the site that are to be rehabilitated and develop management strategies for ensuring fire is excluded from these communities until such time that they are sufficiently regenerated to survive fire. This is likely to require exclusion of fire for a period of 25 – 30 years.
- 2) 70m wide buffers planned for between the development and outer perimeter fences are to be identified and established to double as fire protection zones (FPZs).
- 3) Grasses are to be maintained by slashing or grazing at less than 300mm in height within FPZs.

5.4 DURING DEVELOPMENT

The site is to be cleared and developed in three stages. There will need to be several strategies employed by the Department of Public Works and QCS to manage the bushfire hazard severity during the development process. The strategies associated with the development proposal as well as practices during construction phase are:

- 1) The FPZs are to be maintained.
- 2) Any additional infrastructure created outside of the central development stages are to have a cleared FPZ of 10m established around their perimeter whereby grasses are maintained by slashing or grazing at less than 300mm in height.
- 3) Access to and within the site;
 - a) All access roads are to comply with council and Australian standards;
 - b) A 10m wide fire trail is to be established around the perimeter of various stages to provide access to the Rural Fire Service and on site fire management units via multiple access points
- 4) Storage of flammable material within the site;
 - a) During construction it will be necessary to ensure no flammable material (e.g. Petroleum, chemicals, paint) is stored within 10 metres of vegetation that is retained on or adjacent to the subject site;
 - b) Petroleum products and other highly flammable material is stored a minimum of 20m from vegetated areas adjacent to the property.
- 5) Provision of water resources;
 - a) Retain and, if necessary, improve access to on-site water resources for fire fighting purposes

5.5 POST-DEVELOPMENT

Once the first stage of the development is complete, QCS will remain responsible for ongoing monitoring of the subject site to ensure that bushfire management practices are maintained such that:

- 1) FPZs will be maintained between retained vegetation and developed areas. FPZs should be 70m wide and vegetation within these should be maintained to a height of less than 30cm.
- 2) Fire is to be excluded from within the 100m buffer areas for at least 25-30 years or until sufficient regeneration has occurred such that vegetation communities are able to persist in the event of a fire. Subsequent to this, fire regimes are to be managed appropriately to best facilitate the natural re-establishment of open forest vegetation communities within the buffer.
- 3) Fire regimes are to be managed at an appropriate regime within the south western corner of Lot 238 to best facilitate the continued survival and spread of *Melaleuca irbyana* communities.
- 4) Maintain access to on-site water resources for fire fighting purposes.
- 5) Fire fighting facilities i.e. slip on units, for the purposes of controlling fire close to developed portions of the site and within 70m wide grassed buffers to correctional facilities are to be maintained.

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