Fraser Coast REGIONAL COUNCIL

Bushfire Management Strategy 2010

Produced with the assistance of the following organizations under the Bushfire Mitigation Programme

Emergency Management EMQ Queensland

Queensland Government Department of Emergency Services

DOTARS
DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

FOREWORD

The Bushfire Management Strategy was prepared for Fraser Coast Regional Council by consultants Rob Friend & Associates Pty Ltd and Tiaro Plants. In addition to work carried out by Council staff the project was supported by funding under the Queensland Government Department of Emergency Services and Federal Department of Transport and Regional Services Bushfire Mitigation Program.

The draft plan was released for public comment in June 2009 and input sought from fire management experts including members of the Fraser Coast Bushfire Hazard Abatement Committee and the general public. Comments received were considered by the consultants and suggested changes incorporated into the current document where required.

The Strategy brings together best practice information resources that will be used to inform fire management decisions and allow Council to identify and meet fire management obligations under legislation.

On 8 September 2010 Council adopted the Fraser Coast Bushfire Management Strategy as the principal guiding resource to inform fire management planning for Fraser Coast Regional council controlled lands.

Document Control

Quality Assurance Statement				
Revision No.	Author	Status	Approved for Issue	
			Name	Date
01	Rob Friend & Marilyn Connell	Draft Report	Rob Friend, Director, RF&A Pty Ltd & Tiaro Plants	26 May 2009
02	Rob Friend & Marilyn Connell	Final Draft	Rob Friend, Director, RF&A Pty Ltd & Tiaro Plants	20 July 2009

Adopted by Council on 8 September 2010 (Strategic Action Plan section adopted as a separate document)

Cover Photo: - Coastal wallum, Burrum Heads (left) & Tall Open Forest, Tinnanbar (right)

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Project Management Details

The following people prepared this Fraser Coast Bushfire Management Strategy:

- Project Manager and Principal Bushfire Ecologist - Rob Friend, Rob Friend & Associates Pty Ltd;
- Joint Project Manager and Local Expert – Marilyn Connell, Tiaro Plants.
- GIS support - David Gooding, Australian Geographical Information Systems.

The Consultancy Team was assisted by an internal Council Project Team and an external Advisory Group which consisted of members of the Fraser Coast Hazard Abatement Group. Particular thanks are given to these two groups for their assistance, advice and contribution to the preparation of this document: -

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Introduction

Land uses like farmland or a national park, imply a set of specific assets and values and, therefore, varying perceptions of losses. The landscape-fire problem has multiple partial 'solutions' not just one overall solution. These involve social governance, land management (public and private), suppression capacity and personal or agency preparedness. There will always be a residual risk of severe fire occurrence. Minimisation of residual risk requires effective land management, recurrent funding and the perpetual vigilance of all parties[1].

The Fraser Coast Regional Council (FCRC) commissioned Rob Friend & Associates Pty Ltd and Tiaro Plants to prepare a Bushfire Management Strategy for the FCRC local government area. Fraser Island has not been included within this report.
This Report has been separated into three parts.

- Part One contains background information about the FCRC, its geography, vegetation and land tenure arrangements.
- Part Two contains a set of land management practices and guidelines for a range of activities such as firebreak and fire trail construction and maintenance and fuel load monitoring.

In addition to the report new Geographic Information System (GIS) data set has been developed. This new GIS data set includes: -

- A Digital Terrain Model (DEM). This has been used to develop slope and aspect maps over the entire region.
- A new Bushfire Hazard Map based on a review of the Regional Ecosystem mapping provided by FCRC[2] and the slope and aspect types derived from the DEM.
- A Bushfire Risk Map which identifies those significant Council and community assets which are potentially susceptible to impact from a bushfire event. These are assets such as community infrastructure i.e. hospitals, community centres and Council managed infrastructure such as water reservoirs, sewage and water facilities which are adjacent to areas of high or medium bushfire hazards
- A map identifying those fire sensitive bushfire communities / Regional Ecosystems within the region. These are communities which can be significantly degraded should a bushfire be permitted to burn into or through.

Project Objectives

In accordance with the Contract between Fraser Coast Regional Council and Rob Friend & Associates Pty Ltd and Tiaro Plants, the project objectives were: -

Key milestone one
- Collate and review existing bushfire management plans for properties adjoining Council reserves and open spaces.
- Develop GIS data layers.
- Complete draft version one "Bushfire Hazard Mitigation and Risk Management Strategy" Maps, Plans for Fraser Coast Region.

Key milestone two
- Workshop draft report version two with reference group and community.
- Report with GIS data presented to Council.
- Final draft "Bushfire Management Strategy", maps, and Plans for Fraser Coast Region.

[1] (Landscape fires as social disasters: An overview of 'the bushfire problem' A. Malcolm Gill, CSIRO, Environmental Hazards 6 (2005) 65-80.
[2] Regional Ecosystem Mapping Version 5.1

Key milestone three

- Final draft "Bushfire Management Strategy", Maps, Plans for Fraser Coast Region adopted by Council.

Project Methodology

The following outlines the methodology undertaken by the consultants to develop this Bushfire Management Strategy for Fraser Coast Regional Council.

We have also identified the assumptions and constraints used to derive the Bushfire Hazard Map as well as key findings of our analysis of the data provided by Council.

The project

- The area within which the project was to focus was the mainland area of Fraser Coast Region. Fraser Island was not part of this study area.
- The following digital data was provided by Council for the consultants to use as appropriate: -
  - 5m contours over the whole Region;
  - 1m & 0.5m contours over parts of Hervey Bay;
  - Land tenure including parks, reserves and wetlands;
  - Bike – pedestrian paths;
  - Bike routes;
  - Road centre lines;
  - Road footpaths;
  - Remnant Vegetation (Bioregional Ecosystems V5.1);
  - Pre-clearing vegetation;
  - Digital Cadastral Database (DCDB);
  - Rivers and Waterways;
  - Satellite images covering the whole of FCRC.
- Other information included
  - Freehold lands acquired by Council by lot and real property description
  - Leasehold lands for the Maryborough district;
  - Historic and Cultural heritage sites for Hervey Bay.
- The project entailed an analysis of available data within the FCRC area including contours, land tenure and the remnant vegetation layers.
- The Regional Ecosystem polygons were described and attributed in accordance with the vegetation communities as specified in Table A3.1 in the State Planning Policy 1/03 (SPP1/03) – Mitigating the Adverse Impacts of Flood, Bushfire and Landslip Guidelines.
- The 5m contours were used to build a Triangulated Irregular Network (TIN). The TIN was then used to sample on a 1sqm.pixels to develop both slope and aspect characteristics over the Fraser Coast Region.
- Each 1sqm pixel was attributed in accordance with Tables A3.2 & A3.3 of the SPP1/03 Guidelines.
- As specified in the SPP1/03 all vegetation communities which was attributed with a bushfire hazard score of 2 or less was automatically attributed with a severity of bushfire hazard rating of "Low".
- Each of the bushfire hazard characteristics were overlayed i.e. vegetation, slope and aspect to derive combined bushfire hazard scores.
- These combined bushfire hazard scores were separated into classes based on Table A3.4 in the SPP1/03 Guidelines to derive the severity of bushfire hazard or the Bushfire Hazard Map for Fraser Coast Regional Council area.
- This map along with the satellite imagery and land tenure was used as the basis of the field investigations. High bushfire hazard areas were ground truthed.
- Attention was also paid to rural residential areas within the region to ascertain the bushfire risks associated with these communities.
- Those vegetation communities which were scored as 2 or less were also inspected, where practical, to confirm their presence and to enable them to be described as bushfire sensitive communities.
- Based on the ground truthed Bushfire Hazard Map, the Bushfire Management Strategy was developed.
- The final Draft Bushfire Hazard Map was presented to the external bushfire mitigation group who provided external bushfire management advice

to Council for this project. While the maps were generally accepted, a few potential mapping errors were highlighted.

Findings

The following assumptions were made as part of this project: -

- The project scope did not include a substantial review of the vegetation mapping i.e. remnant vegetation data covering the Fraser Coast Region. Therefore the existing remnant vegetation layer was accepted in its current form.
    - Some inconsistencies were observed with the remnant vegetation mapping however these inconsistencies were not such that they should have a significant impact on the accuracy of the bushfire hazard mapping.
    - It is also noted that the existing Remnant Vegetation map may be some years old and as such while being the latest available is still not current. However no significant differences were found between the remnant vegetation polygons, the satellite imagery and those areas observed during the ground truthing exercise.
- Following the development of the draft Bushfire Hazard Map a number of small high and medium bushfire hazard areas were identified throughout the region. It appeared following further analysis that these might be a result of the contour data which flowed into the TIN.
    - For the purpose of this study and the final Bushfire Hazard Map the following rules were installed in the GIS to manage these contour data errors.
    - All areas of "High" bushfire hazard less than 5ha were mapped at the hazard level of the surrounding area. All high areas were then mapped as "Medium" bushfire hazard.
    - All areas of "Medium" less than 5ha were mapped as the surrounding bushfire hazard level which for all incidents was "Low" bushfire hazard.
- A review of the final Bushfire Hazard Map indicated that these rules did not generate any bushfire management difficulties or inconsistencies in the final Bushfire Hazard Map.

Fraser Coast Region

General Description

Location

Fraser Coast Regional Council has been formed by the amalgamation of Maryborough City, Hervey Bay City, Woocoo Shire and Divisions 1 & 2 of Tiaro Shire and includes the whole of Fraser Island and the islands within the Great Sandy Strait.

Fraser Coast Region covers an area of 7,125sqkm and is centred on Maryborough with Hervey Bay the other major population area within the Region.

The Fraser Coast Regional Council area abuts Bundaberg Regional Council to the north, Gympie Regional Council to the south and North Burnett Regional Council with the Coral Sea to the east.

Environment Values

The Fraser Coast South Burnett Tourism Board promotes the region as one of Australia's premier nature destinations. Many environmental values of this region are of national and international significance which are contributing factors to the recent acceptance of the Great Sandy Biosphere by UNESCO.

World Heritage Listed sites include Fraser Island and the Great Barrier Reef. Areas of Internationally significance include the Ramsar listed Great Sandy Straits which includes high tide roost sites of migratory shorebirds.

The exceptional scientific values of Mt Bauple National Park have long been recognised by the Queensland Government. It was gazetted as a National Park (Scientific) in 1935.

Amongst the rare and threatened flora and fauna species which occur in the Fraser Coast Region are a number for which uncontrolled fire has been identified as a key threat[3]. (See Appendix IV).

Settlement patterns

The population of 95,000 is concentrated in two major regional centres of Maryborough and Hervey Bay which are surrounded by coastal communities and smaller rural towns. Rural residential communities such as Glenwood have been established in areas which are surrounded by agriculture or vegetated state lands. In the 5 years to July 2006, the average population change for the Fraser Coast local government area was 3.7%, which exceeds the state average of 2.4%[4].

Other townships within the Fraser Coast Region include Burrum Heads, Burrum Town, Toogoom, Torbanlea, Aldershot, Tiaro and Bauple. Coastal communities include Booral, River Heads, Maaroom, Boonooroo, Tuan, Poona and Tinnanbar.

Land Use

Major agricultural enterprises include beef cattle, sugar cane, timber production and a smaller number of dairying and horticulture enterprises e.g. macadamia orchards and pineapples. Changes are occurring within the timber industry as harvesting of native hardwoods from some State Forests is being phased out and a private hardwood plantation industry is emerging. The sugar cane industry is also changing. With the increase in the harvesting of green cane, fewer cane fires are being lit in the district.

Within the Council boundaries are large tracts of state lands across a range of tenures e.g. National Parks, Conservation Parks, State Forests, Forest Reserves, Unallocated State Lands and extensive exotic pine plantations. The number and size of National Parks has increased in recent years with the transfer of a number of State Forests from Department of

[3] (Burnett Mary Region Back on Track Biodiversity Action Plan Apr 2008 EPA)
[4] Qld population update No. 11, 2007 – Planning Information & Forecasting Unit, Dept of Infrastructure & Planning

Natural Resources and Water to the Environmental Protection Agency/Qld Parks and Wildlife Service.

NOTE: - *It is noted that the Department of Natural Resources and Water and the Environmental Protection Agency has now been amalgamated into a single department called the Department of Environment and Resource Management (DERM).*

Bushfire and changing demographics & peri urban rural interface

Traditionally fire was a tool used by many farmers as part of their day to day farm management. Annually sugar cane farmers lit fires to burn the sugar cane prior to harvest and many cattle graziers burnt their paddocks to encourage the 'green pick' for their cattle. Consequently rural areas had a labour force that was familiar with managing fire. Farmers worked together and shared fire fighting equipment. Those resources and skills are disappearing from Fraser Coast, with the expansion of urban centres, changes in farm management practices, and an increase in properties being managed as lifestyle properties.

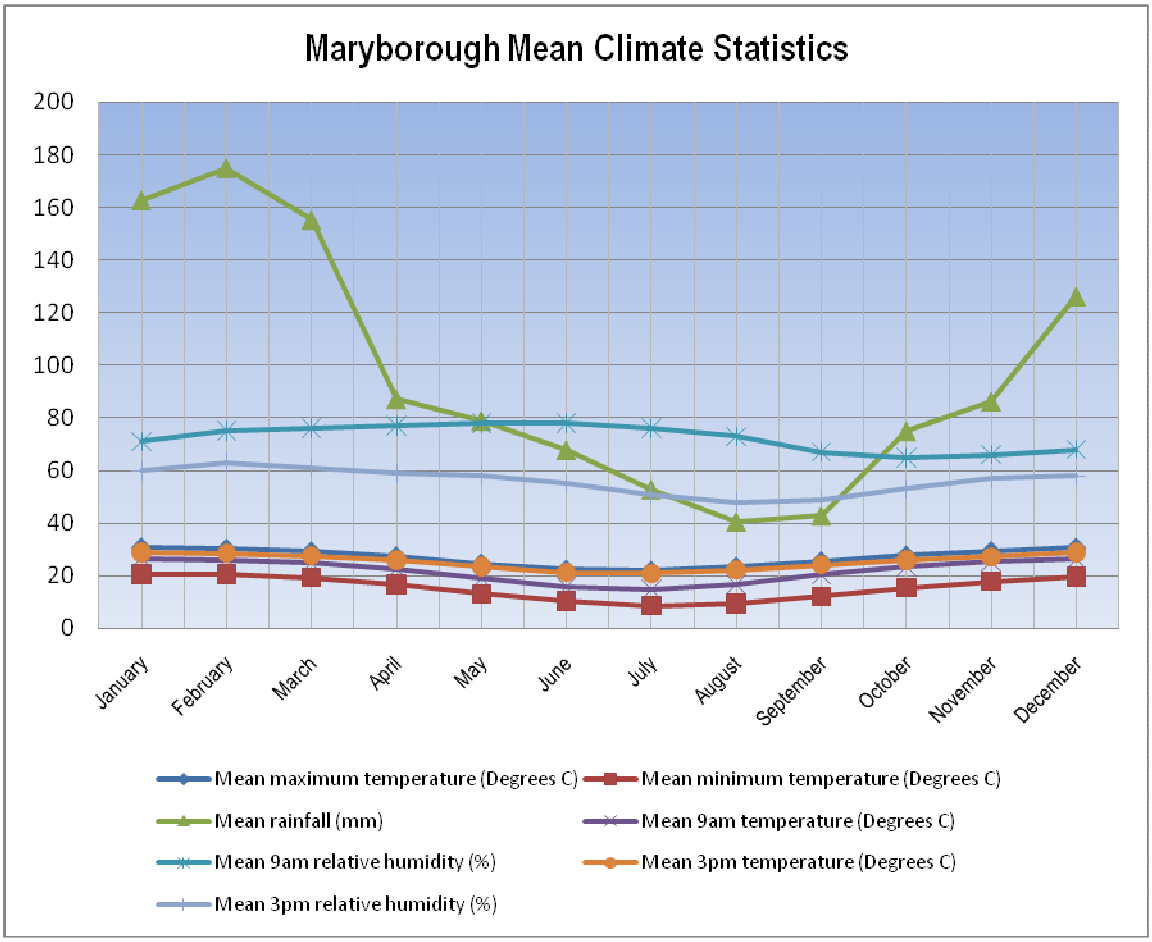
If population growth continues as predicted by the Department of Infrastructure and Planning, urban encroachment into rural areas will have ongoing implications for managing bushfire risk.

Climate

Fraser Coast has a humid sub-tropical climate with mild winters and warm summers. Most rain occurs in summer months.

The following figure (Figure 1) provides a graph of the mean climatic statistics for Maryborough. The climatic records within the Fraser Coast area are limited to Maryborough. Local climatic records have been maintained for Childers, Rainbow Beach, Gayndah and Brian Pastures. However, the climate for these areas is significantly different from the FCRC area so as not to be relevant with regard to influencing bushfire behaviour. For the purpose of this report the graph below is limited to the Maryborough climatic data.

Climate Statistics - Maryborough



Climate Change

Climate change is a natural occurrence at a local, regional, hemispherical and global scale, however a key question which is at the forefront of a number of scientific investigations across and wide range of disciplines is or has humans contributed to that climate change and if so what are the likely impacts of that change.

There is currently substantial debate and concern regarding human induced climate change by the increase of climate change gases such as methane, carbon etc.

A number of scientists are modelling human induced climate change and have indicated that we are in a global warming phase and this will have significant impact on global climate and as such those environments which we are dependent on such as vegetation.

The San Diego Declaration of Climate Change and Fire Management (2006) noted that extreme wildfire events are increasing, wildfire seasons are lengthening and there is an increase in large-scale wildfires in fire-sensitive ecosystems. Research indicates that climate change has, in part, caused these trends[5].

A warming climate not only increases the vigour of plants, but also enables for areas which are restricted by lower temperatures to be available for vegetation types which require warmer environments.

A warmer climate may see an increase in the vigour of some vegetation types along

[5] Association for Fire Ecology, Third International Fire Ecology and Management Congress Nov 2006

with a potential increase in precipitation the result for much of the Fraser Coast region is that the existing vegetation types may increase in its biomass and therefore an increase in available fuels and hence a high potential for those fuels to be available for consumption during a bushfire event.

Increased rainfall may mean soil moisture may be retained for longer periods, vegetation will remain lush or retain higher level of moisture within the plant and therefore fuels may not be available for fire. However, when that dry period does persist there may be higher levels of fuels available for a fire once those moisture levels have been reduced to a level when those fuels will become available for a fire to consume.

Climate change has the potential to impact on ecosystems throughout the Fraser Coast, with a number of reports being produced in the recent past about the potential impacts of climate change on bushfire and the susceptibility of some landscapes to increase bushfire impacts.
While the majority of climate change and bushfire dialogue has been undertaken with particular reference to South Australia there is commentary of the possible impacts of climate change on the Queensland environment.

The potential impact of climate change on Queensland has not been fully studied however, some general indicators have been identified: -

- Average summer temperatures will increase by 1 degree over the next 30 years.
- Rainfall will generally decrease however an increase in severe weather will occur with significant rainfall being experienced in coastal areas due to these severe storm events
- A drying of the landscape may lead to a drying of vegetation and an increase of woodlands and less structured open forests. This in turn may, over time, reduce the amount of fuel available and hence lead to lesser possible intense wildfire events.

It is also important to note that climate change, natural or human induced may occur over a significant number of years i.e. 50 – 100 years, therefore the transition to a drier or wetter climate will be over a considerable number of years and as such some vegetation communities will retain their existing flammability hazard rating for many years to come.

Historically, the Fraser Coast experiences highly variable climatic conditions from year to year and the impacts of climate change may not be pronounced e.g. November monthly rainfall records for Maryborough range from 3mm to 301mm. However, what a warmer climate may mean for the Fraser Coast region based on the current modelling for a warming of global climate is: -

- Potential fuel loads within open forest and woodlands may increase as a result of an increase in understorey biomass should the local climate become wetter.
- An increase of CO_2 may result in enhanced growth of vegetation and increase biomass.
- Conversely should the climate get drier vegetation will get simpler and vegetative biomass may decrease thus resulting in a decreased level in fuel loads and therefore bushfire impacts.
- The potential for a number of environmental weed species to increase in biomass and therefore contribute to fuel loads.
- Existing adhoc physical management and maintenance regimes around bushland reserves may in fact increase fuels at the bushland interface thus increasing bushfire risks to adjacent assets.
- However, it is unlikely that there would be a substantial change to the plant species within most vegetation communities as the dominant species which contribute to fuel loads occur over a relatively large geographic and climatic range.
-

Further information is available from the Bureau of Meteorology (www.bom.gov.au).

Land form

The Fraser Coast is characterised by coastal lowlands, alluvial plains of the Mary, Susan and Burrum Rivers, undulating rises and low hills bordered by the Sea View and Clifton Ranges in the west (see Figure 2). To the east is the sand mass of Fraser Island and the Great Sandy Strait wetlands. The highest peaks are Mt Urah (598m) and Mt Bauple (496m) with a number of other mountains between 200 – 300m in the west and southern parts of the region.

Fraser Coast occurs within the southeast Queensland bioregion. Contained within each bioregion are a number of subregions or provinces, each having relatively uniform patterns of geology, landform, climate and biota (described by Sattler and Williams (1999).

Four subregions occur within the Fraser Coast.

- **Gympie Block** (SEQ 7) located west of the Mary River catchment and south of Curra. Features include low, hilly landscapes on old sedimentary rocks, metamorphics and intermediate and basic volcanics with scattered acid volcanic intrusions. The relatively fertile soils associated with volcanics support patches of hoop pine vine forest and mixed eucalypt forests. These are replaced by ironbark woodlands where rainfall is lower.
- **Burnett-Curtis** coastal lowlands (SEQ 8) contain lower Mary River catchment and coastal areas north of Poona. It is based on sedimentary rocks of the Maryborough Basin and marine and alluvial sediments. While drier than provinces to the south, it is marked with a tropical biotic component. Major vegetation types include heath lands, Melaleuca and Eucalypt woodlands and open forests.
- **Great Sandy** (SEQ 9) includes Great Sandy Strait and the coastal zone south of Poona. It is characterised by sand masses and sandstone hills. Major vegetation types include rainforest, mixed Eucalypt open forests, Banksia woodlands and Melaleuca woodlands.
- **Brisbane-Barambah Volcanics** (SEQ 5) is an area of rolling hills and broad stream valleys in the western Mary River catchment. In the eastern section granite intrusions are associated with elevated topography. It contains extensive ironbark Eucalypt woodlands, Araucarian microphyll rainforests and prior to clearing, *Eucalyptus tereticornis* woodlands.

Vegetation and Regional Ecosystems

Remnant vegetation has been mapped throughout the Fraser Coast region by the Qld Herbarium and described as Bioregional Ecosystems (commonly referred to as Regional Ecosystems or RE's).

Based on work developed by Sattler and Williams (1999) all Bioregional Ecosystems within the state have been described based on the Bioregion, the geology/substrate-landform or landzone upon which it occurs and the vegetation association of the predominant species in the upper most stratum i.e. canopy. The Fraser Coast Regional Council area is located within the southeast Queensland Bioregion. This bioregion has been attributed with the number 12[6].

A Regional Ecosystem is attributed and described as three sets of numbers such as 12.3.4. The 12 identifies the bioregion within the vegetation community is located, that being the Southeast Queensland Bioregion. The 3 identifies the geology upon which the vegetation community occurs, this example being alluvium (river and creek flats) and the final numeric, in this example 4, describes the dominate vegetation but has been attributed with that number in accordance with the sequence of its description. That is 12.3.4 was the 4th RE described in the bioregion and on that landzone.

Each Regional Ecosystem has been assigned a status under the *Vegetation Management Act* (1999) and biodiversity

[6] Sattler. P. & Williams. R. 1999. The Conservation Status of Queensland's Bioregional Ecosystems. EPA.

status as defined by Environmental Protection Agency. In accordance with the Agencies Biodiversity Assessment and Mapping Methodology or BAAM. The Status included in Table 1 below is as stated in Schedule 1, 2 and/or 3 of the *Vegetation Management Regulations* 2000 (1 July 2008).

The status used in Table 1 below is the Biodiversity States as defined by the Department of Environment and Resource Management. See the following website for a description of the Biodiversity Status http://www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems/introduction_and_status/

Table 1 – Regional Ecosystems of Fraser Coast Regional Council

RE	Description	Status
12.1.1	*Casuarina glauca* open forest on margins of marine clay plains	Endangered
12.1.2	Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains	No concern
12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	No concern
12.2.1	Notophyll vine forest on parabolic high dunes	Of concern
12.2.2	Microphyll/notophyll vine forest on beach ridges	Endangered
12.2.3	Araucarian vine forest on parabolic high dunes	Of concern
12.2.4	*Syncarpia hillii, Lophostemon confertus* tall open to closed forest on parabolic high dunes	Of concern
12.2.6	*Eucalyptus racemosa* woodland on dunes and sand plains. Usually deeply leached soils	No concern
12.2.7	*Melaleuca quinquenervia* or *M. viridiflora* open forest to woodland on sand plains	No concern
12.2.8	*Eucalyptus pilularis* open forest on parabolic high dunes	No concern
12.2.9	*Banksia aemula* woodland on dunes and sand plains. Usually deeply leached soils	No concern
12.2.11	*Corymbia spp., Eucalyptus spp., Acacia spp*. open forest to low closed forest on beach ridges in northern half of bioregion	No concern
12.2.12	Closed heath on seasonally waterlogged sand plains	No concern
12.2.14	Strand and fore dune complex comprising Spinifex sericeus grassland *Casuarina equisetifolia* woodland/open forest and with *Acacia leiocalyx, A. aulacocarpa, Banksia integrifolia* subsp. *integrifolia, Pandanus tectorius, Corymbia tessellaris, Cupaniopsis anacardioides, Acronychia imperforata*. Occurs mostly on frontal dunes and beaches but can occur on exposed parts of dunes further inland.	No concern
12.2.15	Swamps with *Baumea spp., Juncus spp*. and *Lepironia articulata*	No concern
12.2.16	Sand blows largely devoid of Vegetation. Sand blows on large sand islands.	Of concern
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	Endangered
12.3.3	*Eucalyptus tereticornis* woodland to open forest on alluvial plains	Endangered
12.3.4	*Melaleuca quinquenervia, Eucalyptus robusta* open forest on or near coastal alluvial plains	Of concern
12.3.5	*Melaleuca quinquenervia* open forest on coastal alluvium	Of concern
12.3.5a	*Melaleuca quinquenervia, Casuarina glauca* +/- *Eucalyptus tereticornis* open forest. Occurs on lowest river terraces of Quaternary alluvial plains in coastal areas	Of concern
12.3.6	*Melaleuca quinquenervia, Eucalyptus tereticornis, Lophostemon suaveolens* woodland on coastal alluvial plains	No concern
12.3.7	*Eucalyptus tereticornis, Melaleuca viminalis, Casuarina cunninghamiana* fringing forest	No concern

RE	Description	Status
12.3.8	Swamps with *Cyperus spp., Schoenoplectus spp.* and *Eleocharis spp*.	Of concern
12.3.11	*Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia* open forest on alluvial plains usually near coast	Of concern
12.3.11a	Open forest of *Eucalyptus siderophloia* with vine forest understorey. Other canopy species include *Corymbia intermedia, Araucaria cunninghamii* and *Agathis robusta*. Frequently occurring understorey species include *Flindersia spp., Lophostemon suaveolens, L. confertus, Cupaniopsis parvifolia, Acronychia spp., Alphitonia excelsa* and *Acacia disparrima*. Occurs on sub-coastal Quaternary alluvial plains. Rainfall usually exceeds 1000mm/y	Of concern
12.3.12	*Eucalyptus latisinensis* or *E. exserta, Melaleuca viridiflora* on alluvial plains	Of concern
12.3.13	Closed heathland on seasonally waterlogged alluvial plains usually near coast	Of concern
12.3.14	*Banksia aemula* woodland on alluvial plains usually near coast	Of concern
12.5.1	Open forest complex with *Corymbia citriodora* on sub-coastal remnant Tertiary surfaces. Usually deep red soils	No concern
12.5.2	*Eucalyptus tereticornis, Corymbia intermedia* on remnant Tertiary surfaces, usually near coast. Usually deep red soils	Endangered
12.5.4	*Eucalyptus spp., Corymbia spp., Melaleuca spp.* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	No concern
12.5.5	*Eucalyptus portuensis, Corymbia intermedia* woodland on remnant Tertiary surfaces. Usually deep red soils	Of concern
12.5.7	*Corymbia citriodora, Eucalyptus portuensis, E. fibrosa* subsp. *fibrosa* open forest on remnant Tertiary surfaces. Usually deep red soils	No concern
12.5.8	*Eucalyptus hallii* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Of concern
12.5.9	Sedgeland to heathland in low lying areas on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Of concern
12.5.10	*Banksia aemula* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	No concern
12.5.12	*Eucalyptus racemosa, E. latisinensis* ± *Corymbia gummifera, C. intermedia, E. bancroftii* woodland with heathy understorey on remnant Tertiary surfaces	Of Concern
12.5.13	Microphyll to notophyll vine forest ± *Araucaria cunninghamii* on remnant Tertiary surfaces	Endangered
12.8.25	Open forest with *Eucalyptus acmenoides* or *E. helidonica* on Cainozoic igneous rocks especially trachyte	Of concern
12.9-10.2	*Corymbia citriodora, Eucalyptus crebra* open forest on sedimentary rocks	No concern
12.9-10.3	*Eucalyptus moluccana* on sedimentary rocks	Of concern
12.9-10.4	*Eucalyptus racemosa* woodland on sedimentary rocks	No concern
12.9-10.7	*Eucalyptus crebra* woodland on sedimentary rocks	Of concern
12.9-10.7a	*Eucalyptus tereticornis, E. siderophloia* and/or *E. crebra, Corymbia intermedia* and *Lophostemon suaveolens* woodland. Occurs on Cainozoic and Mesozoic sediments	Of concern
12.9-10.10	*Melaleuca no*dosa low open forest on sedimentary rocks	Of concern
12.9-10.16	Araucarian microphyll to notophyll vine forest on sedimentary rocks	Endangered
12.9-10.17	Open forest complex often with *Eucalyptus acmenoides, E. major, E. siderophloia* ± *Corymbia citriodora* on sedimentary rocks	No concern
12.9-10.19	*Eucalyptus fibrosa* subsp. *fibrosa* open forest on sedimentary rocks	No concern

RE	Description	Status
12.9-10.21	*Eucalyptus acmenoides* or *E. portuensis* open forest usually with *Corymbia trachyphloia* on Cainozoic to Proterozoic sediments	No concern
12.9-10.22	Closed sedgeland/shrubland on sedimentary rocks. Coastal parts	Of concern
12.11.6	*Corymbia citriodora, Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics	No concern
12.11.7	*Eucalyptus crebra* woodland on metamorphics ± interbedded volcanics	No concern
12.11.8	*Eucalyptus melanophloia, E. crebra* woodland on metamorphics ± interbedded volcanics	Of concern
12.11.10	Notophyll vine forest ± *Araucaria cunninghamii* on metamorphics ± interbedded volcanics	No concern
12.11.14	*Eucalyptus crebra, E. tereticornis* woodland on metamorphics ± interbedded volcanics	Of concern
12.11.17	*Eucalyptus acmenoides* or *E. portuensis* open forest on metamorphics ± interbedded volcanics	Of Concern
12.11.18	*Eucalyptus moluccana* open forest on metamorphics ± interbedded volcanics	No concern
12.12.1	Simple notophyll vine forest usually with abundant *Archontophoenix cunninghamiana* (gully vine forest) on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.5	*Corymbia citriodora, Eucalyptus crebra* open forest on Mesozoic to Proterozoic igneous rocks	No concern
12.12.7	*Eucalyptus crebra* woodland on Mesozoic to Proterozoic igneous rocks	No concern
12.12.8	*Eucalyptus melanophloia* woodland on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.9	Shrubby woodland with *Eucalyptus dura* usually on rocky peaks on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.10	Shrubland of rocky peaks on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.11	*Eucalyptus portuensis* or *E. acmenoides, Corymbia trachyphloia* open forest on Mesozoic to Proterozoic igneous rocks	No concern
12.12.12	*Eucalyptus tereticornis, E. crebra* or *E. siderophloia, Lophostemon suaveolens* open forest on granite	Of concern
12.12.13	Araucarian complex microphyll to notophyll vine forest on Mesozoic to Proterozoic igneous rocks	No concern
12.12.16	Notophyll vine forest on Mesozoic to Proterozoic igneous rocks	No concern
12.12.19	Vegetation complex of rocky headlands, predominantly but not exclusively on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.21	*Corymbia intermedia, E. exserta* woodland on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.22	*Eucalyptus decolor, E. portuensis* or *E. acmenoides* open forest on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.23	*Eucalyptus tereticornis* ± *E. eugenioides* woodland on crests, upper slopes and elevated valleys on Mesozoic to Proterozoic igneous rocks	No concern
12.12.25	*Eucalyptus fibrosa* subsp. *fibrosa* woodland to open forest on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.26	*Acacia harpophylla* open forest on Mesozoic to Proterozoic igneous rocks	Endangered
12.12.28	*Eucalyptus moluccana* open forest on Mesozoic to Proterozoic igneous rocks	Of concern
12.12.28x1	*Eucalyptus moluccana* ± *E. crebra, Corymbia citriodora* open-forest or woodland on areas that have been subject to deep weathering. Occurs on broad ridges and lower slopes on areas that have been subject to deep weathering (land zone 5)	Of concern
Disturbed	Lands containing disturbed Vegetation considered to be non-remnant	Non remnant

RE	Description	Status
Hoop pine plantation	Hoop pine plantations mostly within Forest Plantations Queensland Land	Non-remnant
Plantation	Pine plantations within Forest Plantation Queensland and possible other private lands	Non-remnant
Regrowth	Lands contain regrowth vegetation	Non-remnant
Small	Area of vegetation less than 1ha in size and not protected under the *Vegetation Management Act* 1999	Non-remnant

NOTE: - *A number of RE polygons are mosaic polygons containing up to four RE's. The above list is a list of all RE within the Fraser Coast Region (excluding Fraser Island).*

Regional Ecosystem anomalies

Some anomalies have been identified as a result of the field investigations and subsequent analysis of the Regional Ecosystems overlaying the latest available orthophotos. The extent of anomalies is not known as a substantive review of Regional Ecosystems including regrowth and non-remnant areas was outside of the scope of the project. Some of the anomalies observed include: -

- Areas of plantation forest which have been cleared are mapped as non-remnant
- Some minor areas are mapped as non-remnant and could be mapped as remnant or regrowth

While these incidents are of a minor nature and do not affect the outcome of this project it is important to note that the bushfire hazard mapping is based on the existing Regional Ecosystem mapping and to the extent that there are errors in this mapping there is also the potential for those errors to also be contained in the Bushfire Hazard Map prepared as part of this Strategy.

Vegetation Communities

While Regional Ecosystems have become the basis of vegetation mapping within Queensland it is not an adequate method of mapping vegetation communities for bushfire hazard mapping. It does not fully take into consideration the understorey composition which is the strata within which the majority of bushfires occur within Queensland. There are exceptions such as tall open forests of steeply sloping lands with a northerly to westerly aspect. However these are the exception rather than the rule for SE Queensland.

While a number vegetation surveys have been undertaken within the QPWS estate and it has been assumed that this higher level vegetation mapping has been incorporated into the existing Regional Ecosystem mapping. However, there is no lower scale vegetation community mapping data available for most of the FCRC area outside of State lands.

A general assessment can be made of the various structural types of vegetation communities within the region following a review of the Regional Ecosystem mapping information and the aerial photography coverage for the FCRC.

It is important again to note that this study does not include Fraser Island.

The structural vegetation communities can be derived from the general descriptions of the Regional Ecosystem contained in Table 2 below.

Table 2 below identifies vegetation communities derived from the Regional Ecosystems and places them within the vegetation communities contained in Table A3.1 (SPP 1/03 Guidelines) and assigns the hazard score attributed to that SPP1/03 Vegetation community. The table has been sorted on Hazard Score.

Table 2 – Vegetation Communities

Vegetation community	SPP1/03 Community	Hazard score
Saltpan vegetation including grassland and herbland on marine clay plains	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Mangrove shrubland to low closed forest on marine clay plains and estuaries	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Notophyll vine forest ± *Araucaria cunninghamii* on metamorphics ± interbedded volcanics	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Simple notophyll vine forest usually with abundant *Archontophoenix cunninghamiana* (gully vine forest) on Mesozoic to Proterozoic igneous rocks	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Araucarian complex microphyll to notophyll vine forest on Mesozoic to Proterozoic igneous rocks	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Notophyll vine forest on Mesozoic to Proterozoic igneous rocks	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Notophyll vine forest on parabolic high dunes	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Sand blows largely devoid of vegetation. Sand blows on large sand islands.	Not described	0
Microphyll/notophyll vine forest on beach ridges	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Araucarian vine forest on parabolic high dunes	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Gallery rainforest (notophyll vine forest) on alluvial plains	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Microphyll to notophyll vine forest ± *Araucaria cunninghamii* on remnant Tertiary surfaces	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Araucarian microphyll to notophyll vine forest on sedimentary rocks	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Hoop pine plantations mostly within Forest Plantations Queensland Land	Intact rainforest, mangrove forest, intact riverine rainforest	0
Area of vegetation less than 1ha in size and not protected under the *Vegetation Management Act* 1999	Not described	0
Casuarina glauca open forest on margins of marine clay plains	Intact rainforest, mangrove forest, intact riverine rainforest.	0
Swamps with *Baumea spp., Juncus spp*. and *Lepironia articulata*	Grazed grasslands, slashed grass.	2
Swamps with *Cyperus spp., Schoenoplectus spp*. and *Eleocharis spp*.	Grazed grasslands, slashed grass.	2
Strand and fore dune complex comprising *Spinifex sericeus* grassland *Casuarina equisetifolia* woodland/open forest and with *Acacia leiocalyx, A. aulacocarpa, Banksia integrifolia* subsp. *integrifolia*, *Pandanus tectorius, Corymbia tessellaris, Cupaniopsis anacardioides, Acronychia imperforata*. Occurs mostly on frontal dunes and beaches but can occur on exposed parts of dunes further inland.	Intact acacia forests, with light grass to leaf litter, disturbed rainforest.	4
Eucalyptus racemosa woodland on dunes and sand plains. Usually deeply leached soils	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	5
Eucalyptus fibrosa subsp. *fibrosa* woodland to open forest on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus crebra, E. tereticornis woodland on metamorphics ± interbedded volcanics	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6

Vegetation community	SPP1/03 Community	Hazard score
Eucalyptus moluccana open forest on metamorphics ± interbedded volcanics	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Corymbia citriodora, Eucalyptus crebra open forest on metamorphics ± interbedded volcanics	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus melanophloia, *E. crebra* woodland on metamorphics ± interbedded volcanics	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Shrubland of rocky peaks on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Vegetation complex of rocky headlands, predominantly but not exclusively on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus moluccana ± *E. crebra, Corymbia citriodora* open forest or woodland on areas that have been subject to deep weathering. Occurs on broad ridges and lower slopes on areas that have been subject to deep weathering	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Corymbia citriodora, Eucalyptus crebra open forest on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus crebra woodland on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus melanophloia woodland on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Banksia aemula woodland on dunes and sand plains. Usually deeply leached soils	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Closed heathland on seasonally waterlogged alluvial plains usually near coast	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Banksia aemula woodland on alluvial plains usually near coast	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Banksia aemula woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus hallii woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Sedgeland to heathland in low lying areas on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Melaleuca nodosa low open forest on sedimentary rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Corymbia citriodora, Eucalyptus crebra open forest on sedimentary rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Closed sedgeland/shrubland on sedimentary rocks. Coastal parts	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus moluccana on sedimentary rocks	Grassy eucalypt and acacia forest,	6

Vegetation community	SPP1/03 Community	Hazard score
	exotic pine plantations, cypress pine forests, wallum heath.	
Eucalyptus racemosa woodland on sedimentary rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Lands containing disturbed Vegetation considered to be non-remnant	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Pine plantations within Forest Plantation Queensland and possible other private lands	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Lands contain regrowth vegetation	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus moluccana open forest on Mesozoic to Proterozoic igneous rocks	Grassy eucalypt and acacia forest, exotic pine plantations, cypress pine forests, wallum heath.	6
Eucalyptus acmenoides or *E. portuensis* open forest on metamorphics ± interbedded volcanics	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus portuensis or *E. acmenoides, Corymbia trachyphloia* open forest on Mesozoic to Proterozoic igneous rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus tereticornis, E. crebra or *E. siderophloia, Lophostemon suaveolens* open forest on granite	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Corymbia intermedia, E. exserta woodland on Mesozoic to Proterozoic igneous rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus tereticornis ± *E. eugenioides* woodland on crests, upper slopes and elevated valleys on Mesozoic to Proterozoic igneous rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Shrubby woodland with *Eucalyptus dura* usually on rocky peaks on Mesozoic to Proterozoic igneous rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Corymbia spp., Eucalyptus spp., Acacia spp. open forest to low closed forest on beach ridges in northern half of bioregion	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Closed heath on seasonally waterlogged sand plains	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Melaleuca quinquenervia or *M. viridiflora* open forest to woodland on sand plains	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia open forest on alluvial plains usually near coast	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Open forest of *Eucalyptus siderophloia* with vine forest understorey. Other canopy species include *Corymbia intermedia, Araucaria cunninghamii* and *Agathis robusta*. Frequently occurring understorey species include *Flindersia spp., Lophostemon suaveolens, L. confertus, Cupaniopsis parvifolia, Acronychia spp., Alphitonia excelsa* and *Acacia disparrima*. Occurs on sub-coastal Quaternary alluvial plains. Rainfall usually exceeds 1000mm/y	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus latisinensis or *E. exserta, Melaleuca viridiflora* on alluvial plains	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8

Vegetation community	SPP1/03 Community	Hazard score
Melaleuca quinquenervia, Eucalyptus robusta open forest on or near coastal alluvial plains	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Melaleuca quinquenervia open forest on coastal alluvium	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Melaleuca quinquenervia, Casuarina glauca +/- *Eucalyptus tereticornis* open forest. Occurs on lowest river terraces of Quaternary alluvial plains in coastal areas	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Melaleuca quinquenervia, Eucalyptus tereticornis, Lophostemon suaveolens woodland on coastal alluvial plains	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus tereticornis, Melaleuca viminalis, Casuarina cunninghamiana fringing forest	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Open forest complex with *Corymbia citriodora* on sub-coastal remnant Tertiary surfaces. Usually deep red soils	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus racemosa, E. latisinensis ± *Corymbia gummifera, C. intermedia, E. bancroftii* woodland with heathy understorey on remnant Tertiary surfaces	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus tereticornis, Corymbia intermedia on remnant Tertiary surfaces, usually near coast. Usually deep red soils	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus spp., Corymbia spp., Melaleuca spp. woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus portuensis, Corymbia intermedia woodland on remnant Tertiary surfaces. Usually deep red soils	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Corymbia citriodora, Eucalyptus portuensis, E. fibrosa subsp. *fibrosa* open forest on remnant Tertiary surfaces. Usually deep red soils	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Open forest with *Eucalyptus acmenoides* or *E. helidonica* on Cainozoic igneous rocks especially trachyte	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus fibrosa subsp. *fibrosa* open forest on sedimentary rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus crebra woodland on sedimentary rocks	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Eucalyptus tereticornis, E. siderophloia and/or *E. crebra, Corymbia intermedia* and *Lophostemon suaveolens* woodland. Occurs on Cainozoic and Mesozoic sediments	Paperbark heath and swamps, eucalypt forest with dry-shrub ladder fuels.	8
Syncarpia hillii, Lophostemon confertus tall open to closed forest on parabolic high dunes	Wet sclerophyll forest, tall eucalypts (>30 m), with grass and mixed shrub understorey	10
Eucalyptus pilularis open forest on parabolic high dunes	Wet sclerophyll forest, tall eucalypts (>30 m), with grass and mixed shrub understorey	10
Eucalyptus acmenoides or *E. portuensis* open forest usually with *Corymbia trachyphloia* on Cainozoic to Proterozoic sediments	Wet sclerophyll forest, tall eucalypts (>30 m), with grass and mixed shrub understorey	10

The Historical Context

Indigenous burning

English explorer, James Cook stated while in Australian waters on his 1768-71 trip that he 'saw upon all the Adjacent Lands and Islands a great number of smokes – a certain sign that they are inhabited – and we have daily seen smokes on every part of the Coast we have lately been upon'. These 'smokes' would not have been produced by small campfires, but were the product of deliberately lit bushfires.

The explorer and navigator Phillip Parker King recorded the use of fire for catching large numbers of marsupials at a single event in December 1817. When his expedition sailed past Cape Howe in eastern Victoria, they 'observed large fires burning on the hills, made by the natives for the dual purpose of burning off the dry grass and of hunting the kangaroos, which are thus forced to fly from the woods, and thereby fall an easy prey to their pursuers'. Such observations suggest that Aboriginal hunters were able to predict and control the course of fires they started.

Above taken from Aboriginal People and Their Plants by Philip A. Clarke 2007 Rosenberg Publishing NSW

While we have general knowledge of indigenous use of fire within coastal and inland Queensland, detailed information regarding a number of practices such as day-to-day ignition practices of the local "Butchulla" people are incomplete.

Australian plants and animals, although tested by fire, adapt and recover. But those of us who have come since 1788 and the exotica we imported with us have much more difficulty recovering. Fire should be seen as a positive force, it does not come to destroy but to sort things out, to probe our strength and ultimately to renew. (Collins, 2006).

Cultural assets

Indigenous sites on the mainland which have been reported to include flammable material and are protected by the *Environmental Protection and Biodiversity Conservation Act* 1999 (*EPBC Act*) include:

- Booral Midden – Fish trap Site Complex

This site is recognised by the Australian Heritage Commission as part of the National Estate. It has Aboriginal and early European significance and includes scarred tree, toe-hole tree, remnants of a slab shed which are vulnerable to bushfire. Terrestrial components are on private land[7].

Non urban historic sites which are likely to include flammable material and are also protected by the *EPBC Act* include:

- War Memorial Bridge – on Spring Creek, Brooweena – Woolooga Rd (only known privately built WWI war memorial bridge in Queensland, possibly Australia)
- Yengarie Sugar Refinery QLD – Grahams Creek, 1-2km from the Railway line – just rubble left from the old mill.

A Cultural Management Plan exists for Booral and the Great Sandy Region. These Plans focus on the islands and adjacent coastal zones. Six scarred trees (shield and canoe trees) have been recorded between Booral and Pulgul Creek[8]. Indigenous information is lacking for elsewhere in the region. No historical data is available for Pacific Islander (Kanaka) significant sites/places.

Other places such as Wongi Waterholes feature in Aboriginal dreaming stories and legends.

Other heritage places of significance are listed in Schedule 1 - Heritage Places of Significance within Hervey Bay City Council Planning Scheme Policy 10 - Heritage Inventory (2006).

[7] McNiven I.J. 1994. Booral: Cultural Heritage Management Plan DEH Maryborough
[8] McNiven. I.J. 2002. Cultural Management Plan – Great Sandy Region. DEH.

Local Bushfire History

While it is beyond the scope of this project to investigate all major wildfires in the district, details have been included of a sample. In November 1935 many houses and thousands of hectares were burnt around the Inglewood-Pelican area, as well as the Maryborough, Tiaro and Gympie districts. Driven by fierce westerly winds in late October 1936 fires swept over southeast Queensland from Gympie to the New South Wales border. By 30 October much of the east coast from Gympie to Coffs Harbour, a distance of 480km, was on fire. (Collins, 2006)

Many beef cattle were lost in a large fire in the 1950's burnt from Tinana Creek area west to the Bruce Highway. Severe fires occurred in many regions of southeast Queensland in 1991 which included a loss of life in Toolara State Forest. In 1994 a large rural fire extended from Miva through to Gunalda and Gundiah (pers. comm. D. Irwin 2009). Wildfires of 1951 and 1994 in St. Mary's State Forest and that of the mid-1990s in the western part of Wongi State Forest were moderate to high intensity (Pers. comms. Klupfel, 2009).

In 2006, smoke from a bushfire was identified as the cause of a large vehicular accident on the Maryborough-Hervey Bay Road. The lack of visibility and the number of vehicles involved caused the road to be closed until visibility improved.

Bushfire Ecology

Fire is an important factor determining the growth, survival and persistence of many plant species in Australia. The characteristics of the fire regime that are important in determining these patterns are fire frequency, fire intensity and season of burning.

The following section has been taken for "The role and use of fire for biodiversity conservation in southeast Queensland: Fire management guidelines derived from ecological research (pg 5-7)".

Perceptions of Fire

Fire is an integral part of most southeast Queensland ecosystems, and therefore should not be considered unnatural or catastrophic per se.

Most southeast Queensland ecosystems are adapted to fire. While some communities such as rainforests and mangroves do not benefit from being burnt, many others require fire to maintain the diversity and vigour of the organisms and processes within them. Heathlands, grassy woodlands, shrubby forests and tall open forests all fall into this category.

For many plants in these communities, fire is a catalyst for regeneration.

- Fire can act as a trigger for seed release. Banksia and Hakea species are typical examples, although species within these groups differ in the extent to which they retain seed on the plant in the absence of disturbance (Cowling et al. 1990). Some eucalypts also release seed in response to fire (Noble 1982, Gill 1997). For example many freshly-fallen *E. planchoniana* capsules with seeds beside them were observed in Toohey Forest after a recent planned burn (P. Donatiu, pers. comm. 2000).
- Heat promotes germination in many species, particularly legumes (Shea et al. 1979, Auld and O'Connell 1991). Smoke too plays a major role for some species (Dixon et al. 1995, Enright et al. 1997, Roche et al. 1998).
- Fires influence nutrient availability, providing conditions which promote seedling growth (Williams et al. 1994, Cheal 1996, Florence 1996).
- Fires open up the canopy and remove shrubs, grass clumps and litter. Light penetration is increased and competition for water and nutrients reduced, encouraging seedling growth (Sandercoe 1989, Williams and Gill 1995, Morgan 1998).
- Fires can counteract microbial factors in the soil which may inhibit germination and seedling growth (Florence and Crocker 1962, cited in Florence 1996).
- Fires can act as a cue to flowering and subsequent seed release. *Xanthorrhoea* species are the best

known example of this phenomenon (Harrold 1979, McFarland 1990); however other plants, such as *Lomatia silaifolia* (Denham and Whelan 2000), *Blandfordia spp*. (Sandercoe 1991, Johnson et al. 1994), and *Telopea speciosissima* (Bradstock 1995) also flower almost exclusively in the years after fire.

Many animal and bird species depend on the habitat provided in the early and middle years of post fire regeneration (Fox 1983, Friend 1993, Hannah et al. 1998, Tasker et al. 1999, Woinarski 1999 – see Guideline 3 for further information). Some macropod species, for example, utilise the fresh grass that flourishes after a burn, as do granivorous birds. Without periodic fire, these species may not be able to persist in an area (Kington 1997).
The character of some fire-adapted vegetation types can be lost altogether if fire is excluded for an extended period. Certainly this applies to some wet sclerophyll forests, which develop into rainforest in the absence of fire (Unwin 1989, Harrington and Sanderson 1994, Chapman and Harrington 1997), and to grassy woodlands which may become dominated by species such as *Allocasuarina littoralis* (Lunt 1998b) and *Lophostemon confertus* (Kington 1997). Even long-unburnt heathland can be vulnerable to proliferation of shrubs such as *Leptospermum, Kunzea* and *Melaleuca* (Burrell 1981, cited in Attiwill 1994; W. Drake, pers. comm. 2001).

Ecological Background

Understanding the ecological impacts of fire involves an appreciation of:

- Plant species life history characteristics;
- Post-fire succession, and
- The role of abiotic factors other than fire.

Life History Characteristics

Plants in fire-adapted vegetation types have two major ways of keeping their place in the community. Gill (1981) classified plants as "non-sprouters" or "sprouters", on the basis of whether mature plants subjected to 100% leaf scorch die or survive fire.
Most adults of sprouting species, also called "resprouters" or "fire tolerant plants", regrow from shoots after a fire. These shoots may come from root suckers or rhizomes, from lignotubers, from epicormic buds, or from active pre-fire buds (Gill 1981). Some resprouters, i.e. those which regrow from root suckers or rhizomes (such as blady grass and bracken); can increase vegetatively after a fire. However, other resprouters cannot increase vegetatively, and therefore need to establish new plants to maintain population numbers, as adults will eventually age and die. *Banksia spinulosa, Eucalyptus planchoniana, Alphitonia excelsa, Strangea linearis* and *Boronia rosmarinifolia* are examples of resprouting species in southeast Queensland.

The adults of non-sprouting species, also sometimes called "obligate seeders" or "fire sensitive" plants, die when their leaves are all scorched in a fire. These species rely on seed regeneration to maintain their presence in the community. Obligate seeder species generally produce more seed (Lamont et al. 1998), and greater numbers of seedlings (Harrold 1979, Wark et al. 1987, Benwell 1998) than resprouters, and seedling growth rates tend to be faster (Bell and Pate 1996, Benwell 1998). *Allocasuarina littoralis, Pultenaea villosa, Boronia keysii, Eucalyptus grandis* and *Hakea actites* are example of southeast Queensland species which typically regenerate from seed after fire.

These categories are not invariant. Survival rates in the field for both resprouters and obligate seeders change with fire intensity (Morrison and Renwick 2000), as leaf scorch is rarely exactly the "just 100%" specified by Gill (1981). Some species exhibit different regeneration strategies in different environments (Williams et al. 1994, Benwell 1998). Examples from SEQ in include *Ricinocarpos pinifolius* and *Monotoca scoparia*, which act as obligate seeders in woodland habitats but resprout in dry heath (Sandercoe 1989, W. Drake, pers. comm. 2001). Differences in

regeneration strategies between species found at Cooloola and at Myall Lakes have also been identified (Sandercoe 1989).
Some species can regenerate by seed in the interval between fires, while others are limited to the immediate post-fire period (Cheal 1996, Keith 1996). Noble and Slatyer (1980) have developed a "vital attributes" model which builds on Gill's classification. Their model includes factors associated with seed production and dispersal, and adds a time dimension. This model can be used to predict how species, and even communities, may be affected by particular fire regimes.

Post-Fire Succession – Flora

In the years after a fire, plant communities change in structure, dominance, and above-ground composition. Immediately after a fire, bare ground is plentiful. Shoots of resprouting species are the first signs of life to appear, and then with adequate soil moisture, seedlings can be found.

In many systems, species richness peaks in the early years post-fire, while both short-lived herbs and more persistent species are present (Specht et al. 1958, Posamentier et al. 1981, McFarland 1988a). At this stage the vegetation structures is relatively simple and open (Coops and Catling 2000).

Grass and herb species grow and flower (Harrold 1979, Wark et al. 1987, McFarland 1990, Enright et al. 1994), however some shrub species will not yet have reached reproductive maturity (Harrold 1979, Benson 1985). Over the years, litter builds up and structure becomes more complex (Coops and Catling 2000). Canopy cover is restored. In shrubby systems, shrub cover may become so thick as to be almost impenetrable. Some plant species decrease sharply in abundance or disappear as competition for light and other resources becomes increasingly intense (Specht et al. 1958, Russell and Parsons 1978, McFarland 1988a, Sandercoe 1989).

Many of these species will remain present, but invisible, in the soil seed bank (Posamentier et al. 1981, Gill and Bradstock 1995), while others persist through underground structures such as bulbs. After a number of years overall reproductive effort declines (McFarland 1990, Lunt 1994). Even-aged stands of seeder species which developed after the fire, for example some legumes age and eventually die. Thus when a fire has not occurred for many years, the shrub layer may thin out, although litter will still be thick.

Post-Fire Succession – Fauna

The cyclical sequence in vegetation composition and structure is paralleled by changes in the relative abundance of fauna species with time since fire. Successional effects have been identified for mammals, birds, reptiles, and invertebrates.

Studies from a range of vegetation types have confirmed that different small ground dwelling mammal species dominate burnt areas at different times after fire. A typical sequence begins with *Pseudomys spp*. (e.g. the New Holland Mouse *P. novaehollandiae*) – and the introduced House Mouse (*Mus musculus*). The dasyurids are next, with the Common Dunnart (*Sminthopsis murina*) tending to precede the Brown Antechinus (*Antechinus stuartii*). Bush Rats (*Rattus fuscipes*) and Swamp Rats (*Rattus lutreolus*) occupy later regeneration niches (Fox and McKay 1981, Fox 1982, Fox 1983, Friend 1993, Wilson 1996). A study by Catling and Burt (1995) that linked abundance with habitat complexity found Brown Antechinus and Bush Rats preferred the complex habitat which develops some years after a fire, while larger herbivorous mammals such as the Eastern Grey Kangaroo (*Macropus giganteus*) preferred an open understorey with few shrubs and good grass cover.

Immediately after or even during a fire, insectivorous and carnivorous bird species such as raptors, kookaburras, ibis and crows may be attracted to the area (McFarland 1988b, Woinarski 1999). Open country species such as those that feed on grass seed dominate in the early post-fire years (Woinarski 1999). McFarland

(1988b) identified a number of species which favoured early regeneration in the Cooloola coastal heath, including Brown Quail (*Coturnix australis*) and Richard's Pipits (*Anthus novaehollandiae*). Ground Parrots (*Pezoporus wallicus*) and Brush Bronzewings (*Phaps elegans*) were most abundant in mid-aged heaths, while the White-cheeked Honeyeaters (*Phylidonyris nigra*) and Yellow-tailed Black Cockatoos (*Calyptorhynchus funereus*) reached highest densities in heaths which had not been burned for over 10 years (McFarland 2000). Black-breasted Button-quail (Turnix *melanogaster*) inhabit long-unburnt dry sclerophyll forest, where litter is thick (Hughes and Hughes 1991).

Some reptiles also appear to favour different post-fire habitats (Friend 1993, Wilson 1996). Hannah et al. (1998) found three lizard species – all from the genus *Lampropholis* – were much more abundant, in plots that had been long unburned than in plots which were recently, burned. Conversely, two species from the genus *Carlia* were more abundant in recently burnt plots. This Queensland study (from Bauple near Gympie) did not find any clear relationship between burning history and amphibian abundance.

Invertebrate species assemblages also vary with time since fire. Groups associated with leaf-litter, such as ticks and mites, are more abundant in the later post-fire years (Norris and Conroy 1999, York 1999). Species which are abundant in the early years after a fire tend to be generalists, or species adapted to drier and more open environments (York 1999).

Other Abiotic Factors

Factors other than fire such as soil type, rainfall, and topography, also have a major effect on the distributions of animal and plant species and communities. Interactions can occur. For example, soils are often deeper and richer in nutrients in gullies than on slopes. These factors in themselves mean that the vegetation is likely to be more mesophytic (moisture-loving), and canopies more closed, in these sheltered places (Ash 1988, Florence 1996). Soil moisture is therefore better retained. Fires that burn the vegetation on slopes will often skip or stop when they reach the wetter gully vegetation, partly because fire burns more slowly downhill. This provides more opportunity for fire-sensitive mesophytic species to grow.

The patchwork of vegetation that results from the interaction of fire with other abiotic factors has implications for biodiversity conservation. Animals seeking shelter from a fire burning through a dry vegetation type may find refuge in unburnt creek side patches. Some species may utilise this habitat until post-fire regeneration renders their favoured habitat accessible. The location of different vegetation types in a landscape may shift over time, as boundaries move in response to fire frequency. "Ecotonal" plant species find a home in the movable zone between the drier and wetter systems (W.J. McDonald, pers. comm. 2000).

Bushfire, Fauna and Habitat in FCRC

Inappropriate fire regimes was identified as a major threat to a number of priority species as part of the Back on Track project managed by Queensland Environmental Protection Agency and the Burnett Mary Region Group (EPA 2008). See Appendix V for list of fire threatened flora and fauna species. However, there is a significant knowledge gap with regard to appropriate fire regimes for many of these priority flora and fauna species. For the purposes of this Strategy a sample of these priority species are discussed which illustrate the diversity of issues with regard to identification of appropriate fire regimes.

Wildfire, hot prescribed burns or too frequent fires can kill or injure **koalas** (*Phascolarctos cinereus*) and temporarily reduce food sources for surviving koalas. Too frequent burns over time can limit the carrying capacity of the habitat (killing trees and recruitment) and thus can result in the reduction of the koala population to levels that become unsustainable (White 2005). Studies have identified koala habitat between Tiaro and Maryborough,

Wondunna, Booral region and other isolated locations (Tiaro & District Landcare Group 2004; White 2005, Chenoweth 2005).

The **Glossy black cockatoo** (*Calyptorhynchus lathami*) has a restrictive diet and can be threatened by burning of fire sensitive forest she-oak (*Allocasuarina torulosa*) and black she-oak (*Allocasuarina littoralis*). It is noted that both cool and hot fires can have an adverse impact on Allocasuarina species and as such Allocasuarina stands should be burnt in patches so as to retain stands where Glossy black cockatoos are present or likely to utilise these habitats.

Frequent fires can eliminate shrubby understorey and reduce leaf litter on the ground rendering habitat unsuitable for the vulnerable **Black-breasted button-quail** (*Turnix melanogaster*). When burning regime of 2-4 year intervals ceased at Widgee, allowing the leaf litter to increase, the number of this species increased (pers. comm. Hughes).

The main population of the **Eastern ground parrot** (*Pezoporus wallicus wallicus*) in Queensland is restricted to the coastal region south of Maryborough. If the fire regimes are too frequent, the heathland is unable to regenerate sufficiently to provide food and cover. Heathlands become unsuitable immediately after fire, and may remain so for up to four years. Conversely, suitability can also decline if fires occur too infrequently (interval between fires greater than 15 years). (DEWA 2009).

The Conservation Advice for ***Quassia*** *(Quassia bidwillii)* lists inappropriate fire regimes as biggest potential threat. Fire regimes need to consider effects on other threats such as Lantana (*Lantana camara*), Guinea grass (*Megathyrsus maximus* var *maximus*) and Rhodes grass (*Chloris gayana*)[9].

[9] DEWH&A. 2008. Approved Conservation Advice for Quassia bidwillii (Quassia). DEWH&A.

Statutory Responsibilities

State

The following section contains relevant extracts from various pieces of Queensland legislation which relate to fire management on land and / or with respect to vegetation.

Table 3 – State Legislation

Act / Regulation	Relevant Sections	Relevance for Council
Qld Fire and Rescue Service Act 1990	Provides the primary source of law dealing with bushfires in Queensland. The Crown in all its other capacities is bound by this legislation.	FCRC is bound by the QFRS Act
	Part 7 of the Act deals with "Control and Prevention of Fires" and describes the powers of the Chief Commissioner relating to fires.	
	Section 61 - Defines "occupier of land" which includes "Where there is no person in actual occupation of the land, the person charged by the owner or by law with the management of the land."	FCRC is deemed to be an occupier of all lands managed by Council including freehold, leasehold and trustee lands. Additionally all lands managed by wholly or dominant shareholding privatised Council entities, Council would also be deemed to be the Occupier.
	Section 65 - Deals with the granting of permits to light a fire on any land. This section gives the Chief Commissioner the power to grant or refuse a permit application (orally or in writing) to light a fire on any land. The section also specifies that the applicant must take reasonable steps to notify every occupier of adjoining land of the making of the application. The "occupier of adjoining land" is defined in Section 64 of the Act and means the occupier of land that • Touches some part of the land in question, or • Would touch some part of that land but for the existence of a watercourse, road or firebreak, that is 10m or less in width or, although wider than 10m, is not clear of vegetation or other flammable material for at least 10m in every direction	FCRC and its agents all are required to obtain a Permit to Burn prior to igniting any fire greater than 2sqm in area.
	Section 67 - Requires the "Occupier" to take all reasonable steps to extinguish or control an unauthorised fire and also report the existence and location of the fire as soon as is practicable to a fire officer or other named officer.	FCRC is required to take all reasonable steps to extinguish any un-permitted fire on Council's land. As Council is a relatively large organisation its

Act / Regulation	Relevant Sections	Relevance for Council
		level of responsibility and capacity would be expected to be greater than a normal land holder. Council's level of responsibility would be akin to that currently practiced by State Government agencies that own and manage lands within the Fraser Coast region i.e. Forest Plantations Qld, Qld National Parks and Wildlife Service/Qld Department of Environment and Resource Management.

	Section 69 - Provides the Chief Commissioner with the power to requisition an occupier to reduce fire risk.
	The Chief Commissioner may require any occupier of premises to take measures for the purpose of reducing the risk of a fire occurring on the premises or reducing potential danger to persons, property or the environment in the event of a fire occurring on the premises.
	A requisition may be given:
	• In a particular case – by giving a notice to the occupier concerned, or
	• By notification published in the gazette in which case each occupier of land to whom the notification applies must comply with the requisition.
	• Without limiting the measures that may be required to be taken, an occupier may be required to do any of the following:
	  • Make and maintain firebreaks in accordance with any directions contained in the notification or notice
	  • Remove, dispose of or otherwise deal with any vegetation or other flammable material in accordance with any directions contained in the notification or notice
	  • Obtain equipment and keep it available for use for fire fighting purposes
	  • Take measures to ensure an adequate supply of water or any other substance for fire fighting purposes
	  • Ensure that the means of escape from the premises in the event of fire can be safely and effectively used at all material times
	  • Suspend such operations as may be specified for the period specified
		QFRS has the ability to requisition FCRC to reduce a fire hazard on FCRC land

	Section 72 - Deals with offences regarding the lighting of fires.	This section would normally not be relevant to Council or its officers, however should a Council office not obtain prior approval to light a fire via a permit to burn then Council would be responsible for that fire.
	Section 73 - Deals with the liability of a person for a fire lit by an agent or employee.	As above

Act / Regulation	Relevant Sections	Relevance for Council
	Section 74 - Deals with the liability for damage caused by certain fires. This section provides that a person, who lights a fire for the purpose of burning off vegetation, does not contravene the Act or incur any liability at Common Law for any loss, injury or damage caused by the fire providing the person has complied with the requirements of the Act regarding notification and the obtaining of a permit. There is no protection offered if it can be shown that the person acted recklessly or maliciously.	Should a Council Officer ignite a fire which cause damage outside of the control of that person then the Act protects them for liability. However if that person/s are not acting within the conditions of the permit to burn or do not have a permit to burn or have acted outside of their delegation and responsibilities then the Act does not provide them with protection for liability for damages which may occur as a result of that fire.
Disaster Management Act 2003	The purpose of this act is to provide a legislative framework to enable the State, its instruments and Local Governments to plan and managed disaster within the state. Two of the key objectives: - (a) establishing disaster management groups for the State, disaster districts and local government areas; (b) preparing disaster management plans and guidelines.	In response to this Act FCRC has prepared a Disaster Management Plan and established a Disaster Management Unit within Council and across other State Government agencies such as State Emergency Service, Department of Community Safety and the Department of Justice and Attorney General/Qld Police Service.
Nature Conservation Act 1992	This act has no specific mention of fire management outside of the taking of firewood and the management of fire as part of specific management of particular reserves as contained in Schedule 5 of the *Nature Conservation (Protected Areas Management) Regulations* 2006.	No relevance to Council with respect to fire.
Nature Conservation (Protected Areas Management) Regulations 2006	Part 2 of the Regulation deals with fire on a Protected Area. S103 – Deals with unlawful lighting of fires. It is unlawful to light a fire in or part of a protected are unless one has authority or approval. S104 deals with Unattended fires. A person must put out a fire before leaving a fire. S106 deals with the powers of a Conservation Officer in relation to fires. (1) If a conservation officer reasonably believes a fire in a protected area is, or may become, a hazard to the area, a person or the property of a person, the officer may - (a) give the person apparently in charge of the fire an oral or written direction to put the fire out or lower its intensity to a reasonable level; or (b) put out the fire. *Example of basis for reasonable belief—*	S106 is relevant to Council in that should a Conservation Officer have a reasonable belief a fire is threatening a Protected area he may instruct Council to put the fire out or put the fire out.

Act / Regulation	Relevant Sections	Relevance for Council
	a prevailing strong wind appears likely to carry wind-borne embers away from the fire (2) The person must comply with the direction. Maximum penalty for subsection (2)—165 penalty units.	
Land Act 1992	Fire is only mentioned in the act with respect to forgoing rent and with respect to fire management in issuing a tree clearing permit.	No relevance for Council
Land Regulations 1995	Schedule 9 Section 9 deals with lighting fire on trust land without the permission of the trustee outside of a place designated for the lighting of a fire such as a fireplace, barbeque.	Council may be required to enforce this Regulation if it is the trustee and witnesses this act.
Forestry Act 1959	PART 7— Control and prohibition of fires on State Forests, Timber Reserves and Forest Entitlement Areas S65 Control of fires on lands adjoining State Forest etc. (1) If a person performing duties under this Act discovers any fire burning within 3km of any State Forest, timber reserve or forest entitlement area, and the person is of the opinion that such fire is likely to spread to and cause damage to the State Forest, Timber Reserve or Forest Entitlement Area, the person may (with such assistants, plant, vehicles, animals and equipment as are necessary for the purpose) enter upon the land on which such fire is burning and perform any acts necessary to control and extinguish the fire. (1a) No liability shall attach to the Chief Executive or any person performing duties under this Act in respect of any loss or damage to property occasioned by any person as aforesaid in the exercise in good faith of the person's powers, pursuant to this section, in connection with any fire but any damage shall be deemed to be damage by a fire within the meaning of any policy of insurance against fire covering the damaged property and every such policy of insurance whether issued before or after the commencement of this Act shall notwithstanding anything therein contained be read and construed accordingly. **Recovery of expenses incurred in extinguishing fires.** (2) Where it is established that the owner or occupier of the land on which the fire originated, or the owner's or occupier's agent or employee, was responsible for the lighting of such fire and its lighting was not authorised under the *Fire Service Act 1990*, Part 7*, then the State may recover from the owner or occupier of the land on which the fire originated, in any court of competent jurisdiction, all reasonable expenses incurred by a person performing duties under this Act in controlling and extinguishing such fire (including, but without limiting the generality hereof, salaries and wages of officers and employees and compensation for the use of	S 65(1) permits a person undertaking their duties under the Forestry Act 1959 to enter upon adjacent Council land (land within 3km of the State Forest, Timbered Reserve or Forest Entitlement Area) and put that fire out. S65(2) removes any liability of any person acting under the Act to damage caused in putting a fire out S68 provides the mechanism for an officer acting under this Act to assist another land holder in conducting a prescribed burn.

Act / Regulation	Relevant Sections	Relevance for Council
	plant, vehicles and equipment). The provisions of subsection (2) shall be in addition to and not in diminution of or substitution for the provisions of any other enactment of this Act. (3) Where any person performing duties under this Act has, within the boundaries of any State Forest, timber reserve or forest entitlement area, as the case may be, extinguished or caused to be extinguished a fire burning within that State Forest, Timber Reserve or Forest Entitlement Area, as the case may be, then, if it be established that such fire originated on land other than that State Forest, Timber Reserve or Forest Entitlement Area, as the case may be, and that the owner or occupier of the land on which such fire originated, or his or her agent or employee, was responsible for the lighting of such fire and that its lighting was not authorised under the *Fire Service Act 1990**, part 7, the State may recover from the owner or occupier of the land on which the fire originated, in any court of competent jurisdiction, all reasonable expenses incurred by a person performing duties under this Act in controlling and extinguishing such fire (including, but without limiting the generality hereof, salaries and wages of officers and employees and compensation for the use of plant, vehicles and equipment). (3a) The provisions of subsection (3) shall be in addition to and not in derogation of or substitution for the provisions of any other enactment of this Act. **68 Cooperative burnings** The Chief Executive may on any property, the nearest boundaries of which are within 3km of any State Forest, Timber Reserve or Forest Entitlement Area, join with the owner or occupier of such property, or render such assistance as the Chief Executive deems fit, in carrying out any burning operations which have been duly authorised under the *Fire Service Act 1990*, Part 7*. (*Now see Part 7 - Fire and Rescue Service Act 1990, and Fire Service Amendment Act 1996, Section 5.)	
Forestry Regulation 1998	Part 2 - Fire control in recreation areas s7 (1) A person must not, in a recreation area, light, keep going or use a fire other than in a fireplace or barbecue provided by the Chief Executive for the use of fire. Maximum penalty - 10 penalty units. (2) A person does not commit an offence under subsection (1) if - (a) the person lights or uses a fire in a barbecue, stove or other	The Regulation may not have any direct relevance to FCRC however an act by a authorised officer may influence FCRC in undertaking similar action within adjacent lands such as banning a fire restricting the use of stoves etc.

Act / Regulation	Relevant Sections	Relevance for Council
	appliance specially constructed for containing a fire; and (b) The use of the barbecue, stove or other appliance is agreed to by a forest officer. PART 3—Activities in State Forests and Timber Reserves Fire control in Timber Reserves s11 (1) The Chief Executive may, by erecting notices, and keeping the notices in place, at a Timber Reserve: (a) declare that a total fire ban is in force in the whole or a part or parts of the Timber Reserve, or (b) prohibit or restrict the use of stoves, barbecues, lamps, lanterns or other appliances fuelled by liquid or gaseous fuel in the whole or a part or parts of the Timber Reserve. (2) The Chief Executive may erect and keep in place a notice under subsection (1) only if the Chief Executive is satisfied the erection and keeping in place of the notice is necessary for protecting the Timber Reserve. (3) A person must not, in a part of a Timber Reserve for which a total fire ban is in force under subsection (1)(a), light, keep going or use a fire. Maximum penalty - 10 penalty units. (4) A person must not, in a part of a Timber Reserve for which a prohibition or restriction is in force under subsection (1)(b), use a barbecue, lamp, lantern, stove or other appliance fuelled by liquid or gaseous fuel otherwise than in conformity with the prohibition or restriction. Maximum penalty - 10 penalty units. (5) Despite subsections (3) and (4), a forest officer may give a person who is using an appliance under a restriction in force under subsection (1)(b) a direction to stop using the appliance. (6) A forest officer may give a direction under subsection (5) only if the forest officer is satisfied, on reasonable grounds, that the direction is necessary for protecting the Timber Reserve. Hazardous fires in State Forests and Timber Reserves 12. (1) This section applies if a forest officer is satisfied on reasonable grounds that a fire lit in a State Forest or Timber Reserve is, or is likely to be, a hazard to the State Forest or Timber Reserve or to a person or property in the State Forest or Timber Reserve. (2) The forest officer may: (a) put out the fire, or	

Act / Regulation	Relevant Sections	Relevance for Council
	(b) direct the person appearing to the forest officer to be in charge of the fire— (i) to put out the fire, or (ii) to reduce the intensity of the fire in the way reasonably required by the forest officer (3) If a forest officer puts out a fire or directs a fire to be put out, the forest officer may also give a direction that another fire must not be lit to replace the fire that is put out (4) A person who is aware of a direction given under subsection (3) must not contravene the direction Maximum penalty for subsection (4) - 10 penalty units.	
Forestry Plantations Queensland Act 2006	This act is mainly dealing with the setup and operations of Forest Plantation Queensland a privatised entity of the Queensland Government. However Section 25 dealing with content of operation plan states : - (h) FPQ's policies and strategies about each of the following – (iv) managing the risk of fire in State plantation forests	This Act has no relevance to Council.
Local Government Act Qld 1993	This Act provides for local governments to make Local Laws and Local Law policies with respect to matters which are within the jurisdiction of Local Government such as the control of nuisances. The relevant sections of the Local State: - **PART 3 - FIRES AND FLAMMABLE MATERIALS** Division 1 Regulations of Fires Regulation of lighting and maintaining fires 9(1) The Local Government may, by local law policy, prohibit or restrict the lighting and maintaining of fires in the whole or designated parts, of the Local Government's area. *Example* *The Local Government might prohibit the lighting or maintaining of fires, or a particular type of fire, unless 1 or more of the following conditions are met:* *(a) the fire is contained in an approved incinerator;* *(b) the fire is established in a specified way and specified precautions are taken to prevent the spread of fire;* *(c) the fire is lit and extinguished within a specified time;* (2) The local law policy may for example and without limitations: (a) define any part or parts of the Area as a designated area for the purposes of this Division;	FCRC currently has a number of Local Laws from the previous local governments which have been raised under this act. These include: - • Hervey Bay City Council - Local Law No 15 (Control of Nuisances) which regulates the lighting of fires within the Shire • Maryborough City Council Local Law No. 14 (Control of Nuisances) • Tiaro Shire Council – Local Law No. 38 (Control of Nuisances) • Woocoo Shire Council – Local Law No. 111 (Control of Nuisances).

Act / Regulation	Relevant Sections	Relevance for Council
	(b) determine that within designated areas the lighting of fires is either: (i) prohibited; (ii) permissible only in approved incinerators or receptacles; (iii) permissible only in accordance with the terms and conditions of a permit obtained from the Local Government; (c) determine the degree of Regulation which shall occur in a particular designated area by identifying the degree of Regulation applying in a particular zone for particular land as used in the Planning Scheme; (d) determine that where fires may be lit in designated areas in approved incinerators they shall nevertheless be lit (or allowed to remain alight) only: (i) to burn such materials or classes of materials as are specified; and/or (ii) during such times as are specified. (3) However, a local law policy cannot prohibit or restrict the lighting and maintaining of a fire if: (a) the fire is authorised by notification under Section 63 or permit under Section 65, or required by a notification or notice under Section 69, of the Fire and Rescue Authority Act 1990, or (b) a person is authorised or required to light the fire in the performance of duties under another Act. (c) **Compliance with local law policies** 10. A person must comply with a prohibition or restriction imposed under this Division. Maximum Penalty - 50 Penalty Units	

Other Legislation and State Planning Policies

Integrated Planning Act 1997

The *Integrated Planning Act* (*IPA*) (1997) is only relevant when considering fire management within bushland parks and its relevance is limited to Schedule 8 of the Act. Schedule 8 Table 4 – Operational Works of *IPA* (1997) provides for the removal of vegetation without the requirement for an operational works permit if the clearing of vegetation is for essential management.

Essential management is defined within *IPA* (1997) in Schedule 10 as: -

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 20m, whichever is the greater; or
b) For establishing a necessary fire management line if the maximum width of the clearing for the fire management line is 10m; or
c) Necessary to remove or reduce the imminent risk that the vegetation poses of serious personal injury or damage to infrastructure; or
d) By fire under the *Fire and Rescue Service Act 1990* to reduce hazardous fuel load; or
e) Necessary to maintain infrastructure including airstrips, buildings, fences, helipads, roads, stock yards, watering facilities and constructed drains other than contour banks, other than to source construction material.

The relevance of *IPA* (1997) and the *Vegetation Management Act* (*VMA*) (1999) is that there are exemptions under these two pieces of legislation relating to the removal of vegetation for the purpose of establishing a firebreak between vegetation and infrastructure. This distance as defined by the definition of Essential management (used in both pieces of legislation) may permit an owner of a structure to seek the removal of vegetation within Council bushland parks if they have a belief that their assets may be threatened by adjacent vegetation within the Bushland Park.

It is important to point out that neither pieces of legislation permits a person to enter upon another persons land to enact an exemption provided under the *VMA* (1999).

Vegetation Management Act 1999

The *Vegetation Management Act* (*VMA*) 1999 has been established in Queensland to manage the removal of vegetation on all lands within the State.

Under the *Vegetation Management Act* (1999) the removal of vegetation outside of the exempt classifications may require an Operational Works Application be lodged with the Department of Environment & Resource Management (DERM) for approval to remove remnant vegetation.

The Act allows for a number of exemptions where approval is not required for the removal of remnant vegetation. The two primary exemptions which Council has are those relating to: -

- Essential Management,
  - for establishing or maintaining a necessary firebreak to protect infrastructure other than a fence, road or vehicular track, if the maximum width of the firebreak is equivalent to 1.5 times the height of the tallest vegetation adjacent to the infrastructure, or 20m, whichever is the greater; or
  - for establishing a necessary fire management line if the maximum width of the clearing for the fire management line is 10m; or
  - necessary to remove or reduce the imminent risk that the vegetation poses of serious personal injury or damage to infrastructure; or
  - by fire under the *Fire and Rescue Service Act 1990* to reduce hazardous fuel load.

- Routine Management
  - in Category 3 remnant vegetation or where there is no Property Map of Assessable vegetation in remnant not of concern Regional Ecosystem.

The *Act* also refers to the State Planning Policy SPP1/03, and permits the setback provisions contained in Schedule 8 of *IPA* (1997) and relating specifically to Essential management can be reduced if the setbacks are permitted by the SPP1/03 and the Senior Fire Warden can verify that compliance.

The impacts to Council bushland parks may be the same in terms of a property owner may seek vegetation within bushland parks to be removed and that they would not need or be required to obtain approval under the *VMA* (1999).

Of course in both scenarios under *IPA* (1997) and *VMA* (999) the property owner will have to seek approval of the land owner of the bushland park i.e. Fraser Coast Regional Council, and they would be bound by any Local Law which may regulate the removal of vegetation within Council owned or managed lands.

State Planning Policies (SPP)

The State Government released in September 2003 the *State Planning Policy SPP1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*. This State Planning Policy was made under the *Integrated Planning Act* (IPA) 1997.

The purpose of this policy is to set out the State's interest in ensuing that the natural hazards of flood, bushfire and landslide are adequately considered when making decisions about development. That is when Local Government is considering a development application as required under the *IPA* (1997) and if the Local Government has maps which are specified in its planning Scheme the States Interest through the *SPP1/03* is to also be considered.

The SPP1/03 also has guidelines which provide a methodology for both applicants and assessment managers within Local Government are to assess and derive a bushfire hazard score using the three principal hazard factors being vegetation, slopes and aspect. Alternative methodologies may be used as long as the specific outcomes and solutions contained within the Guidelines are attained.

With respect to bushfire the *SPP1/03* applies in two areas within the State and within Local Government Areas.

A1.1 In natural hazard management areas this policy applies as follows

(a) In natural hazard management areas for flood, bushfire or landslide to material changes of use and associated reconfigurations of a lot that:

- *increase the number of people living or working in the natural hazard management area (e.g. residential development, shopping centres, tourist facilities, industrial or commercial uses) except where the premises are only occupied on a short-term or intermittent basis (e.g. by construction/ maintenance workers, certain agricultural and forestry workers); or*
- *involve institutional uses where evacuating people may be particularly difficult (e.g. hospitals, education establishments, child care, aged care, nursing homes and high security correctional centres); or*
- *involve the manufacture or storage of hazardous materials in bulk; or*
- *would involve the building or other work described in (b) and (c) below as an intrinsic element of the development proposal; and*

(b) In natural hazard management areas for flood, to building or other work that involves any physical alteration to a watercourse or floodway including vegetation clearing, or involves net filling exceeding 50 cubic metres; and

(c) In natural hazard management areas for landslide, to building or other work on potentially unstable slopes that involves:
- *earthworks exceeding 50 cubic metres (other than the placement of topsoil); or*
- *vegetation clearing; or*
- *redirecting the existing flow of surface or groundwater.*

and

A1.2 Throughout Queensland to the following types of community infrastructure that provide services vital to the wellbeing of the community:

- *police and emergency services facilities including emergency shelters;*
- *hospitals and associated institutions;*
- *facilities for the storage of valuable records or items of cultural or historic significance;*
- *State-controlled roads;*
- *railway lines, stations and associated facilities;*
- *aeronautical facilities;*
- *communication network facilities;*
- *works of an electricity entity under the Electrical Safety Act 2002; and*
- *water cycle management infrastructure.*

A Bushfire Natural Hazard Management Area is defined in the SPP1/03 as: -

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.

Figure 9 identifies the Bushfire Hazard Management Areas (High and Medium) within the Fraser Coast Regional Council area.

Building Code of Australia

While the Building Code of Australia is not legislation it is reference in legislation and provides a set of codes within which a building must be built.

The BCA does reference a number of Australian Standards which also are not legislation but are a set of standards which should be adhered to when constructing a building.

The relevant Australian Standard relating the construction of buildings and bushfire is AS3959-1999 – Building in a Bushfire Prone Area. At the time of writing this Australian Standard has been renewed by AS3959-2009, however Queensland has not as yet adopted the new Australian Standard (May 2009).

AS3959-1999 provides a number of standards depending on the proximity the structure is in relation to a bushfire hazard.

The Standard has three levels, Level 1, 2 and 3. Levels 2 & 3 are for structures located within a bushfire prone area. Under the SPP a bushfire prone area is deemed to be an area mapped as either a medium or high bushfire hazard area using an accepted methodology such as that contained in the SPP1/03 Guidelines. AS3959-2009 is a significant overhaul of the 1999 version and provides substantial information relating to the identification of the type of bushfire hazard which a building may experience from a bushfire.

Fraser Coast Planning Schemes

As the existing Fraser Coast Regional Council is the result of an amalgamation of four local governments: -

- Hervey Bay City Council
- Maryborough City Council
- Woocoo Shire Council and
- A significant portion of the northern portion of Tiaro Shire Council. The southern portion was amalgamated with Gympie Regional Council.

Table 4 below provides a summary of the planning scheme requirements with respect to bushfire planning within each of the existing planning schemes.

Table 4 – Planning Scheme specifications

Planning Scheme	Specifications
Hervey Bay Planning Scheme	• Is SPP1/03 compliant with respect to bushfire • Has a Bushfire Hazard Areas Overlay Code • Refers to the Bushfire Hazard Areas Overlay Map • Bushfire hazard areas i.e. high and medium are identified on Overlay Map sheet 2 for all planning districts. • It would appear that the bushfire hazard areas are those developed by the Qld Department Emergency Services – Rural Fire Service
Maryborough City Plan	• No reference to fire or fire hazard planning could be located within the Planning Scheme ***NOTE: -*** *An amendment is currently being considered by the State to include Bushfire Management Code into the Maryborough City IPA Planning Scheme to make it SPP1/03 compliant with regard to Bushfire (pers. comms. Bennett. C 2009).*
Tiaro Shire Planning Scheme	• Is SPP1/03 compliant with respect to bushfire • Has a Natural Hazards Overlay Code (Division 4) which refers to the Natural Hazards Overlay Map • Uses the Department of Emergency Services – Rural Fire Service Shire wide Bushfire Hazard Map (Map OM4) as the Natural Hazards Overlay Map.
Woocoo Shire Planning Scheme	• Is SPP1/03 compliant with respect to bushfire • Has a Natural Hazards Overlay (Division 5) and Code (Division 6) • Code refers to OM3 as the Overlay Map for Natural Hazard Areas

FCRC - Council Managed Lands

Council has the responsibility for managing numerous parcels of land including parks and reserves of varying sizes to preserve their aesthetic, recreation or biodiversity values. Council has also acquired a number of lands which they own in freehold.

To date wildfires on Council managed lands have been controlled by local Rural Fire Brigades in most cases in consultation with a variety of Council staff.

Management Plans exist for Maryborough Park, Cooks Reserve, and Teddington Weir Waterworks Reserve. While these Plans include references to fire management, none include a detailed site specific fire management plan. Poona Reserve Management Plan includes a fire plan.

While the fire hazard i.e. the vegetation remains more or less constant within a particular park or reserve the fire risks associated with that hazard can be higher depending on the location of those hazards with respect to other assets such as buildings, significant environmental assets etc. such as Police Paddock.

Fire has been identified as a potential risk in the Catchment Management Plans for Water Storages managed by Wide Bay Water e.g. Lenthalls and Cassava. Fire Management Plans have been developed for all Wide Bay Water hardwood tree plantations e.g. Pulgul Creek Farm. Rangers monitor and investigate fire outbreaks. Any wildfires which occur on lands managed by Wide Bay Water are controlled by the appropriate Rural Fire Brigade in consultation with Wide Bay Water staff (pers. comm. Harrold, J. May 2009).

Other Managed Lands

Significant areas of land within the Fraser Coast are managed by State Government Agencies. The principal State Government Agencies include The Department of Environment and Resource Management (DERM) which was created following the Queensland Government 2009 election by amalgamating the Environmental Protection Agency and the Department of Natural Resources and Water.

NOTE: - *At the time of preparing this document the management of land previously managed by the EPA and DNRW were still being worked out within the new department.*

The Forestry Plantation Queensland (FPQ) have management responsibility over much of the plantation forests within the Region, however some hardwood State Forests are still managed by DERM – Forest Products.

The Department of Defence also manages a large tract of bushland which extends over the southern boundary of the Fraser Coast region into Gympie Regional Council area.

Other State Government agencies which have lands within FCRC include Department of Transport, Qld Rail, Dept of Main Roads, and the corporatised Ergon Energy.

A Joint Agency Fire Management and Response Plan identify roles, responsibilities and promotes co-operative management between Forestry Plantations Queensland, Natural Resources and Water – Forest Products and Queensland Parks & Wildlife Service (Qld Govt 2007).

The general management Strategy for state agencies is the identification of areas of high fire risk, reduce the risk by undertaking hazard reduction burns, developing a network of fire trails and maintaining them. Each agency has fire response vehicles and access to contractor and local government equipment to implement this Strategy as well as deal with fire outbreaks.

State Forests are jointly managed by two agencies in respect to fire, i.e. Forestry Plantations Queensland, DERM.

While the Department of Community Safety, Qld Fire and Rescues Service does not manage land, it has primary

responsibility for the suppression of both vegetation and structural fires throughout the State. Under respective Legislation a Conservation Officer (as defined by the *Nature Conservation Act* 1992) and a Forestry Officer (As defined under the *Forestry Act* 1959) have the powers to manage fires within and in close proximity to their lands.

DERM Environment Division Estate

The Maryborough Unit of Queensland Parks & Wildlife Service (Environment Division DERM) conducts fuel hazard reduction burning and maintains a network of fire control lines in all tenures they are responsible for including National Parks, Forest Reserves, and Conservation Park. Fire Management Strategies exist for Burrum Coast National Park and Poona National Park. Planned burns are not undertaken in Mt Bauple National Park (Scientific), O'Reagans Conservation Park and Woocoo National Park due to the presence of fire sensitive vegetation.

DERM Resource Management Division Lands

Land management teams in the Regional Service Delivery area of the Resource Management Division of DERM are responsible for the management of fire hazards on Unallocated State Land (USL). Fire management teams have been established at the Maryborough office which comprises of four operational officers. This unit has a dedicated fire fighting vehicle and is equipped with necessary communication and safety equipment to comply with Workplace Health and Safety (WH&S) standards. The Regional Co-coordinator, Fire Management is based at Beenleigh and has responsibility for activities and management of the team.

Each region of DERM (Resource Management Division) is required to develop specific management plans (based on the general policies, practices and plans) for the Unallocated State Land (USL) under their control.

Fire management programs include the prevention of and protection from fire on Unallocated State Land through establishment and maintenance of fire access trails, prescribed burns, the construction and maintenance of fire breaks, fuel reduction buffers bordering Unallocated State Land and cooperation with other land management agencies.

Other tenure types such as State managed roads and rail corridors are not considered to significantly contribute to the bushfire hazard of the region. However Qld Rail also undertakes fuel management along their rail corridor from time to time particularly along those lines which are electrified.

Plantation Forests

Forestry Plantations Queensland (FPQ) sole responsibility is to manage the State's plantations as defined under the *Forestry Plantations Queensland* Act 2006. Within the Fraser Coast region the Forest Management Area extends from north of Tewantin to Elliott River near Bundaberg. The exotic pine softwood estate covers nearly 90,000ha of plantations and a further 40,000ha of included and adjacent native forest.

The prime fire management objective over these lands is protection of the plantation assets from damaging wildfires and the protection of neighbouring lands and communities from fires escaping FPQ lands.

FPQ has a trained and well equipped fire management work force which manages hazards and wild fires within FPQ lands.
FPQ hazard management is achieved via a combination of hazard reduction or prescribed burning operations in plantations and native forest areas during the cooler autumn and winter months, maintenance of internal and external firebreaks, and regular surveillance of the estate matched to fire risk and weather conditions including fire tower observations and ground patrols.

Disaster Management Plan

The Fraser Coast Regional Council has recently produced a Fraser Coast Regional Council – *Local Disaster Management Plan 2009 (Rowland,* 2008). The Plan was prepared in response to requirements of the *Qld Disaster Management Act* 2003.
The key objectives of the Fraser Coast Regional Council Local Disaster Management Plan are to:

- Outline the Council's policy for disaster management
- Outline the Council's disaster management framework
- Detail the disaster management structure for the Fraser Coast Local Disaster Management Group
- Identify likely disaster events that may impact the area
- List the agreed roles and responsibilities of lead and support agencies during disaster events
- Provide guidelines for disaster prevention, preparedness, response and recovery measures
- Identify individual sub plans for the conduct of disaster management functions and activities
- Integrate with relevant Council corporate and operational documents and operational procedures.

With regard to bushfire disasters the Plan identifies : -

- lead and supporting agencies for both rural and urban fires and
- sets up a coordination and disaster management and Operations teams

The Plan also provides a range of procedures and processes for the Disaster Management Group and Council to undertake. To review exact procedures and risk management practices please see the Disaster Management Plan. (http://www.frasercoast.qld.gov.au/services/Emergency%20Page.shtml).
Council is developing a Memorandum of Understanding with the Department of Emergency Services with regard to the provision of equipment during a declared disaster under the Disaster Management Plan (pers. comms. Nelson. H. 2009).

Existing Resources for Bushfire Management

Fraser Coast Regional Council has limited resources directed to bushfire hazard mitigation and management and none of these resources are dedicated to bushfire management.
However as a local government it has substantial resources which it can contribute to a significant bushfire event once a Disaster emergency has been announced.

Bushfire Hazard Mapping

Basis for Hazard Classification

The classification of bushfire hazard within Queensland has been defined by the State Planning Policy SPP1/03 "*The Mitigation of Adverse Impacts of Flood, Bushfire and Landslide*" (DES, 2003).

The SPP1/03 Guidelines provides a methodology for the determination of bushfire hazards within the State.

The SPP1/03 methodology use three criteria to derive a bushfire hazard score or rating for a particular area. The hazard criteria are: -

- Vegetation
- Slope
- Aspect

Vegetation is the primary landscape characteristic which is rated with a bushfire hazard rating. The ratings range from 0 which is virtually in-flammable to highly flammable which is rated as 10. The relevant table in the SPP1/03 Guidelines is Table A3.1.

SPP1/03 - Table A3 1 Hazard scores and associated fire behaviours for various vegetation communities

Vegetation communities[1]	Fire behaviour	Hazard score
Wet sclerophyll forest, tall eucalypts (>30 m), with grass and mixed shrub understorey.	Infrequent fires under severe conditions, flame lengths may exceed 40 m, 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 20 m, 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 20 m, 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 >10 m, 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

***Note 1**: Vegetation assessment should be based upon examination of the vegetation on the subject site and surrounding the subject site. Narrow strips of vegetation may be flammable; however, bushfires will not generally reach their full intensity where bushfire fronts are less than 100m wide. For this reason areas of vegetation with a narrow linear shape (e.g. roadside vegetation beside a cleared paddock) are considered to have the next lower hazard score (e.g. paperbark heath would have a score of 6 not 8, cypress pine forest 5 not 6):*

- *areas with a linear shape (e.g. roadside vegetation beside a cleared paddock); and*
- *units of vegetation less than 50ha in area and more than 1km from the nearest extensive vegetation.*

A3.14 Where the vegetation community is assessed as having a vegetation community hazard score of **2 or less**, no other factors need to be taken into account and the relevant sub-units should be given a Low severity of overall bushfire hazard. No further action is required.

SPP1/03 - Table A3.2: Hazard scores for slope

Slope	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%)	1

*[**Note:** For site specific assessment of bushfire hazard, if the site is downhill from the hazard, the slope effect may be taken as zero as the fire intensity will be less. However, burning heavy fuels may roll downhill and trees may fall down, so recommended setbacks from the hazard still need to be observed].*

SPP1/03 - Table A3.2: Hazard score for aspect

Aspect	Hazard score
North to North-West	3.5
North-West to West	3
West to South	2
North to East	1
East to South and all land under 5% slope	0

SPP1/03 - Table A3.4: Hazard score ranges to identify the severity of bushfire hazard

Total hazard score	Severity of bushfire hazard
13 or greater	High
6 to 12.5	Medium
1 to 5.5	Low

Severity of Bushfire Hazard

The State Planning Policy (SPP1/03) has defined the hazard categories and as such they define the three levels of Severity of bushfire hazard as low, medium and high. The categorisation of an area as low, medium or high is derived on the sum of individual rating of the three main criteria.

The interaction between the three key bushfire hazard criteria as defined by the SPP1/03 and other variable such as fuel loads, fuel types, fuel moisture and climatic conditions result in a complex number of interactions which can change on a day by day and in fact on a hourly basis during the bushfire season (September to April in southeast Queensland and depending on rainfall during that period).

The key differentiation points between the three levels of bushfire hazard are defined in Table 5 below.

Table 5 – Definitions of bushfire hazard levels

Bushfire hazard rating	Description
Low	▪ Land less than 5% slope with low or grassy vegetation ▪ No particular building or bushfire protection necessary (dependant on proximity of medium or high bushfire hazard areas) ▪ No compliance to building standards ▪ Management access should be maintained to vegetated green space and areas of high or medium bushfire hazard
Medium	▪ Areas to be considered to be a natural hazard management area (bushfire) ▪ Building constraints exists (AS3959-1999 Construction of Buildings in a Bushfire Prone Area – level 1 compliance ▪ Some design constraints with respect to development layout ▪ Existing structures should be encouraged to review their risk status and without initiating significant impact on the local biodiversity, improve their bushfire protection, where possible
High	▪ Areas to be considered to be a natural hazard management area (Bushfire) and a Bushfire Prone Area ▪ Building constraints exists (AS3959-1999 Construction of Buildings in a Bushfire Prone Area – level 1 compliance minimum. ▪ Development layout designs need to comply with existing guidelines and to the latest bushfire protection practices

Generic Fire Regimes

Fire regimes include a fire frequency or return frequency for a specific vegetation community, but also include the timing or season of a burn, the intensity of a burn, the pattern of the burn which can be achieved using a particular ignition strategy.

Additionally the purpose of a burn should be considered however the proposed fire frequency provided below areas based on obtaining an ecological outcome from a burn within that particular vegetation community.

The Qld Herbarium has provided fire guidelines for Regional Ecosystems contained with the State. However, no comments have been made for Regional Ecosystems within the Southeast Queensland Bioregion within which the Fraser Coast Regional Council is located.
It is important to note that other outcomes such as hazard management may not necessarily adhere to the fire frequencies provided below.

The following table (Table 6) provides a list of Regional Ecosystems within the region, their desirable fire frequency and if they require fire as part of their ecology.

Table 6 has been sorted to group like vegetation communities / Regional Ecosystems together as their fire frequencies would be similar.

Table 6 – Desirable Fire Frequencies

RE	Description	Status	Fire Frequency
12.2.16	Sand blows largely devoid of vegetation. Sand blows on large sand islands.	Of Concern	NA
12.1.1	*Casuarina glauca* open forest on margins of marine clay plains	Of Concern	Fire not necessary
12.2.15	Swamps with *Baumea spp., Juncus spp*. and *Lepironia articulata*	Not of Concern	Fire not necessary
12.2.14	Strand and fore dune complex comprising Spinifex sericeus grassland *Casuarina equisetifolia* woodland/open forest and with *Acacia leiocalyx, A. aulacocarpa, Banksia integrifolia* subsp. *integrifolia, Pandanus tectorius, Corymbia tessellaris, Cupaniopsis anacardioides, Acronychia imperforata*. Occurs mostly on frontal dunes and beaches but can occur on exposed parts of dunes further inland.	Not of Concern	Fire not necessary
12.3.8	Swamps with *Cyperus spp., Schoenoplectus spp.* and *Eleocharis spp*.	Of Concern	Fire not necessary
12.9-10.22	Closed sedgeland/shrubland on sedimentary rocks. Coastal parts	Of Concern	Fire not necessary
12.1.2	Saltpan vegetation including grassland and herbland on marine clay plains	Not of Concern	No burn
12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	Not of Concern	No burn
12.2.1	Notophyll vine forest on parabolic high dunes	Of Concern	Fire sensitive
12.2.2	Microphyll/notophyll vine forest on beach ridges	Of Concern	Fire sensitive
12.2.3	Araucarian vine forest on parabolic high dunes	Of Concern	Fire sensitive
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	Endangered	Fire sensitive
12.5.13	Microphyll to notophyll vine forest ± *Araucaria cunninghamii* on remnant Tertiary surfaces	Endangered	Fire sensitive
12.2.11	*Corymbia spp., Eucalyptus spp., Acacia spp*. open forest to low closed forest on beach ridges in northern half of bioregion	Not of Concern	8 – 12 years
12.3.11	*Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia* open forest on alluvial plains usually near coast	Of Concern	8 – 16 years
12.3.11a	Open forest of *Eucalyptus siderophloia* with vine forest understorey. Other canopy species include *Corymbia intermedia, Araucaria cunninghamii* and *Agathis robusta*. Frequently occurring understorey species include *Flindersia spp., Lophostemon suaveolens, L. confertus, Cupaniopsis parvifolia, Acronychia spp., Alphitonia excelsa* and *Acacia disparrima*. Occurs on sub-coastal Quaternary alluvial plains. Rainfall usually exceeds 1000mm/y	Of Concern	Fire sensitive
12.2.12	Closed heath on seasonally waterlogged sand plains	Not of Concern	8 – 15 years
12.2.9	*Banksia aemula* woodland on dunes and sand plains. Usually deeply leached soils	Not of Concern	10 – 16 years
12.3.13	Closed heathland on seasonally waterlogged	Of Concern	8 -16 years

RE	Description	Status	Fire Frequency
	alluvial plains usually near coast		
12.3.14	*Banksia aemula* woodland on alluvial plains usually near coast	Of Concern	8 – 16 years
12.5.10	*Banksia aemula* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Not of Concern	8 – 16 years
12.5.9	Sedgeland to heathland in low lying areas on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Of Concern	8 – 16 years
12.2.4	*Syncarpia hillii, Lophostemon confertus* tall open to closed forest on parabolic high dunes	Of Concern	20 – 50 years
12.2.8	*Eucalyptus pilularis* open forest on parabolic high dunes	Not of Concern	20 – 50 years
12.02.6	*Eucalyptus racemosa* woodland on dunes and sand plains. Usually deeply leached soils	Not of Concern	8 – 12 years
12.5.12	*Eucalyptus racemosa, E. latisinensis* ± *Corymbia gummifera, C. intermedia, E. bancroftii* woodland with heathy understorey on remnant Tertiary surfaces	Of Concern	8 – 12 years
12.9-10.4	*Eucalyptus racemosa* woodland on sedimentary rocks	Not of Concern	8 – 12 years
12.2.7	*Melaleuca quinquenervia* or *M. viridiflora* open forest to woodland on sand plains	Not of Concern	8 – 20 years
12.3.12	*Eucalyptus latisinensis* or *E. exserta, Melaleuca viridiflora* on alluvial plains	Of Concern	8 -16 years
12.3.4	*Melaleuca quinquenervia, Eucalyptus robusta* open forest on or near coastal alluvial plains	Of Concern	8 – 16 years
12.3.5	*Melaleuca quinquenervia* open forest on coastal alluvium	Not of Concern	8 – 12 years
12.3.5a	*Melaleuca quinquenervia, Casuarina glauca* +/- *Eucalyptus tereticornis* open forest. Occurs on lowest river terraces of Quaternary alluvial plains in coastal areas	Not of Concern	8 – 16 years
12.3.6	*Melaleuca quinquenervia, Eucalyptus tereticornis, Lophostemon suaveolens* woodland on coastal alluvial plains	Not of Concern	8 – 16 years
12.3.7	*Eucalyptus tereticornis, Melaleuca viminalis, Casuarina cunninghamiana* fringing forest	Not of Concern	8 – 16 years
12.9-10.10	*Melaleuca no*dosa low open forest on sedimentary rocks	Of Concern	8 – 12 years
12.11.10	Notophyll vine forest ± *Araucaria cunninghamii* on metamorphics ± interbedded volcanics	Not of Concern	Fire sensitive
12.12.1	Simple notophyll vine forest usually with abundant *Archontophoenix cunninghamiana* (gully vine forest) on Mesozoic to Proterozoic igneous rocks	Of Concern	Fire sensitive
12.12.13	Araucarian complex microphyll to notophyll vine forest on Mesozoic to Proterozoic igneous rocks	Not of Concern	Fire sensitive
12.9-10.16	Araucarian microphyll to notophyll vine forest on sedimentary rocks	Of Concern	Fire sensitive
12.12.16	Notophyll vine forest on Mesozoic to Proterozoic igneous rocks	Not of Concern	Fire sensitive
12.12.26	*Acacia harpophylla* open forest on Mesozoic to Proterozoic igneous rocks	Endangered	Fire sensitive
12.5.1	Open forest complex with *Corymbia citriodora* on sub-coastal remnant Tertiary surfaces. Usually deep red soils	Not of Concern	12 – 25 years
12.5.7	*Corymbia citriodora, Eucalyptus portuensis, E. fibrosa* subsp. *fibrosa* open forest on remnant	Not of Concern	8 – 12 years

RE	Description	Status	Fire Frequency
	Tertiary surfaces. Usually deep red soils		
12.9-10.2	*Corymbia citriodora, Eucalyptus crebra* open forest on sedimentary rocks	Not of Concern	8 – 12 years
12.11.6	*Corymbia citriodora, Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics	Not of Concern	8 – 20 years
12.12.5	*Corymbia citriodora, Eucalyptus crebra* open forest on Mesozoic to Proterozoic igneous rocks	Not of Concern	8 – 20 years
12.5.2	*Eucalyptus tereticornis, Corymbia intermedia* on remnant Tertiary surfaces, usually near coast. Usually deep red soils	Endangered	8 – 16 years
12.9-10.7a	*Eucalyptus tereticornis, E. siderophloia* and/or *E. crebra, Corymbia intermedia* and *Lophostemon suaveolens* woodland. Occurs on Cainozoic and Mesozoic sediments	Of Concern	8 – 16 years
12.12.12	*Eucalyptus tereticornis, E. crebra* or *E. siderophloia, Lophostemon suaveolens* open forest on granite	Of Concern	8 – 16 years
12.12.23	*Eucalyptus tereticornis* ± *E. eugenioides* woodland on crests, upper slopes and elevated valleys on Mesozoic to Proterozoic igneous rocks	Not of Concern	8 – 16 years
12.5.4	*Eucalyptus spp., Corymbia spp., Melaleuca spp.* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Not of Concern	8 – 12 years
12.5.8	*Eucalyptus hallii* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks	Of Concern	8 – 12 years
12.12.21	*Corymbia intermedia, E. exserta* woodland on Mesozoic to Proterozoic igneous rocks	Of Concern	8 – 16 years
12.9-10.19	*Eucalyptus fibrosa* subsp. *fibrosa* open forest on sedimentary rocks	Not of Concern	8 – 16 years
12.12.25	*Eucalyptus fibrosa* subsp. *fibrosa* woodland to open forest on Mesozoic to Proterozoic igneous rocks	Not of Concern	8 – 16 years
12.12.7	*Eucalyptus crebra* woodland on Mesozoic to Proterozoic igneous rocks	Not of Concern	8 – 20 years
12.9-10.7	*Eucalyptus crebra* woodland on sedimentary rocks	Of Concern	12 – 25 years
12.11.14	*Eucalyptus crebra, E. tereticornis* woodland on metamorphics ± interbedded volcanics	Of Concern	8 – 20 years
12.11.7	*Eucalyptus crebra* woodland on metamorphics ± interbedded volcanics	Not of Concern	8 – 20 years
12.11.8	*Eucalyptus melanophloia, E. crebra* woodland on metamorphics ± interbedded volcanics	Of Concern	8 – 20 years
12.12.8	*Eucalyptus melanophloia* woodland on Mesozoic to Proterozoic igneous rocks	Of Concern	8 – 20 years
12.5.5	*Eucalyptus portuensis, Corymbia intermedia* woodland on remnant Tertiary surfaces. Usually deep red soils	Of Concern	8 – 12 years
12.8.25	Open forest with *Eucalyptus acmenoides* or *E. helidonica* on Cainozoic igneous rocks especially trachyte	Of Concern	8 – 16 years
12.9-10.17	Open forest complex often with *Eucalyptus acmenoides, E. major, E. siderophloia* ± *Corymbia citriodora* on sedimentary rocks	Not of Concern	4 - 12 years
12.9-10.21	*Eucalyptus acmenoides* or *E. portuensis* open forest usually with *Corymbia trachyphloia* on Cainozoic to Proterozoic sediments	Not of Concern	8 – 16 years

RE	Description	Status	Fire Frequency
12.11.17	*Eucalyptus acmenoides* or *E. portuensis* open forest on metamorphics ± interbedded volcanics	Of Concern	8 – 20 years
12.9-10.3	*Eucalyptus moluccana* on sedimentary rocks	Of Concern	8 – 20 years
12.11.18	*Eucalyptus moluccana* open forest on metamorphics ± interbedded volcanics	Not of Concern	8 – 20 years
12.12.22	*Eucalyptus decolour, E. portuensis or E. acmenoides* open forest on Mesozoic to Proterozoic igneous rocks	Of Concern	6-25 years
12.12.28	*Eucalyptus moluccana* open forest on Mesozoic to Proterozoic igneous rocks	Of Concern	8 – 16 years
12.12.28x1	*Eucalyptus moluccana* ± *E. crebra, Corymbia citriodora* open forest or woodland on areas that have been subject to deep weathering. Occurs on broad ridges and lower slopes on areas that have been subject to deep weathering (land zone 5)	Of Concern	8 – 16 years
12.12.10	Shrubland of rocky peaks on Mesozoic to Proterozoic igneous rocks	Of Concern	20+ years
12.12.19	Vegetation complex of rocky headlands, predominantly but not exclusively on Mesozoic to Proterozoic igneous rocks	Of Concern	20+ years
12.12.9	Shrubby woodland with *Eucalyptus dura* usually on rocky peaks on Mesozoic to Proterozoic igneous rocks	Of Concern	20+ years
12.12.11	*Eucalyptus portuensis* or *E. acmenoides, Corymbia trachyphloia* open forest on Mesozoic to Proterozoic igneous rocks	Not of Concern	12 – 25 years
Disturbed	Lands containing disturbed vegetation considered to be non-remnant	Non remnant	Depending on management
Hoop pine plantation	Hoop pine plantations mostly within Forest Plantations Queensland Land	Non-remnant	Never
Plantation	Pine plantations within Forest Plantation Queensland and possible other private lands	Non-remnant	As required
Regrowth	Lands contain regrowth vegetation	Non-remnant	Depending on management
Small	Area of vegetation less than 1ha in size and not protected under the *Vegetation Management Act* 1999	Non-remnant	Fire sensitive

Other factors which also need to be contemplated and actions developed with regard to a desirable fire regime for the above vegetation communities/regional ecosystem include: -

- Timing of a burn;
- Intensity of the burn;
- The spatial distribution of a burn.

While most of these issues would be contained within a park or reserve specific fire management plan some general comments can be made with respect to their generic contribution to a fire regime.

Table 7 – Other Generic Fire Regime elements

Element	Contribution
Timing of Burn	The timing of a burn is extremely important in terms of some vegetation communities and particularly to habitat and fauna diversity. Burning of some vegetation communities particularly those which are seed propagules during the flowering season may have an impact on seeding cycle for that season. This in turn may result in a loss of available habitat for fauna species dependant on those seeding plant species for food. Burning of shrubby open forests may result in the replacement of the shrubs by grasses and again alter habitat availability for those fauna species dependant on a closed or shrubby understorey within an open forest area. It is therefore important to ensure that any prescribed burn takes into consideration the ecological requirements of the various communities to ensure it has no lasting impacts on that community.
Intensity of burn	The intensity of a fire is important both in terms of the ecological value it has for some vegetation communities or conversely the significant impact an intense fire can have on others. For tall open forests such as Blackbutt tall open forest there is a need for an intense fire to open canopies and initiate recruitment of the next generation of next aged canopy. However an intense fire in a community with a vine forest understorey can result in that understorey being completely removed and depending of following burns it may never return. Additionally an intense fire within Koala habitat may result in longer terms impact to koala food trees with the fire having the potential to kill trees and it may take up to 10 to 15 years for suitable replacement trees to come back to again provide sufficient habitat for Koalas. In an area where koala habitat is scarce this could have significant impacts on the Koala population. While undertaking high intensity burns are very difficult to manage, if they can be, in areas which require the occasional high intensity burn, permitting a wildfire to burn through these areas for longer terms ecological and biodiversity outcome may be acceptable. Additionally implementing a fire management program which seeks to manage understorey hazards in key Koala habitats may be required.
Spatial burn	The spatial distribution of a particular burn is also important with respect to a desirable fire regime within a vegetated area. Obviously the larger the area, the greater the potential for the fire to be influenced by weather conditions which may arrive after the fire has been ignited. The smaller the area the opportunities for the fire to obtain a sufficient intensity to deliver the outcomes required by the prescribed burn are significantly restricted. Therefore selecting an appropriate area to burn is essential to deliver either hazard abatement or ecological outcomes from a prescribed burn. Additionally using the area within which a prescribed burn is to be undertaken to obtain desirable outcomes can influence the ignition program where slope and wind can be used to either increase the rate of spread and therefore intensity or reduce the rate of spread and reduce the intensity of a fire.

Bushfire hazard comparisons

Due to a number of factors the bushfire hazards associated with vegetation types and risks associated with the potential for those vegetation types to carry a fire are significantly different around the country.
In general terms the bushfire risk associated with vegetation types in Victoria and southern New South Wales when compared to that of the Fraser Coast is significantly different.

There are two main factors for this and they relate to climate and species dominating various vegetation types within these areas.

The southern areas of Australia have a predominant winter rainfall while the northern part of Australia has a predominant summer rainfall associated with monsoons.

Therefore, when the bushfire weather is at its peak in Australia, during mid to late summer, the southern areas are usually dry or drying out and the northern parts are moist from rainfall associated with the summer monsoon period.

Dry vegetation and fuels during high to severe bushfire weather are at high to extreme risk of carrying a bushfire and for the bushfire to be extremely intense. However in northern Australia and on the Fraser Coast during this hot period the area is usually experiencing either storms or monsoon rainfall or rainfall generated from cyclones. This rainfall wets the fuels and makes it unlikely to enable a fire to generate significant intensity.

Additionally, when the Fraser Coast is at its driest i.e. late winter, early spring, the air temperature is generally cool thus not able to contribute to the generation of an intense fire.

However, it must be noted that the above comments are a generality and as such will not be the case in all years and at all times.

A late or no "wet season" in northern Australia and on the Fraser Coast may provide the circumstance where the available fuels are dry and with the warmer climate of summer an intense bushfire may eventuate.

The other factor mentioned earlier is vegetation types and the species within those vegetation types.

A number of vegetation communities in southern Australia i.e. Victoria and southern NSW are tall to very tall open forests with tall shrubby understoreys'. Many of the eucalyptus species retain bark above the ground level in ribbons such as the Mountain ash, blue gums or stringybark species. These bark types in the forest types within which they occur assist in enabling a fire to gain access to the upper parts of the community and thus significantly increase the intensity of the fire and the rate of spread of a fire.

However, in the Fraser Coast and most of Queensland, these forest types and species are not as prevalent as they are in some southern forest.

Queensland and the Fraser Coast do have eucalyptus species which have similar bark and height attributes to those species in the southern States, such as Blackbutt (*E. pilularis*), Flooded gum (*E. grandis*), Sydney blue gum (*E. saligna*). While these species are present in the Fraser Coast region, for the most part, the region's vegetation types are lower, open and are dominated by gum bark, bloodwood bark and ironbark types which generally do not assist fire to gain access to the canopy or sub-canopy.

It is also important to note: -

- Some of these tall forest types with high bushfire potential are located on Fraser Island.
- Paperbark forest types have the potential to permit fire to gain access to the canopy via their bark as well.
- Wallum communities can also permit a fire to gain access to the canopy due to the density and stratum of the shrubs and their low tree canopy.

It is also important to note that some of these tall forest types with high bushfire potential are located on Fraser Island.

So in summary, while the vegetation within the Fraser Coast does not present the levels of bushfire risks that tall vegetation types in southern Australia present to communities, it does not mean that residents can be complacent about the risks associated with the vegetation communities within the Fraser Coast region.

The general rule is that vegetation will burn and will burn intensely at some stage and threaten life, property and the environment some time and somewhere within the region.

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Part 2 – Guidelines and Procedures

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Fire Management Planning

Bushfire Management covers two basic areas, Strategic Planning and Tactical Planning. This section will provide guidelines and procedures to assist Council in tactical planning for bushfire management.

Standard zoning and unit System

One of the standard ways fire management plans and bushfire planning deals with the identification of various areas within a bushfire planning area is to identify and describe a number of zones. Zones are discreet areas within which a specific set of actions are prescribed or specified to be undertaken to assist in bushfire management and / or control. Standard zones which are commonly used are described in Table 8 below: -

Table 8 – Zone Descriptions

Zone	Description
Property protection zone	Property protection zone area those areas around a structure or asset which will afford protection from a bushfire in terms of direct flame attack and radiant heat. These zones area usually divided into an inner and outer zone. The inner zone is a zone within which no flammable plants are to be planted and where no other flammable material is to be stored. Flammable material includes, fuel drums, pile of wood, firewood, mulch etc. The outer zone is a zone where vegetation is managed to assist in bushfire protection. This may allow for the location of less-flammable plant species to assist in protection from radiant heat and ember attack. Grasses are to be maintained and particularly before and during the bushfire season.
Bushland Zone	This zone describes an area of vegetation within a bushland park where the fire management prescriptions include prescribed burning operations.
Bushland Protection Zone	This zone identifies an area of vegetation which is to be protected from bushfire during a prescribed burn and where practicable during a wildfire. This zone may include riparian vegetation or habitats which contain fire sensitive flora and/or fauna species.
Park asset zone	This zone describes an area within the bushland park where Council has an asset. These assets could include playground equipment, sewage or water pump stations, picnic, interpretation and toilet facilities.
Private bushland zone	This zone includes bushland on neighbouring properties. Under an agreement with relevant parties, a private bushland zone may be included within a Council Fire Management plan. However private bushlands will not form part of a FCRC bushland park prescribed burning Plan.
Fuel management zone	This zone includes firebreaks and/or fire trails around property boundaries and may include firebreaks and/or fire trails along neighbouring property boundaries. Firebreaks and fire trails within bushland land will not be identified on a zone map as being a fuel management zone. These will form the boundaries of fire management units. However a boundary of the fire management unit may include a fuel management zone.

Protection of Cultural Heritage and Historic sites

Cultural heritage includes Aboriginal Heritage places, zones of sensitivity while non indigenous places or sites are usually referred to as Historic sites. Wildfires have the potential to jeopardise the integrity of these cultural heritage and historical sites, artefacts and structures, in particular sites which include materials such as timber e.g. scarred trees, camps etc.

It is therefore important to have a set of guidelines which will enable Fraser Coast Regional Council to have a set of guidelines to ensure these significant cultural heritage and historic sites are protected from prescribed and where possible, wildfires.

The following guidelines have been developed to provide for a strategic as well as a tactical approach to ensure that Fraser Coast region's important cultural and historic heritage sites are protected from both prescribed and wildfire.

Table 9 – Bushfire Protection Practices

Site type	Actions
Aboriginal Cultural Heritage sites	i. Where permissible identify the location on all fire management planning documentation. ***NOTE**: - This must be undertaken with permission from the Local Aboriginal community with Traditional owners and the EPA – Cultural Heritage Unit;* ii. Ensure that sites which may be susceptible to bushfire attack e.g. scar trees, midden sites are protected by a type 3 firebreak; iii. During a prescribed burn, all fuel around the site is to be removed for a distance of 5m from the outward edge of the site; iv. During a wildfire and where practicable, all effort is to be made to ensure that the site is protected from direct attack of the fire front in front of the fire head by the removal of fuel from around the site before the fire gets to the site; v. Following a prescribed burn and/or a wildfire, the site is to be inspected as part of blackout procedures to ensure that all residual fire is extinguished before the fire team leaves the fire area; and vi. Should a site be damaged as a result of the bushfire (prescribed or wildfire) the site should be inspected as soon as practicable by members of the Local Aboriginal community and the EPA to fully document the damage and to develop a plan for its ongoing conservation and protection.
Historic Sites	i. Identify the location on all fire management planning documentation; ii. Ensure that sites which may be susceptible to bushfire attack are protected by a type 2 firebreak; iii. During a prescribed burn all fuel around the site is to be removed for a distance of 5m from the outward edge of the site; iv. During a wildfire and where practicable, all effort is to be made to ensure that the site is protected from direct attack of the fire front in front of the fire head by the removal of fuel from around the site before the fire gets to the site; v. Following a prescribed burn and/or a wildfire, the site is to be inspected as part of blackout procedures to ensure that all residual fire is extinguished before the fire team leaves the fire area; and vi. Should a site be damaged as a result of the bushfire (prescribed or wildfire) the site should be inspected as soon as practicable by Council and other relevant parties including members of the local historic society/group to fully document the damage and to develop a plan for its ongoing conservation and protection.

Fauna and Habitat

The Australian fauna and associated habitat have evolved within an ecological framework which has included bushfire as part of the ecological processes. Many native fauna species in fire-adapted systems exhibit preference for a particular stage of post-fire regeneration, depending on their feeding and breeding needs, indeed many are dependent on fire to regenerate habitats.

However, with the development of urban areas and the isolation of habitats or the lack of useful ecological corridors, the importance of using fire as a management tool is even more important to ensure that the limited numbers of habitats within these small urban bushland parks are protected from inappropriate bushfires in terms of intensity and frequency.

Table 10 – Fauna and Habitat Impact Mitigation

Issue	Guideline	Desired Outcome
Fire Frequency	Fire frequency is usually described as the time between two or more fires within the same area of bushland. Fire frequency can be both a benefit and a threat to fauna and their habitat. Too frequent fires can reduce species diversity to a relative few number of species reducing habitat availability and hence reducing the number of species (vertebrate and invertebrate) that can utilise a specific area of bushland. Depending on a range of landscape and hydraulic factors, too infrequent fires can have the effect of reducing the diversity of habitats and change the habitat from a structurally simple habitat i.e. grassland to a structurally complex habitat i.e. closed forest/vine forest. While there are merits for both habitat types, changes in habitat structure may result in fauna species becoming locally extinct, e.g. fauna dependant on a grassland habitat which has changed to a more complex vegetative community or habitat type, may mean that the loss of suitable habitat for the grassland species results in them becoming locally extinct.	Maintain a habitat complexity which maximises the habitat types and fauna diversity within a given area. Ensure that prescribed fire frequencies take into account the frequency of wildfires within a given area and the requirements of local fauna species.
Fire Intensity	Fire intensity is the other major influence on habitat and fauna. It is acknowledged that fire intensity is linked to the amount and location of fuel as well as soil moisture. Fire intensity is basically how hot the fire can get. The hotter a fire the more vegetation (alive and dead) is affected by the fire. A low intensity fire will consume most if the available fine fuels (fuels less than 6mm in diameter). This includes dry grass, fine twigs and dry leaf material. A high intensity fire will not only consume the fine fuel it will also consume shrubs, large logs on the ground and may also involve the canopy of trees particularly in vegetation types which have continuous fuel ladders and touching canopies. Therefore the hotter the fire the greater the impacts are on habitat and therefore greater the impacts on fauna both during the fire and following the fire. However if an area which has been consumed by a high intense fire is adjoining an area which was not burnt, then the recovery potential of the burnt area is higher and a greater the chance for the fauna population to recover. The other impact of a high intensity burn is the incidence of erosion and sedimentation which can significantly increase post fire. Soils are exposed for longer periods due the time it takes for the bushland to recover. An intense rainfall event can result in significant erosion from sloping landscapes and sedimentation of down slope drainage lines. This sedimentation can impact on drainage lines by silting up waterholes, increasing turbidity of water holes and the smothering of sensitive aquatic flora and fauna species.	For prescribed burns to have varying fire intensities within a particular burn to create microhabitat variations within a given area. Generally for urban bushland park the fire intensity to be kept low to allow for improved fire management and to reduce the impacts on available habitats within that bushland area.
Timing of Burn	Many fauna have specific breeding times and these change between fauna types and species, however mostly they are linked to resource availability. A number of fauna species which utilise urban bushland parks have no substantive problem in obtaining resources i.e. water, flowers, leaves etc, therefore the timing of a fire for these urban fauna species is not a major	To provide and maintain a range of habitat types within significant bushland areas for specialist flora and fauna species.

Issue	Guideline	Desired Outcome
	consideration. However this is not the case for specialist fauna species which require particular types of habitat such dense understorey or groundcover, nesting opportunities or food sources such as Fairy wrens or bandicoots for example. There are a number of fauna species which have a limited selection of food such as Glossy black cockatoos (*Calyptorhynchus lathami*) which feed solely on *Allocasuarina spp* seed pods. Therefore undertaking a burn during the seeding period of a substantive stand of black sheoak (*Allocasuarina littoralis*) may compromise the available food sources of these cockatoos. Additionally, the timing of burns may have an effect on exposure of soils and should this occur during the storm season. It may result in erosion of soil, sedimentation of waterways and a loss of suitable habitat for particular fauna and flora species.	

Prescribed Burns

Introduction

Prescribed burning is the purposeful application of fire to vegetation for a specified and planned purpose. However, the application of fire can vary depending on the planned outcomes, the weather conditions prior to and during the burn and the resources available to manage the fire. The following guidelines will provide guidance for a Fire Control Officer (FCO) before, during and following a prescribed burn.

They may also be used as a basis for contractors to base the planning and implementation of a prescribed burn on Councils behalf.

The following assumptions have been made with regard to the implementation of these guidelines:

1. Prior to a prescribed burn being planned a Fire Management Plan (FMP) for the reserve shall be prepared.
2. Council will have employed or trained existing staff to fill the role of the Fire Control Officer as specified in this guideline;
3. All persons undertaking the prescribed burn will have received minimum accredited fire management training to level one standard.

The prescribed burn is the final part of a planning and operational works program in the overall management of a bushland reserve or park.

Table 11 – Decision Action – Prescribed Burns

Stage	Practices
Pre-burn planning	• **Permit to Burn** The Fire Control Officer (FCO) will be responsible for the operation of the prescribed burn. As indicated previously in this document, the Fraser Coast Regional Council is deemed to be a landowner under the *Qld Fire and Rescue Authority Act* (1990) and therefore they are required to obtain a permit to burn prior to undertaking any prescribed burn on their lands. One of the initial duties of the FCO is to apply to the local fire warden for a 'Permit to Burn' (refer to flow chart pg95). The Application for a permit is to be done in writing and permit applications are available from the Queensland Fire and Rescue Authority (QFRA) Urban or Rural Services. As part of the requirements of the permit to burn application the FCO will also be required to notify the adjacent land owners of Councils intention to apply for a Permit to Burn. The permit should be obtained a minimum of two weeks prior to the planned date for the prescribe burn. • **Burn Area Reconnaissance** The burn area reconnaissance is to allow the FCO the opportunity to

Stage	Practices
	re-familiarise themselves with the reserve and the block/s which are to be burnt. The reconnaissance must be undertaken using a checklist of issues which may affect the management of a prescribed burn and be in accordance with the management plan. The checklist covers four main areas: **1. Firebreaks and fire trails** All firebreaks and fire trails should be assessed to determine their status with regard to accessibility for fire tenders with regard to erosion, fallen trees, dumped vehicles etc. **2. Fuel loads** Sample fuel loads need to be taken to determine up to date knowledge of existing fuel loads within the area to be burnt. Notes should also be made of fuel loads, level of curing and fuel types in adjacent areas to assist in determining the ignition plan for the block. **3. Water sources** If reticulated water is available, the location of hydrants should be checked relative to the block to be burnt. In areas outside of reticulated water, all other available water sources should be assessed. It should be noted that natural waterholes along creeks or drainage lines should not be used as a water source for prescribed burns as they provide essential habitat for the fauna that utilise the reserve. Water from creeks may also be of poor quality or contain pathogens, which may be harmful to other organisms outside of the aquatic environment. An assessment of the salt levels may be required as many of the coastal streams are brackish. Arrangements should be made with neighbouring landowners if they have water storage areas which are suitable for Council to use as part of its fire suppression plan. The FCO should also check locked gates and access tracks to these water storage areas and the fire block. If there are no suitable or available water storage areas the FCO will be required to arrange for water tankers to be available on the day of the burn. All water tankers must be able to quickly fill Council and Rural Fire Brigade fire tenders via direct couplings or through high volume pump. The nearest reticulated hydrants should also be identified and ensure that they are operational if required. **4. Removal of Stock** If the area to be burnt is used for grazing by stock, the FCO must ensure that the persons who have agistment rights on that land are informed. Clear directions must be given to remove their stock from that area at least one week prior to the burn and that they will not be able to return the stock back to the land until the FCO satisfied that the land can sustain the stock again. • **Public notification** As part of the ongoing community consultation process regarding the management of bushland reserves and conservation estate areas, the notification of the local community regarding a prescribed burn is necessary. This public notification is best undertaken as a general notification in the newspaper or via a letter from the local Councillor or the Mayor informing local residents of Councils bushland management program which involves undertaking prescribed burns for hazard reduction and/or promotion of environmental health of a bushland reserve. This notification also decreases the number of calls received by the Qld Fire and Rescue Authority regarding a fire or smoke at a bushland area being prescribed burnt. The FCO needs to contact the local Aboriginal representative if a

Stage	Practices
	prescribe burn is to be undertaken around or adjacent to a site of known cultural heritage. • **Plant, vehicle and equipment check** As part of the pre-ignition planning, it is best to check all plant, vehicles and equipment that will be used during a prescribed burn to ensure that everything is in good working order. Do not take any equipment into the field which is not in proper working condition. All vehicles should be fuelled as well as all pumps and drip torches. All water tanks and backpack units should be filled prior to the burn day. • **Weather check** The fire controller should confirm the weather conditions of the proposed burn day with the Bureau of Meteorology. If the wind speed is going to be greater than 15km per hour, the burn should be postponed until the wind speed is more favourable.
During a Prescribed Burn	The day of the burn should be a relatively straightforward process. The following process should be followed. • **Final weather check** The FCO must contact the Bureau of Meteorology for an update on the weather forecast and attempt to view this information in terms of the regional weather conditions as well as the expected local weather conditions. When burning bushland reserves within 5km of built-up areas and an inversion layer exists the prescribe burn must be delayed until the inversion dissipates. • **Fire Response Team organisation** The Fire Response Team (FRT) should form up at least three hours prior to the commencement of the burn. Each unit within the team should ensure that all equipment, tools and other items are in good working condition and that all necessary tools and fire suppressant is present on each vehicle. The FCO should give a final briefing to the FRT and make allowances for any changes that may have occurred. The FRT should then proceed to the burn block and undertake those tasks which the FCO has allocated to them. These tasks include erection of signage, checking of walking tracks unlocking of gates, removal of stock etc. If other agencies are to assist the FRT in the prescribed burn, these other agencies should also be present at the briefing. • **Commence burn** The prescribed burn should commence at an appropriate time to ensure that the objectives of the burn are achievable on the day of the burn. The FCO is to monitor the progress of the burn as well as the condition of the FRT members. All teams must be in radio contact with the FCO and regularly update the FCO as to the progress of the fire and the condition of team members. All communication should come through the FCO to ensure effective and efficient use of resources. • **Black-out of burn area** The FCO is to ensure that the burn block is completely blacked-out as much as possible prior to the removal of any resource from the burn area.
Post Burn	Following a prescribed burn there are several actions which must be undertaken to effectively finalise the burn. • **Post Burn De-brief** A post burn de-brief should be undertaken as soon as possible following the prescribed burn to allow for discussion on the operation of the burn, the effectiveness of various strategies and equipment and to make recommendations to improve the management of a future prescribed burns.

Stage	Practices
	• **Check burn area** The prescribed burn area must be checked to ensure that the area is completely safe from igniting adjacent unburnt areas. During this post burn check another set of photographs can be taken to ensure that a good photographic record is kept of the burn which can be used to monitor regrowth and fuel load accumulation. • **Burn area monitoring** The Fire Management Plan should include a monitoring program of the bushland reserve or conservation estate. These recommendations should be actioned and the burn area should be monitored for regrowth rates and species associations as well as fuel load accumulation.

Fire and Vegetation Monitoring and Evaluation

Introduction

Monitoring is required to evaluate if the objectives of any planned burns are being achieved. The critical aspect of any monitoring program is the identification of what is to be monitored and why. This will direct what specifically is monitored, e.g. the fire, the fuel, the flora, the fauna, and the habitat.

The tasks of managers of natural areas are to conserve the unique biological, cultural, geological and scenic diversity of an area. In order to achieve this, managers must attempt to determine what diversity exists and how their management actions affect that diversity. An effective vegetation monitoring program will provide an insight into what changes, if any, are occurring in vegetation and community composition, abundance, diversity and structure in an area over time and therefore inform future management actions.

With this in mind the following monitoring guidelines must be implemented as part of a bushland park management program which aims to identify the opportunities and constraints for Council with respect to managing its bushland parks. It is recognised that fire is one of the natural processes that occur in most vegetated areas as is weed invasion and community transition however, fire can and is one of the most effective management tools a land manager can use to assist in the management of vegetation for a wide number of objectives.

This monitoring program, while targeted at the establishment of monitoring sites as part of Council's fire management program, essentially provides the opportunity for Council to gather on-site or on-park ecological and natural resource information and for this information to be compiled over a longer term. This will assist Council to understand the impacts of management regimes on the natural values which Council has undertaken to conserve and protect within the bushland park network.

The data collected as part of a monitoring program must be repeatable and consistent in order for the data to be analysed. Prior to any monitoring being undertaken baseline data needs to be collected as a reference point.

The monitoring methods may include use of specific data sheets, sampling, surveys (transect or plot), photographs, maps etc. Included in this report are guidelines for monitoring vegetation using vegetation surveys, photography and fuel load sampling.

Additionally, the Southeast Queensland Fire & Biodiversity Consortium has produced a Fire & Biodiversity Monitoring manual. The link to the SEQFABC monitoring document is provided below.
http://www.griffith.edu.au/environment-planning-architecture/southeast-queensland-fire-biodiversity-consortium/resources/landowner-bushfire-preparation-materials

Vegetation and Fuel load monitoring

The objectives of monitoring the vegetation and the fuel load include:

- To establish local baseline data on fuel loads and accumulation rates in a variety of vegetation/fuel types;
- To provide data which can be used for planning and implementing prescribed burning plans;
- To provide data on and a means of evaluating the effects of prescribed burning regimes and wildfires on fuel loads in a variety of vegetation/fuel types, and
- To provide data on and a means of evaluating the effects of prescribed burning regimes and wildfires on vegetation types.

Expected Outcomes

- Establish fuel load accumulation rate curves for key or significant vegetation types in FCRC bushland reserves and parks;
- Assist in prediction of potentially hazardous fuel loads in a variety of vegetation/fuel types;
- Assist in assessing the effectiveness of fuel reduction programs, and
- Data will help improve the ecological use of fire as a management tool.
- Vegetation monitoring.

Selecting sites to be monitored

Monitoring points should be located within representative number of high priority vegetation types found within Fraser Coast. It is preferable that each vegetation type have a minimum of two monitoring sites, to allow comparative analysis. If regionally or locally rare or threatened plants are known to exist in an area they should also be targeted for specific monitoring.

The placement of monitoring points should be such that they can be easily accessed and located in the future. Ideally they should be located 15m or more into the vegetation type on a bearing at right angles to a marked position on the access track. This will assist in making the monitoring points undetectable to park visitors and thereby reduce possible vandalism. To help identify the location of the plot on subsequent visits a marked peg. should be placed next to the access track in line with the plot. In thicker vegetation types it may also be necessary to flag a trail to the plot, particularly if new staff has to locate the plot.

Procedure for Establishing Photo Monitoring Points

- Choose a site known for its fire history or representation of a vegetation type or both;
- Measure 15m or more from track into vegetation type in perpendicular direction from track (or other convenient point). Place a marked peg next to the access track in line with the plot;
- Drive in vertically, an unpainted 1.8m star picket until 120cm remains above ground. It helps if this 120cm mark is placed on the post before transfer to the field;
- Using a compass, (a little distance from the metal picket) determine a southerly direction and locate the position for the 2.4m star picket 10m away from the first picket. Where possible align star pickets in a north-south direction to avoid sun glare. If this is not possible take a compass bearing and record;
- The distance between the star pickets may be less than 10m in some situations this is dependent on the thickness of the vegetation;
- The 2.4m picket should be painted black and white at 20cm intervals. The top interval is painted white for best photographic definition. At least 9 intervals (180cm) should be painted, with the remaining portion of the picket being driven into the ground;
- Attach steel tags with tie wire to unpainted 1.8m picket with the following information - FCRC Site (no.) - est. --/--/-- . Use a dymo steel labeller for long lasting results. Aluminium tags disintegrate in about 5 years.

Vegetation survey

- Record information on Photo Monitoring Point Establishment form see Appendix II;
- To complete the fire monitoring vegetation datasheet, place the end of a measuring tape over the unpainted star picket and record all vegetation lying within a 10 m radius of the picket.

Photography

The value of photos cannot be overstated. At each monitoring point photos must be taken every time data is recorded. These photos must be carefully labelled indicating the site number and name of the park.

Procedure for Photographical Monitoring

- Using a digital camera preferably with a 24mm lens (wide angle), place the camera on top of the unpainted star picket and face the painted picket;
- Take 2 photos. Photo A; locate the top of the picket in the middle centre of the view finder and Photo B; locate the top of the picket at the top centre of the view finder;
- In forest vegetation it is useful to take a third photo (Photo C) which has the top of the picket at the bottom centre of the viewfinder. This will provide an indication of canopy density;
- Record immediately in a notebook the park name, site number and date and corresponding photo number;
- After images are downloaded, rename the image using the site name, photo station code and photo number. The photo should be placed into the reserve/park monitoring database.

Fuel Load Assessment Guidelines

Introduction

This guideline sets out a practice to enable Council staff to develop skills in determining fuel loads and to carry out fuel load assessment within Council managed land.

Fuel load assessment is one of a number of ways to determine the bushfire proneness of an area of vegetation. Assessing fuel loads enables the reserve/park manager to determine what the quantum of fuel is present and depending on the type of fuel available, they will be able to make informed decisions about how to manage those fuels and vegetation within a particular area.

Fuels

Fuel is any vegetated material that is available for a fire to ignite and consume. However when undertaking fuel load assessment the material which is considered is dead vegetative material less than 6mm in diameter and live vegetative material less than 3mm think.

In Queensland, the fuels which are mostly considered to be assessed are those ground fuels which are most likely to ignite.

However in some vegetation types such as wallum/heathlands, shrubby open forests, elevated fuel may also need to be considered. In other vegetation types such as paperbark forests, or Blackbutt open forests, elevated fuels such as bark retained above the understorey may also need to be considered in the assessment of available fuels and their contribution to the total hazard.

Fuel Load assessment

There are a number of methodologies use to assess fuels in Queensland vegetation, ranging from the collection of all material within a known area i.e. 1 sq. m. to depth of fuel guides and assessment of elevated fuels, which use set tables to derive estimations of fuel loads within a particular area.

While the more time consuming and detailed methodology is the best to educate and inform staff in what fuel are and how various fuel weight and thus contribute to a fire it may not be the most practical when initiating a Council managed lands wide program of fuel load assessment.

Organisations such as the Southeast Queensland Fire and Biodiversity Consortium provide two methodologies One using depth of fuel, time since the last fire and foliage project cover to give an estimate of the fuel loads and the more detailed method of physical fuel collection, drying and weighing[10].

The Main Roads use a method of visual estimation (pers. comms. Daniel. J.) which places fuels into three classes low, medium or high.

It is however important for the person who is collecting information with regard to fuel loads to collect all available information which is relevant to that vegetation community.

It is also beneficial that should a person using a rapid fuel load assessment methodology that they have some knowledge of fuel types, fuel composition and weights of fuels so their data collection process is as informed as it can be.

Fuel Load Collection – Physical Collection Method

Selecting sites to be sampled

Fuel load samples should be collected to the right side of the permanent photo monitoring points at a distance of no less than 5m away from the star picket so as not to impact on the data collected within the monitoring point. The right side is determined by standing at the unpainted star picket and face towards the painted star picket.

i. Three samples should be taken at each site;
ii. The sample 1sqm quadrate is randomly placed on the ground. The random placing can either be by throwing the quadrate or stepping pout a random number of steps in two directions. The area on which the quadrate lie is assessed visually and assigned a low, medium or high ranking for the amount of fuel present around them;
iii. Select the low one as the first site and replace with a quadrate, marked low;
iv. Repeat procedure (iii) and procedure (iv) for medium and high; and
v. Complete the relevant section of the fuel monitoring data sheet.

The sampling site should be accompanied with a GPS location of the centre of the quadrate and a photograph of the sample site before the removal of the fuel with photos of the general area, the sample quadrate and the canopy vertically above the quadrate. Another photo should also be taken of the cleared quadrate before moving onto another site.

If it is hard to pick comparable sites, there can't be much difference between them. The main point is to have three representative samples to provide realistic averages.

Low, medium and high are only arbitrary ratings and in some instances the high sample may in fact be of a lower weight than the low sample. It doesn't matter as we are only after an average.

Sampling Selected Areas

The 1sqm quadrates are sampled with all fuel/vegetative matter (including live and dead material) under 6mm in diameter and up to 1.0m in height above the quadrant (or to the top of a continuous fuel layer if dense shrubby understorey exists) being removed down to soil level.

Start from above and work down to ground level making sure to collect any overhanging plant material that falls within the confines of the quadrant.

When trimming plants at ground level, make sure not to include dirt, sand or stones as this far outweighs vegetative material in mass to volume ratio and will produce an unacceptably high reading / error.

If you can't remove sand or dirt by wiping it off, STOP and leave the small amount of material behind. This should not overtly influence the final dry fuel weight.

[10] http://www.griffith.edu.au/environment-planning-architecture/southeast-queensland-fire-biodiversity-consortium/resources/landowner-bushfire-preparation-materials

It is also important to note what elevated fuels are located within the quadrate and within the vegetation community in general. These should be noted on the data sheet.

As most fuel, particularly that laying on the ground will contain some moisture, it is best that all material be treated the same with respect to its drying to attain the dry fuel weight. Therefore all material can be bagged into the same bag and this material can be dried together and weighed together.

Hessian bags are good to use as fine dirt and sand material can be sifted through the hessian while the vegetative material is retained within the bag for weighing.

Drying and Weighing of Samples

- Weigh each bag prior to oven drying and record information in Section B on fuel monitoring datasheet;
- Dry in ovens at approximately 65°C for several days, or until oven dry. If an oven is not available an airy and sunny place which is not subjected to dew or other moisture sources.
- Check drying rate by weighing daily until they stop losing weight. It is important to weigh the bag following weighing the material to ensure the bag weight is not included in the dry weight value;
- Complete Section C on Fuel Monitoring datasheet for individual bag weights after drying;
- Average weights for each site and convert to tonnes / hectare. Record information in Section D on Fuel Monitoring datasheet;
- Graph results over time; and
- Compare estimates in field to actual fuel loads.

Southeast Queensland Eucalyptus Fuel Model

This model is based on a Honours research project completed by Jan Gilroy[11].

This model is in a "testing" stage and while it has been based on two vegetation types in Redland City it still requires further validation to see how it performs in other vegetation types.
See the following for a brief summary of the model.
http://www.griffith.edu.au/environment-planning-architecture/southeast-queensland-fire-biodiversity-consortium/resources
NOTE: - *this URL may change, however a search for the document (see footnote below) should provide the reader with a complete reference.*

Overall Fuel Hazard Assessment

This method is based on an overall fuel hazard for forest fuels[12] developed by Greg McCarthy, et. al. Fire Research, Forest Science Centre, Orbost Victoria.

This methodology uses the determination of the depth of fuel using a ruler with a disk to measure the height of the ground fuels and then a series of hazard rating tables for elevated hazards base on the determination of the type of hazard represented by the bark hazard to give a hazard level.

As most forest and woodlands do not have a significant bark hazard, the score used for this component can be low for most situations. However pure or dominant Melaleuca spp open forest may need to score the bark hazard in accordance with the Overall Fuel Hazard Assessment methodology.

The South Australian Department of Environment and Heritage also uses this Overall Fuel Hazard Guide to assessing overall fuels within that state.

The two methodologies are available at these two web address/URLs

- McCarty et. al. – Overall Fuel Hazard Guide -

[11] Gilroy. J. & Tran. C. 2006. *A New Fuel Load Model for Eucalypt Forest in Southeast Queensland*. Bushfire 2006 Conference papers. http://www.griffith.edu.au/conference/bushfire2006/

[12] McCarthy. G. 2001 *In Fire and Biodiversity Monitoring Manual. SEQFBC*. 2001

http://www.dse.vic.gov.au/CA256F310024B628/0/212564619B418062CA25703B0031C0A2/$File/Research+Report+47+.pdf

- Dept. For Environment and heritage, Overall Fuel Hazard Guide for South Australia - http://www.environment.sa.gov.au/parks/pdfs/PARKS_PDFS_FUEL_HAZARD_GUIDE.PDF

Firebreaks and Fire Trails

Firebreaks

The firebreaks identified and described in these guidelines have been based on existing firebreak types currently in use throughout southeast Queensland. The following guidelines incorporate 'best environmental management practice' in the maintenance and construction of firebreaks over a variety of landscapes. ***Note:*** *FFZ is a Fuel Free Zone; FRZ is a Fuel Reduced Zone*.

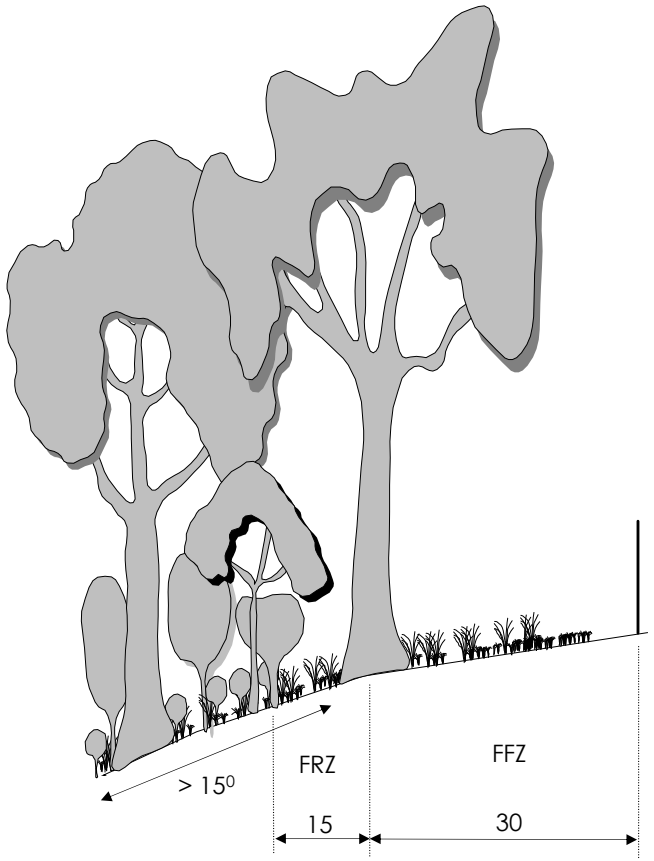
The total sizes of the FFZ and FRZ should, where possible, ensure they are compliant with the setbacks recommended in the State Planning Policy for Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (SPP1/03) particularly where the vegetation is deemed to be "Hazardous Vegetation" as defined under the SPP1/03 i.e. High or Medium hazardous vegetation.

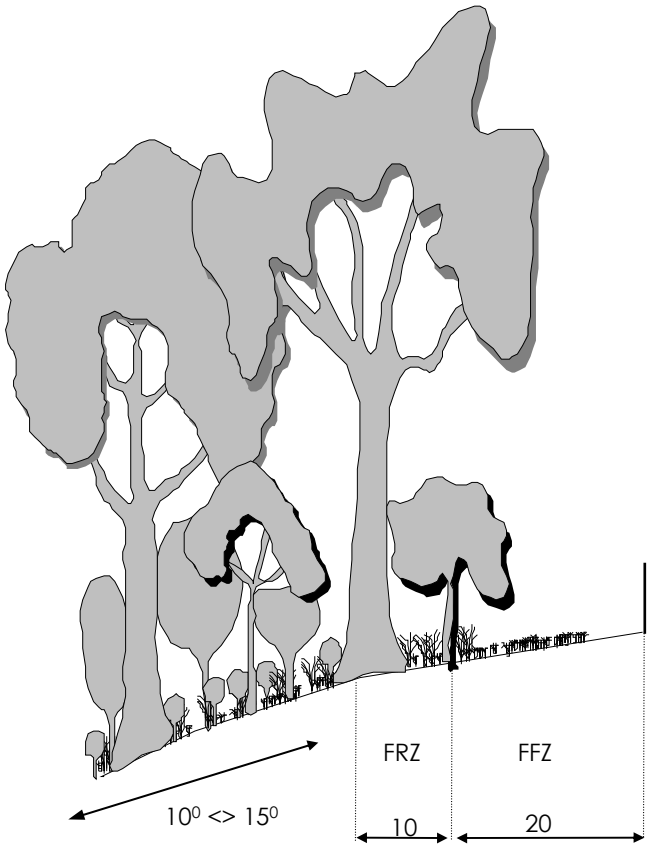
Firebreak Types - Summary table

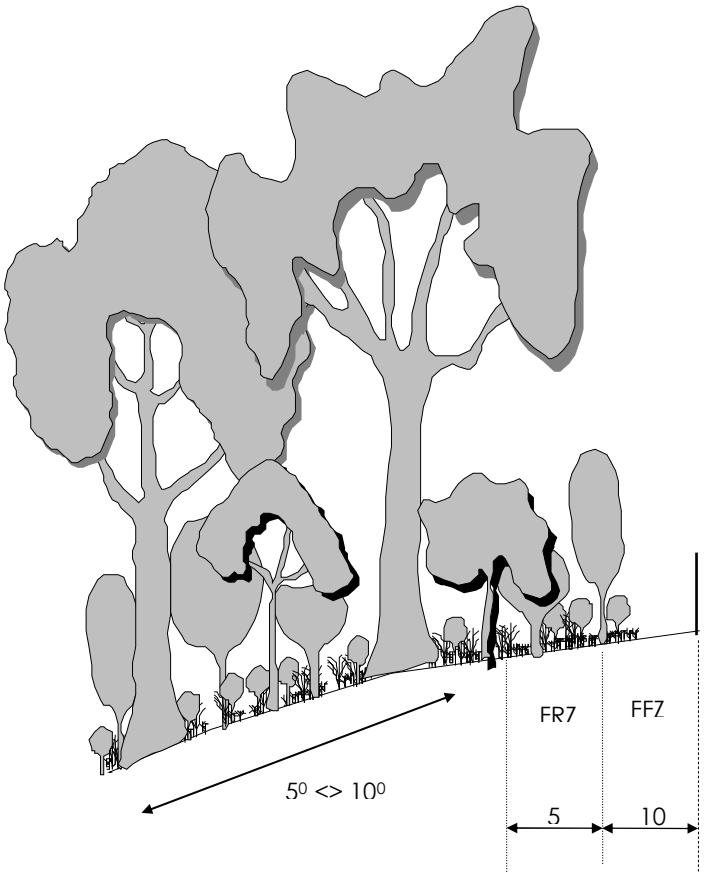
Level of Protection & Firebreak Type No.	Slope	FFZ (m)	FRZ (m)	Vegetation	Access	Constraints	Potential Situation
Maximum use in areas of high risk to property. **1**	$< 15^0$	30	15	Open forest in high fire risk areas adjacent to built assets or significant environmental assets.	• Suitable for large and small fire appliances, dependant on cross slope. • Fire appliance to traverse along the entire length of break and to turn around easily. • Access available from both ends. • Two-way access along break.	• Not suitable for erodible soils or steep slopes e.g. > 12° • Minimise erosion with water inverts & side drains. • Plan for reduced visual impact. • Removal of all fine and medium fuels. • May provide additional access to areas of environmental significance.	A type 1 firebreak would be required in a large bushland park (>40ha) where the adjacent assets are in close proximity to the park boundary.
High use in areas of high risk to property.	$10^0><15^0$	20	10	Open forest in high to moderate fire risk areas adjacent to built assets or significant environmental assets.	• Suitable for large and small fire appliances, dependant on cross slope. • Fire appliance to access entire length.	• Suitable for most soils except those susceptible to erosion. • Minimise erosion with water inverts & side	A type 2 firebreak would be required in a medium to large bushland park (<40ha > 10ha)

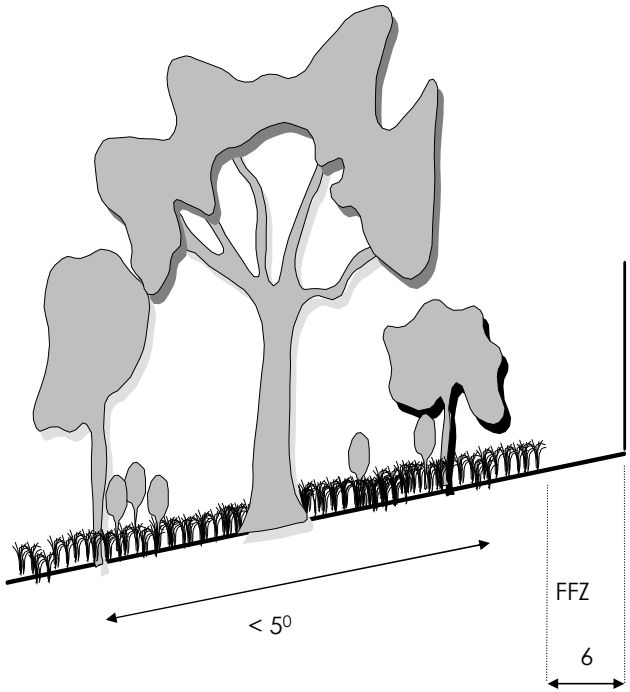
Level of Protection & Firebreak Type No.	Slope	FFZ (m)	FRZ (m)	Vegetation	Access	Constraints	Potential Situation
2					• Two-way access along break.	drains. • Plan for reduced visual impact.	where the protection of property is less than a type 1 situation.
Moderate use in areas of moderate risk to property. **3**	5^0><10^0	10	5	Open forest & woodland in fire prone areas	• Suitable for all fire appliances. • Two-way access along break.	• Suitable for all soil types. • Minimise erosion with water inverts.	A type 3 firebreak would be required for medium ecological reserves (10ha) where the risk to property is relatively high.
Low moderate use in areas of low risk to property. **4**	< 5^0	6	0	Woodlands and grasslands in areas of low fire proneness. Can be used for internal firebreaks around fire management blocks.	• Suitable for small fire appliances. • If used as fire management block boundary may only be suitable as a walking track. • One-way access along break.	• Suitable for all soil types. • Minimise erosion with water inverts.	A type 4 firebreak is for use in all ecological reserves where the risk to property is low or the size of the bushland park is relatively small (<10ha).
Minimum use in areas of very low risk to property. **5**	< 2^0	4	0	Woodlands and grasslands in small ecological reserves. Walking tracks in larger ecological reserves areas can be classified as type 5 firebreaks	• Restricted access for small appliances onto and along break. • Main access through private properties • Mostly used for pedestrian access.	• Suitable for all soil types	A type 5 firebreak is for use around small bushland areas or corridors as well as internal firebreaks in larger ecological reserves.

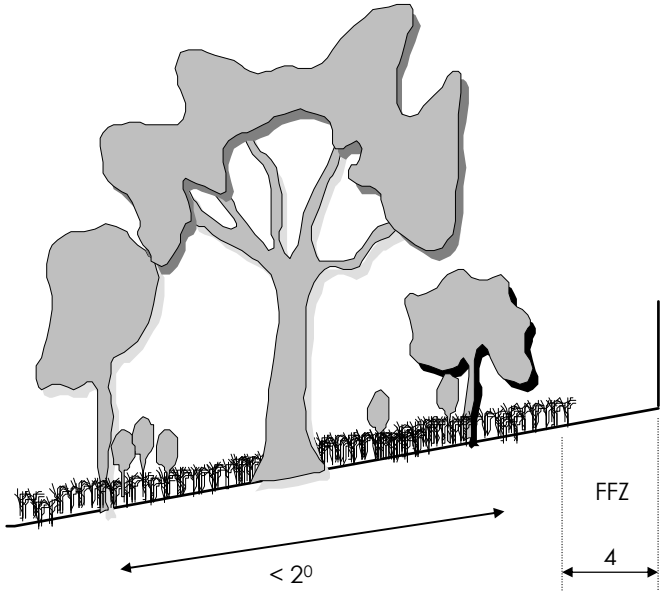
Firebreak Types - Descriptions

Firebreak Type	Graphic Representation	Firebreak Purpose & Description
1		**Purpose**: • Type 1 firebreaks are to be used on slopes greater than 15°. • Type 1 firebreaks can be used on soils that have a low erodability factor and good drainage and/or grass cover. • It is desirable for a buffer area to be present between the property boundary and the asset to further minimise the risk. In some cases, the fuel free zone may be constituted upon the neighbouring land if agreed to by the occupier/owner. • For use in large ecological reserves > 40ha where the risk to property is high to very high. **Description**: • Removal of all standing vegetation to a width of 15m from the property boundary, except grasses. • The fuel-reduced zone should be no less than 5m in width. • Removal of all fine and medium fuels from within the fuel reduced zone • Grasses to be retained within the fuel free and fuel reduced zones of this break to minimise the potential for erosion within the firebreaks. • Appropriate drainage installed along the length and across the firebreaks. • All fine and medium fuels are to be removed from the fuel reduced zone. • The fuel free zone should be such that a large fire tender can access the length of the break. • The width of the break should allow fire appliance to turn around in the break if required. • This break should not be used in areas where there will be substantial impact to the visual amenity or the ecological values of the area. However, these values do not override the safety and asset protection issues of the site.

Firebreak Type	Graphic Representation	Firebreak Purpose & Description
2		**Purpose**: • Type 2 firebreaks would be utilised on slopes between 10° to 15°. • Type 2 firebreaks are utilised in areas where maximum protection is required, however there are constraints from potential soil erosion from soil disturbance. • It is desirable for a buffer area to be present between the property boundary and the asset to further minimise the risk. In some cases, the fuel free zone may be constituted upon the neighbouring land if agreed to by the occupier/owner. • A type 2 firebreak allows easy access to all fire appliances during a fire event. • For use in large to medium sized ecological reserves <40 >10 ha where the risk to property is high. **Description**: • The fuel free zone has a width of 10m. • The fuel-reduced zone has a width of 5m. • All standing vegetation in the fuel free zone is removed except for grasses. • All fine and medium fuels and flammable shrubs are removed from the fuel-reduced zone. • Appropriate drainage inverts are located along and across the fuel free zone.

Firebreak Type	Graphic Representation	Firebreak Purpose & Description
3		**Purpose**: • Type 3 firebreaks are to be used in situations where the upslope is less than 5° and the assets are set back from the bushland interface. • Type 3 firebreaks can be utilised in all down-slope situations, provided there are no crown closures. • Type 3 firebreaks can be used on all soil types. • This firebreak would be used in areas of open grassy woodland with a shrubby or heathy understorey. • Allow for general access by fire suppression vehicles in all situations. • In some cases, the fuel free zone could be within private property following the agreement of a joint firebreak which will minimise the environmental impacts to the site. Timber or other flammable fences should not be used for fencing adjoining these breaks. • For use in low ecological reserves where the risk to property is relatively low or in small ecological reserves where the risk to property is relatively high. **Description**: • This firebreak requires the removal of all the standing vegetation within the fuel free zone except for grasses. • This break is to have a fuel free zone of 5m and a fuel reduced zone of up to 5m. • Water inverts and side drains are to be used to minimise erosion form the fuel free zone. • The fuel free zone should allow clear access for fire suppression vehicles; turning points can be located along firebreaks at 200m intervals.

Firebreak Type	Graphic Representation	Firebreak Purpose & Description
4		**Purpose:** • Type 4 firebreaks are to be used in grassy open woodlands without a shrubby or heathy understorey. • This break would be located in areas of less than 5 degrees upslope and in all down-slope situations. • Type 4 firebreaks would require similar cleared area adjacent to property boundary and no timber fence. • Vehicle access is restricted to one-way traffic to avoid accident during a fire event, therefore clear access point are necessary. Additional fire suppression can be conducted at the rear of adjoining properties. • Fire suppression work should only be conducted for low to medium intensity forest fires. • Type 4 firebreaks would be used in areas of ecological significance where minimum site impact is required. • Type 4 firebreaks are suitable for small bushland reserves or road reserves where the size of the bushland would not allow the formation of a high intensity fire. • For use in medium to small bushland reserves where the risk to property is very low. **Description:** • This firebreak has a width of 5m, which constitutes the fuel free zone. • No fuel-reduced zone is attached to this break. • Water inverts are to be used to minimise the impact to the break from erosion.

Firebreak Type	Graphic Representation	Firebreak Purpose & Description
5		**Purpose:** • This firebreak would be utilised in flat or minimal sloping areas or where there is no fire risk and the firebreak is to be used for fire prevention purposes (e.g. planned burns). • This firebreak would also be utilised in areas of sensitive vegetation or cultural significance, where minimal disturbance is required. • Vehicle access is restricted along the break. • This firebreak is suitable for small bushlands where the size of the reserve is not large enough to allow a high intensity fire to occur. • For use in large ecological reserves for internal firebreaks between blocks. These firebreaks may also be walking tracks. Also for use in small ecological reserves where the risk to property is extremely low and is acceptance that adjacent land owners are prepared to assist in the maintenance of this type of firebreak. **Description:** • This firebreak requires the slashing of the ground cover and the thinning of the understorey to form a firebreak of 3m. • This break receives regular maintenance. • Water bars are to be used to reduce erosion • A cleared area may be located on the adjoining property to further assist in the reduction of available fuel.

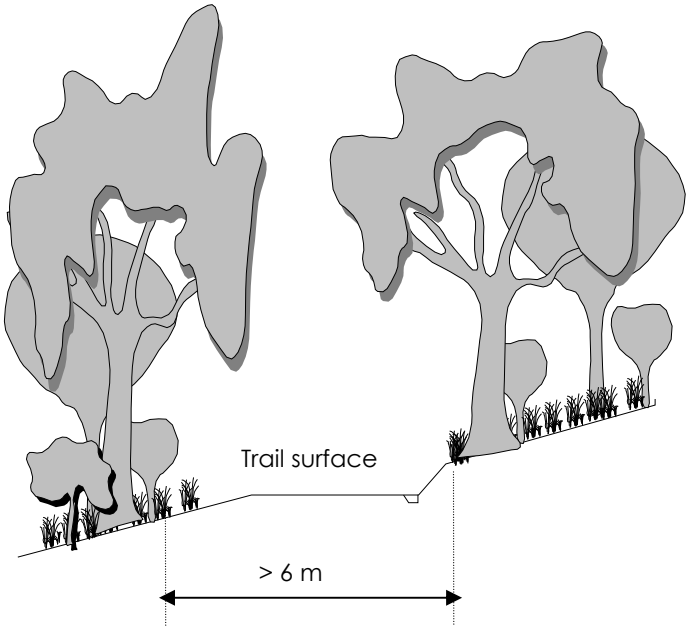
Fire Trails

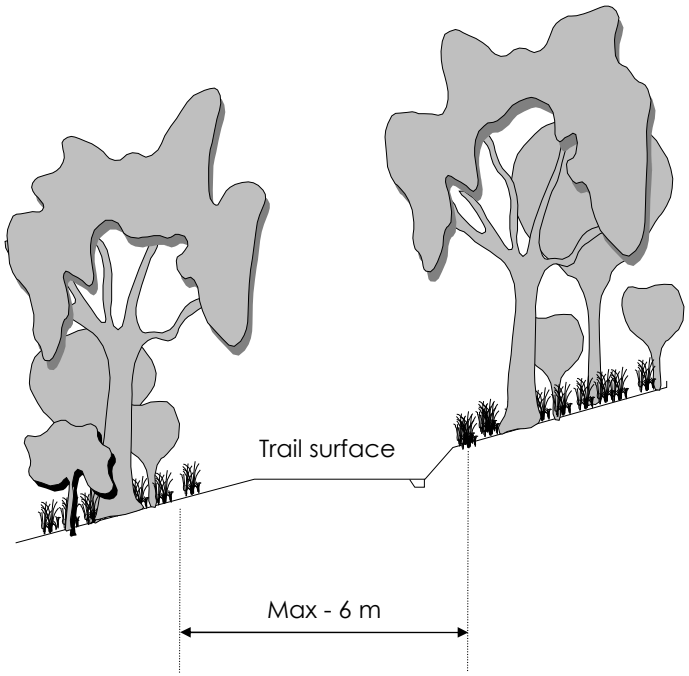
Fire trails are defined in these guidelines as those trails, which have been constructed for the prime role of fire management utilising vehicle based suppression techniques or for vehicle base fire management support. In most cases fire trails should be restricted to service vehicles and should not be available for recreational vehicular access. These trails may be used for other recreational users such as bush walkers, mountain bike riders or horse riders. This recreational usage should be clearly identified in a management plan for the site.

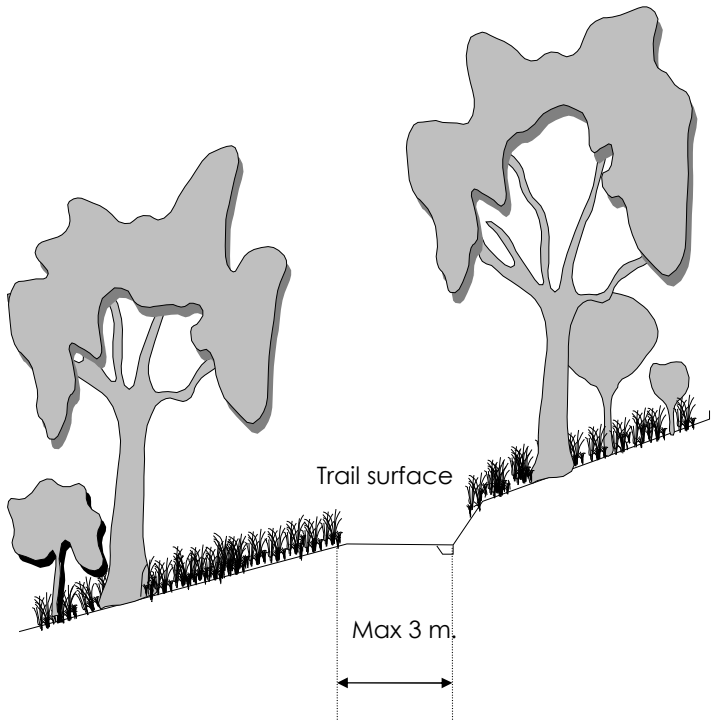
Fire Trail Types - Summary table

Purpose	Slope	Width	Vegetation / Geology	Constraints	Required Fire Trial Type
1. Provide access for large appliances; 2. Provide for rapid movement of appliances; 3. Provide suitable area for direct attack fire suppression activities for small to medium fires; 4. Provide back-burning opportunities for medium to high intensity fires.	$< 5^0$	> 6 m	• Forest, woodland and grassland communities. • Suitable for most substrates.	• Avoid construction on erodible soils. • Cross trail and longitudinal drainage required. • Minimise visual amenity impacts • Minimise disturbance to significant and sensitive vegetation communities.	**A**
1. Provide access for small to large fire appliances; 2. Provide for rapid movement for small fire appliances; 3. Provide back-burning opportunities for small to medium intensity fires; 4. Provide suitable area for direct attack for low to medium intensity fires.	5^0 <> 10^0	< 6 m	• Shrubby and Grassy woodland communities. • Suitable for all substrates.	• Can be utilised on erodible substrates with suitable erosion control mechanisms. • Cross trail drainage required. • Avoid impact to visual amenity. • Minimise impact to significant or sensitive vegetation.	**B**
1. Provide access for small appliances 2. Reduced movement for smaller fire appliances 3. Provide back-burning opportunities for low intensity fires 4. Significant or sensitive vegetation present	$> 10^0$	< 3 m	• Forest, woodland and grassland communities. • Suitable on all substrates	• Cross drainage required. • Use adjacent to sensitive or significant vegetation or creek banks.	**C**

Fire Trail Types - Description

Fire Trail type	Graphic Representation	Fire Trail Purpose and Description
A		**Purpose:** • Type 'A' fire trails are to be used for direct attack operations in all but very high to extreme fire conditions. Back-burning operations can be conducted from type A trails for fire intensities between low too high. • Type 'A' trails allow rapid movement of fire appliances to the fire zone. • Type 'A' trails would be used in open forest and tall woodland communities and in open forest situations where they support other infrastructure such as power lines. **Description:** • The type A trail is a trail which has a width greater than 6m. • The track surface can be constructed of local fill material, however it should be hardened in areas with a slope greater than 8 degrees and in areas with soil that are highly erodible. • Cross trail drainage should be directed into a suitable minor drainage lines which contain sufficient water dissipation structures. • Longitudinal table drains must be constructed on the uphill side of the track/trail. • The type A trail may utilise existing infrastructure access tracks to consolidate maintenance costs if those tracks are suitable for forest fire management. • These trails should not be located along ecotones between different structural communities (e.g. Tall forest - open woodland). • Type 'A' trails should avoid being constructed on highly erodible substrates.

Fire Trail type	Graphic Representation	Fire Trail Purpose and Description
B		**Purpose:** • Type 'B' trails are multi-purpose trails which would provide a suitable break to conduct fire prevention activities (e.g. planned burns) from and to conduct fire suppression operations of low to medium intensity fires. • Type 'B' trails are utilised on all open woodland/forest Vegetation communities with a grassy and/or heathy understorey and grasslands. • Type 'B' trails are used in areas of minor ecological constraint to minimise the environmental impact to an area, however best practice should be undertaken with regard to vegetation removal and erosion and sediment control. **Description:** • This firebreak/fire trail has a width of less than 6m and an additional disturbance zone of less than 1m on either side. • Grass should be encouraged within the disturbance zone to assist in stabilising this area. • The trail surface is formed from on site material. • Water bars and table drains are utilised to manage water flow across and along the trail. • These trails should not be constructed on greater than 10 degrees down slope. • These trails can be used across slopes of less than 15 degrees. Slopes steeper than 15 degrees would make this track ineffective as a firebreak and increases maintenance costs. • These trails would be trafficable by large fire appliances, however passing zones would be required every 100m. • These trails should not be located along ecotones between different structural communities (e.g. open forest - Woodland).

Fire Trail type	Graphic Representation	Fire Trail description and Purpose
C		**Purpose:** • Type 'C' trails are multi-purpose trails which would provide a suitable break to conduct fire prevention activities (e.g. planned burns) from and to conduct fire suppression operations of low intensity fires. • Type 'C' trails are utilised on all open forest /woodland vegetation communities with a grassy and/or heathy understorey and grasslands. • Type 'C' trails are used in natural areas with ecological constraint to minimise impact to the area. **Description:** • This fire trail has a maximum width of 3m. • The trail surface is formed from on-site material. However in slopes above 10° an aggregate mix must be used to assist in stabilising the trail surface • Water bars and table drains must be constructed to manage water flow across and along the trail. • Type 'C' trails should not be constructed on slopes greater than 15°. • This trail can be used across slopes less than 15°. Slopes steeper than 15° would make this track ineffective as a firebreak and increase maintenance costs. • This trail would be trafficable by small fire appliances, however passing areas would be required every 100m. • This trail type should not be located along ecotones between different structural communities (e.g. open forest/ woodland).

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Construction and Maintenance

Fire Trail Construction

Objective
To construct fire trails which optimise access for fire management and safety for the community and fire fighting personnel and which minimise the impacts to the ecological, cultural and visual amenity values of an area.

Flow Chart

The fire trail construction process is represented by the following flow chart:

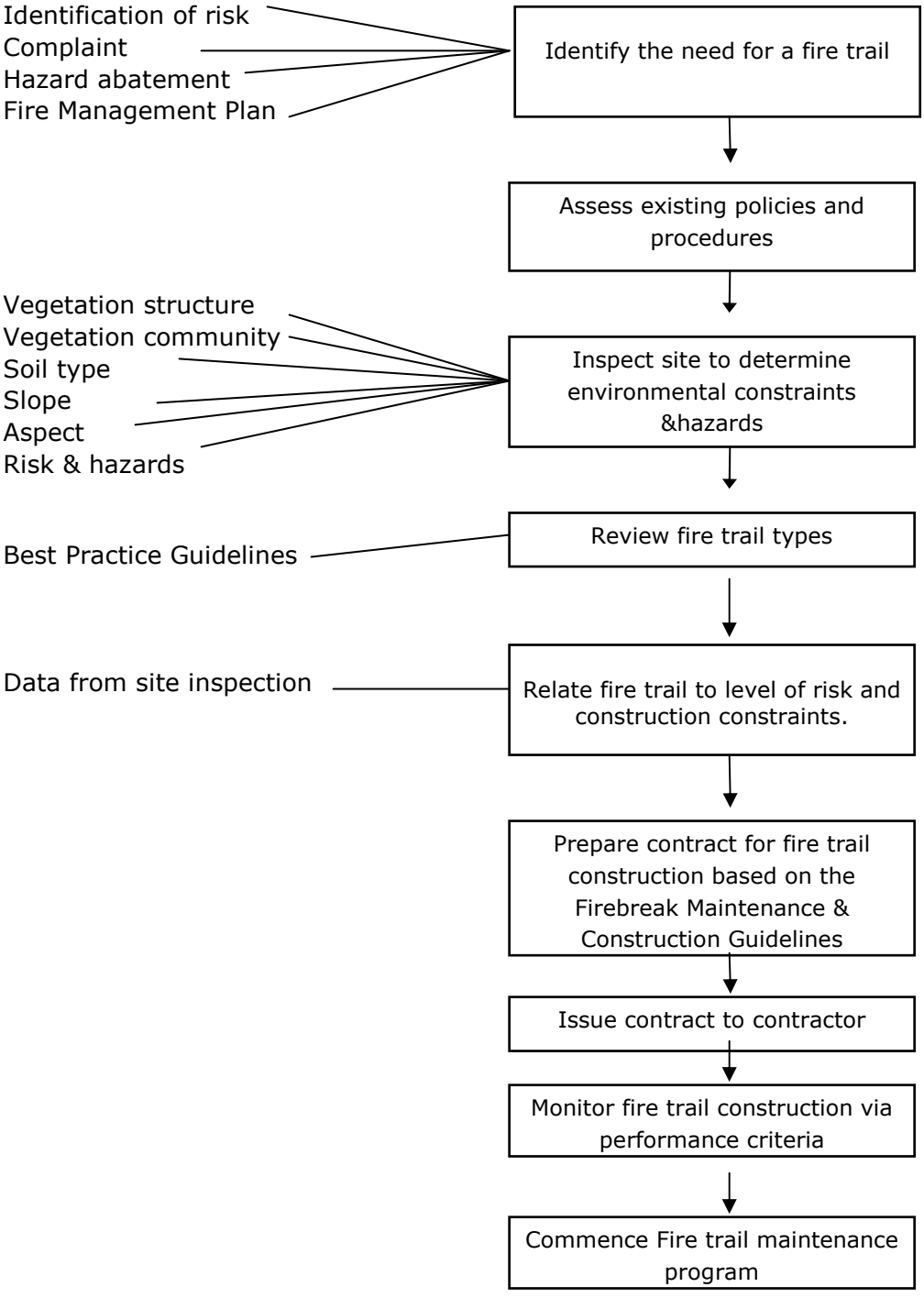

Table 12 - Fire Trail Construction – Best Management Practice

Action	Best Management Practice	Performance Indicator
Assessment	Identify fire prone areas on aerial photos and fire prone areas map	• Areas identified through overlay of fire prone areas, ecological and cultural constraints
	Review available ecological, cultural and geological information.	• Relevant ecological, cultural and geological identified and documented.
	Undertake a site inspection to assess on-ground information with respect to documented information.	• On site inspection undertaken and findings documented.
Design	Relate field data to risk mitigation needs.	• Field data review and analysed.
	Identify best fit for the fire trail.	• Fire trail specifications reviewed.
Consultation	Consultation should be undertaken with any land owner, agency or community group who has a stake in the site or construction of the fire trail	• Consultation undertaken and issues and agreements / concerns documented
	Identify organisations/agencies that may benefit from the construction of a fire trail with regard to locating infrastructure.	• Organisation / agencies identified and discussions held.
Joint Agreements	Enter into joint agreements with regard to the construction of fire trails.	• Joint agreement reached, documented and signed by all parties.
Vegetation removal or modification	Remove all standing vegetation for a distance specified in the fire trail type description. A machine which will achieve the desired outcome without impacting on the site unnecessarily should undertake this. Trees protected by a Local Law i.e. Local Law 26 –Protection of Vegetation (HBCC), Local Law 43 – Vegetation Management 2006 (MCC) or Local Law 56 – Preservation of Trees (WSC) must be deemed a significant fire threat before approval is sought for removal.	• All standing vegetation, except grasses, are removed; and • Regrowth from cut trees and shrubs is minimised.
	All removed vegetation should be mulched and utilised on site to protect the disturbed areas from erosion until a grass ground cover can be regenerated. ***Note**: Environmental weeds are not considered to be Vegetation for the purposes of these practices. It is considered that environmental weeds would be removed as a matter of course during the firebreak construction and appropriate hygiene practices undertaken.*	• No off site disturbance has occurred without prior authorisation.
	Erosion and sediment control works should be undertaken down slope of these works. (e.g. sediment fences, hay bales etc).	• Erosion and sediment control works are constituted prior to the commencement of firebreaks construction works.
	An experienced operator should undertake vegetation removal from the fuel-reduced zone by hand or with a small machine (e.g. Bobcat). This vegetation should also be mulched and utilised on site for erosion control during the rehabilitation stage.	• An appropriate service level agreement should be developed for the task. • Rehabilitation of the understorey through the most appropriate rehabilitation

Action	Best Management Practice	Performance Indicator
		techniques.
Vegetation removal or modification (Cont.)	Grasses must be retained on site in areas with highly erodible soils.	▪ Grasses retained on site following site clearance and modification works.
	Fine and medium fuels should be removed from the fire trail where practicable. ***Note:*** *the total removal of fire fuels may not be achievable. However, the removal of the majority will break up the fuel profile and may then assist in impeding the movement of a fire across the firebreak*.	• The fire trail contains minimal fine fuels and no medium fuels prior to fire season.
	All environmental weed species should be removed from the fire trail. Post disturbance environmental weed control should be undertaken to minimise further invasion/impact to the area.	• All environmental weeds removed from the whole fire trail.
	Soil disturbance must be kept to a minimum.	• Defined areas that require the disturbance of the soil profile should be identified in the contract.
Sediment and Erosion Control	Any cut and fill area must be stabilised to ensure longevity of the fire trail and reduce maintenance costs.	• Areas that are required to be disturbed are to be clearly identified prior to the commencement of onsite works.
	Sediment and erosion control measures are required along the whole disturbance site and these need to be retained until the disturbance is stabilised.	• Erosion and sediment control works are to be constituted prior to the commencement of onsite works.
	Water inverts should be constructed across the new break to ensure appropriate cross drainage. These water inverts should be placed at regular intervals, which relates to the slope and erodability of the land and soil.	• Water inverts constructed to specifications as required.
	Side drains can be utilised when there are restrictions on the construction of cross inverts. These drains should contain minor drop structures to assist in dissipation of water velocity along the drain.	• Side and table drains constructed to specifications.
	When conducting operations related to fire trail construction, care should be undertaken to reduce the noise and dust impacts to the surrounding community and environment. Care should also be undertaken to minimise the impacts to the visual amenity of the site.	• No complaint received regarding noise and/or dust impacts on the surrounding / adjoining community

Firebreak and Fire Trail Maintenance

Objective

To ensure the maintenance of all firebreaks and fire trails on Council managed bushlands so that fire protection objectives are achieved without impact to the sites ecological, cultural and landscape amenity values.

Maintenance Flow Chart

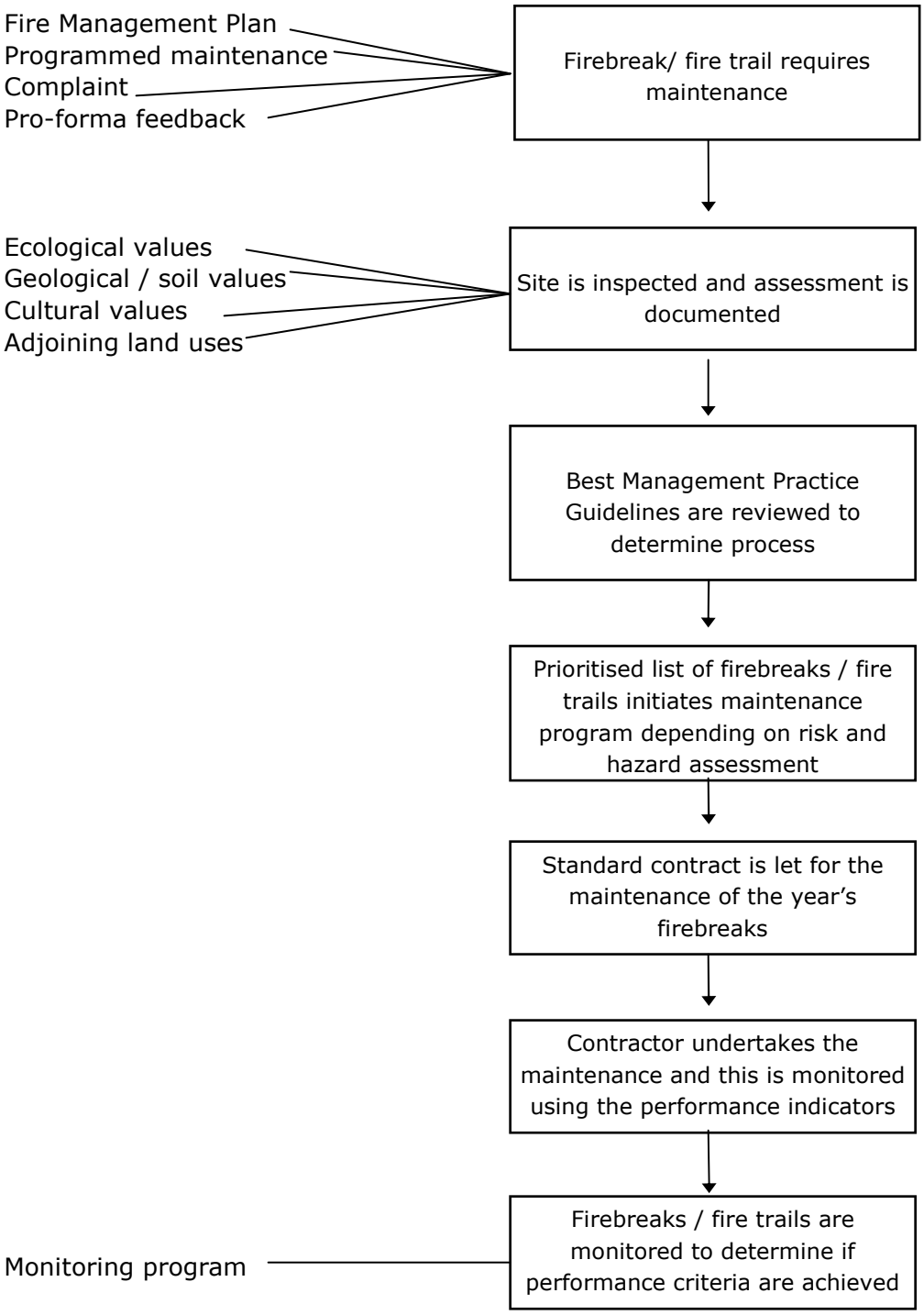

Table 13 - Firebreaks and Fire Trails Maintenance - Best Management Practice

Action	Best Management Practice	Performance Indicators
Vegetation	All regenerating vegetation within the firebreak should be slashed or brush cut below a height of 100 mm. An appropriate herbicide must be applied to minimise regrowth.	• All grassed firebreaks are to be maintained to a height of less than 100mm.
	All fine fuels and regenerating shrubs should be removed from within the fuel reduced zone. Low flammable shrubs may be retained for soil and habitat protection.	• All fine fuels and flammable shrubs to be maintained / removed.
	Dead and fallen branches of all sizes should be relocated further into the bushland (> 10m) as they provide suitable habitat for invertebrates and small vertebrate species.	• All branches removed from the firebreaks / fire trails.
	In firebreak types that predominantly consist of grasslands and in areas where slashing will not produce the desired outcome, the use of a prescribed burn within the firebreak is acceptable.	• Burnt firebreaks are to be completely blacked out prior leaving the site; and • No prescribed burning is to be undertaken if the area is subject to erosion.
	Attention should be taken of new branch growth from trees adjacent to the firebreak or fire trail and these removed if they present a problem to the integrity of the break.	• Removal of all new branch growth from trees adjacent to the firebreaks.
Joint agreement	Joint agreements should be sought with major landowners regarding the maintenance of joint firebreaks.	• A joint agreement has been documented regarding the maintenance of firebreaks / fire trails.
	Review of joint agreements is to be undertaken as part of the continued consultation process.	• Agreements with major land owners reviewed and changes documented within the agreement.
Sediment and Erosion control	All water bars should be cleaned out every year prior to winter.	• No clogging or sedimentation of the water bars from track erosion.
	Any tunnel or gully erosion lines within a firebreak or fire trail should be repaired and if necessary additional water inverts be constructed to reduce the instances of further erosion.	• All erosion areas are repaired within in one month of identification or less in rainy periods.
	Sediment and erosion control measures should be employed in areas that require any soil profile reinstatement or modification.	• No occurrence of erosion from newly reinstated earth works.
Maintenance frequency	The maintenance should be of a frequency to maintain the effectiveness of the firebreaks or fire trails and to protect the sites ecological, cultural and visual amenity values.	• No degradation of the quality of the firebreak or fire trail from erosion. • No degradation of the firebreak or fire trails ecological values. • No increase in the incidence of environmental weeds invasion into the bushland area adjacent to the firebreak or fire trail.

Bushfire Educational Resources

The Southeast Queensland - Fire and Biodiversity Consortium (SEQFABC) has developed an extensive education package about fire and biodiversity protection. This package is primarily targeted to private property owners of bushland blocks; however it can also be used as part of an education program for Local Governments to inform and educate adjacent property owners to Council's managed land about bushfire management and the biodiversity values within such land.

This document has not been reproduced in this Guidelines however the document is available on the FABC web site and the link is provided below.

The FABC has two education documents:

- A 4 page introductory fact sheet, and
- A 20 page in depth booklet relating to fire and biodiversity protection.

These documents are available from the following web address.

http://www.griffith.edu.au/environment-planning-architecture/southeast-queensland-fire-biodiversity-consortium/resources/educational-materials

Glossary of Terms

Term	Definition
Access Point	Point of safe entry and exit onto a reserve area, of sufficient width and level surface to allow fire fighting and management vehicles entry into the reserve.
AFAC	Australian Fire Authorities Council. This national body has been established to coordinate research, training and education in fire throughout Australia.
Aspect	Aspect of a landscape is the direction that the face or slope of land faces when aligned to the magnetic compass. E.g., a slope facing west has a westerly aspect. In Fraser Coast Region, the westerly and northerly aspects are usually the driest and hence more fire prone than easterly and southerly aspects.
Dwell time	Dwell time is the time for a flame or fire to burn at a specific point in a fuel matrix.
Fire Management Zone (FMZ)	A designated area within or contiguous with the planning area which requires specific management prescriptions as identified in the FMP or other management planning documents. E.g., Conservation protection zones pertain to an area of reserve that has significant flora, fauna or habitats which are intolerant to fire.
Fire Management Block (FMB)	A discrete area identified in a Fire Management Plan with a discernible operational boundary on which a specific planned burn is planned.
Fine Fuels	Dead, dry or otherwise combustible material of a diameter up to 6 mm. (E.g., twigs, leaves, grass).
Firebreak	A firebreak is a constructed or natural feature lacking the Vegetation or fuel necessary to carry a ground fire, and that reduces the rate of spread and intensity of any fire that may occur in an area of standing Vegetation.
Fire frequency	Fire frequency is the measurement of the number of years between successive fires that burn through a specified area.
Fire intensity	Fire intensity is the measurement of the heat generated by a fire over a given distance. Intensity is measured in kilowatts per metre kW/m.
Fire Management Plan (FMP)	A document outlining the management of fire hazards within a specific area of standing Vegetation. It details the objectives for management of the area and the nature, including the application of planned burning and timing of specific management actions to be used to meet the defined objectives.
Fire prone	Fire prone is an assessment of an area of Vegetation that has the potential to burn under suitable conditions.
Fire risk	The potential for a fire event to impact on infrastructure, cultural, historical or ecological assets within or contiguous with a bushland area.
Fire trail	A track, path or trail capable of being used as a point to conduct fire prevention or suppression activities. Fire trails are primarily for use for vehicles such as four-wheel drives.
Foliage Projected Cover (FPC)	Measure of canopy projection for a given vegetative community or area given as a percentage of the total area.
Fuel Free Zone (FFZ)	A Fuel Free Zone is an area of a firebreak, which contains virtually no fuel. This area usually consists of the firebreak proper and provides a fuel free zone against a property boundary of a built asset.
Fuel Load	Estimated volume of combustible fuels available in a defined area of Vegetation type expressed as tonnes per hectare (t/ha).
Fuel matrix	Fuel matrix is a description of the types and locations of fuels within an area of Vegetation. E.g., a fuel matrix may consist of ground fuel made up of leaves and sticks as well as suspended fuels in shrubs and bark in trees.

Term	Definition
Fuel Reduced Zone (FRZ)	An area where available fine fuel or standing vegetation has been removed or reduced to a height less than 100 mm.
Hazard	A hazard is fuel complexes defined by volume, type, condition, arrangement and location that determine both the ease and probability of ignition, and fire suppression difficulty.
Inter Burn Period	The minimum or otherwise recommended time stated in years, between successive application of planned burns or occurrence of wildfire in an area.
Ladder Fuels	Arrangement of combustible material or Vegetation structure providing potential for carrying fire vertically into the vegetation canopy. (see "suspended fuels")
Management Plan	A document relating to a specific area, outlining the variety of values and issues contained in that area and which describes the management objectives and actions to enable ongoing management of that area. Specific plans for fire management, weed management, visitor management etc. relate to single issues and form part of an Integrated Management Plan for a specific area.
Planned burn	A fire which has been ignited by a person authorised under a QFRA "permit to burn" in an area of standing vegetation. The fire should conform to specific timing, extent and intensity as prescribed in a Fire Management Plan, and is under the control of the authorised person.
QFRA	Queensland Fire & Rescue Authority, including the Rural Fire Service and the Urban Division (Formerly the Queensland Fire Service)
Rate of spread	The relative forward movement of a fire thorough an area of standing vegetation. rate of spread is usually based on the measurement of the size of the fire perimeter or the increase in area of the fire front.
Remnant Vegetation	Refers to areas of bushland or other vegetation types that have been separated from larger bushland areas within the city.
Standing Vegetation	Describes living and dead vegetation above the ground, including grasslands, heaths, wetlands, and open woodland to closed forest communities.
Stick Raking	Physical removal of dead Vegetation and coarse forest litter.
Suspended Fuels	Elements of fine fuel elevated from the normally compressed ground layer fuels, and thereby drier and liable to create wind-borne "embers" (e.g. bark and leaves caught in branches, dead standing vegetation, flammable live vegetation).
Wildfire	Any unplanned or uncontrolled fire occurring in any area of standing vegetation.

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Appendices

Appendix 1 – Figures

Figure 1 – Map of the region

Figure 2 – Land Tenure

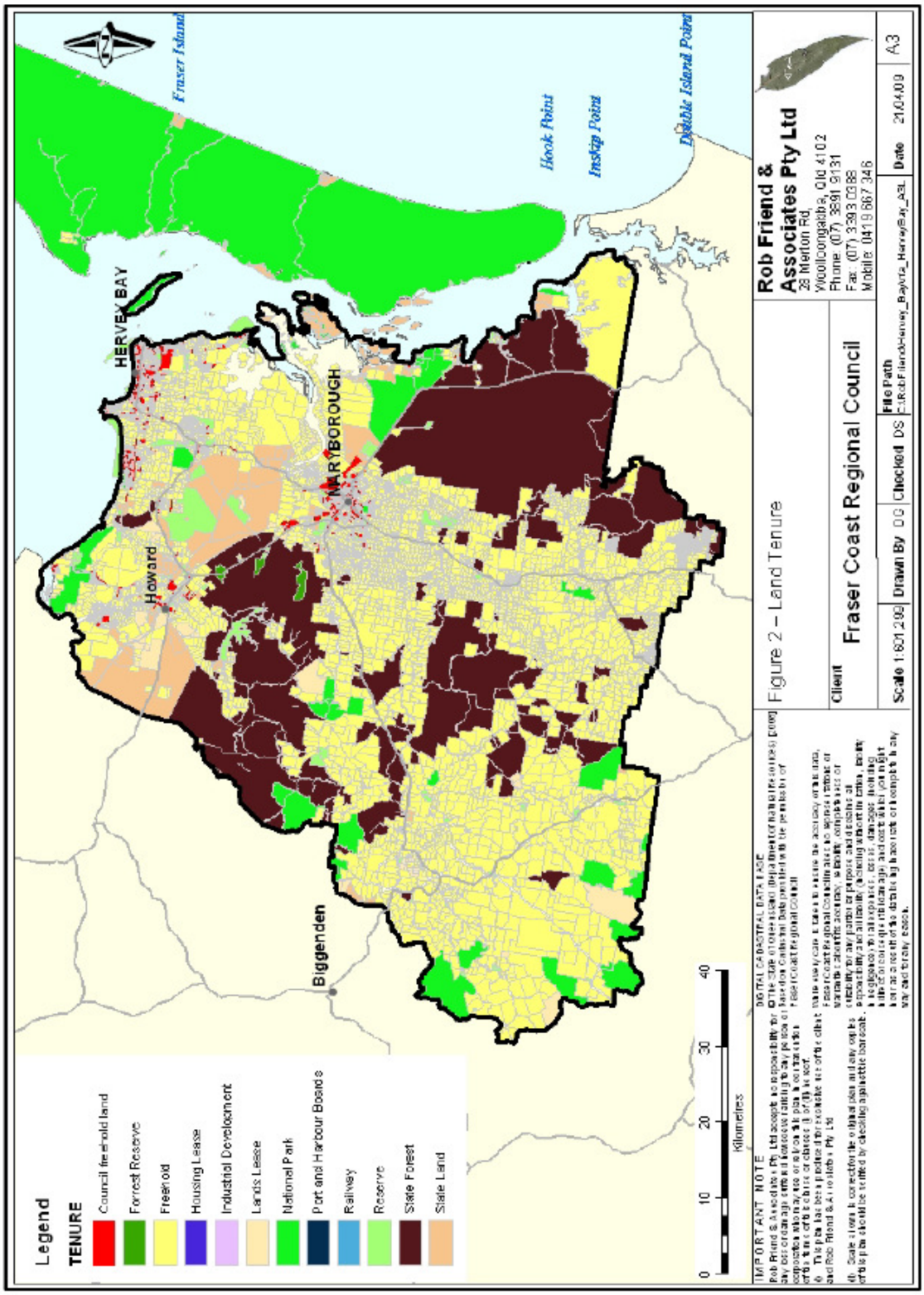


Figure 3 – DEM of the region

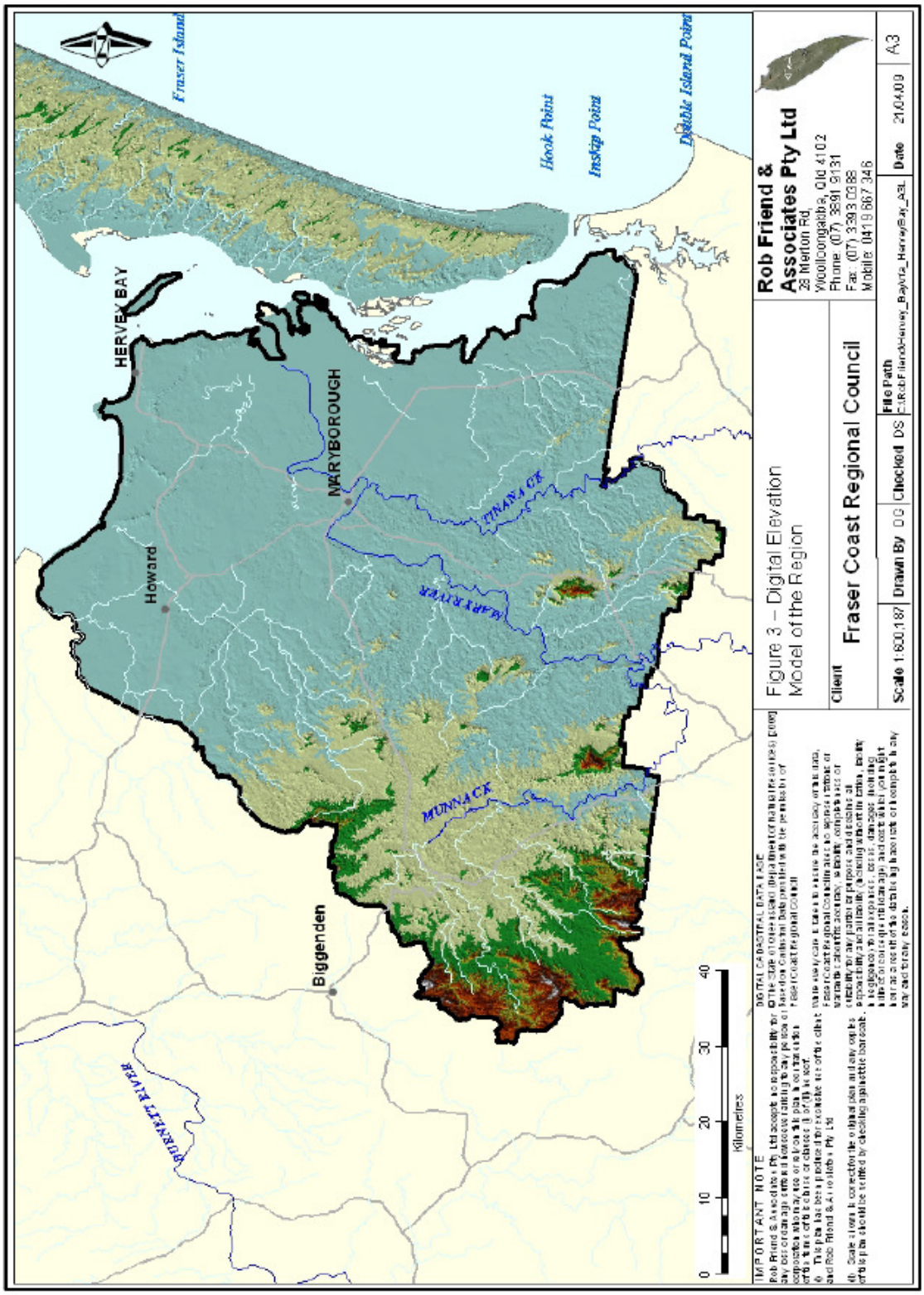


Figure 4 – Vegetation communities map

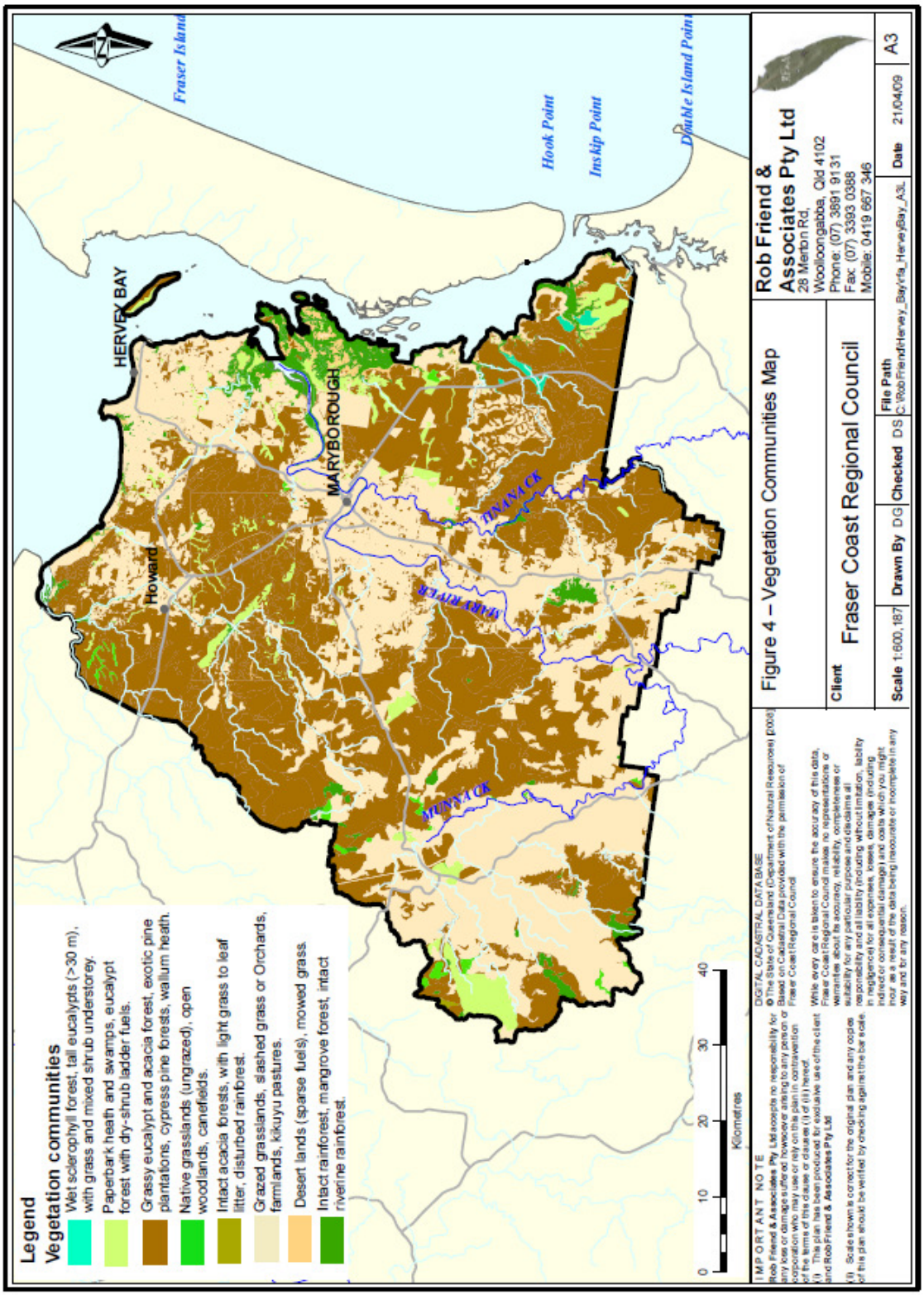
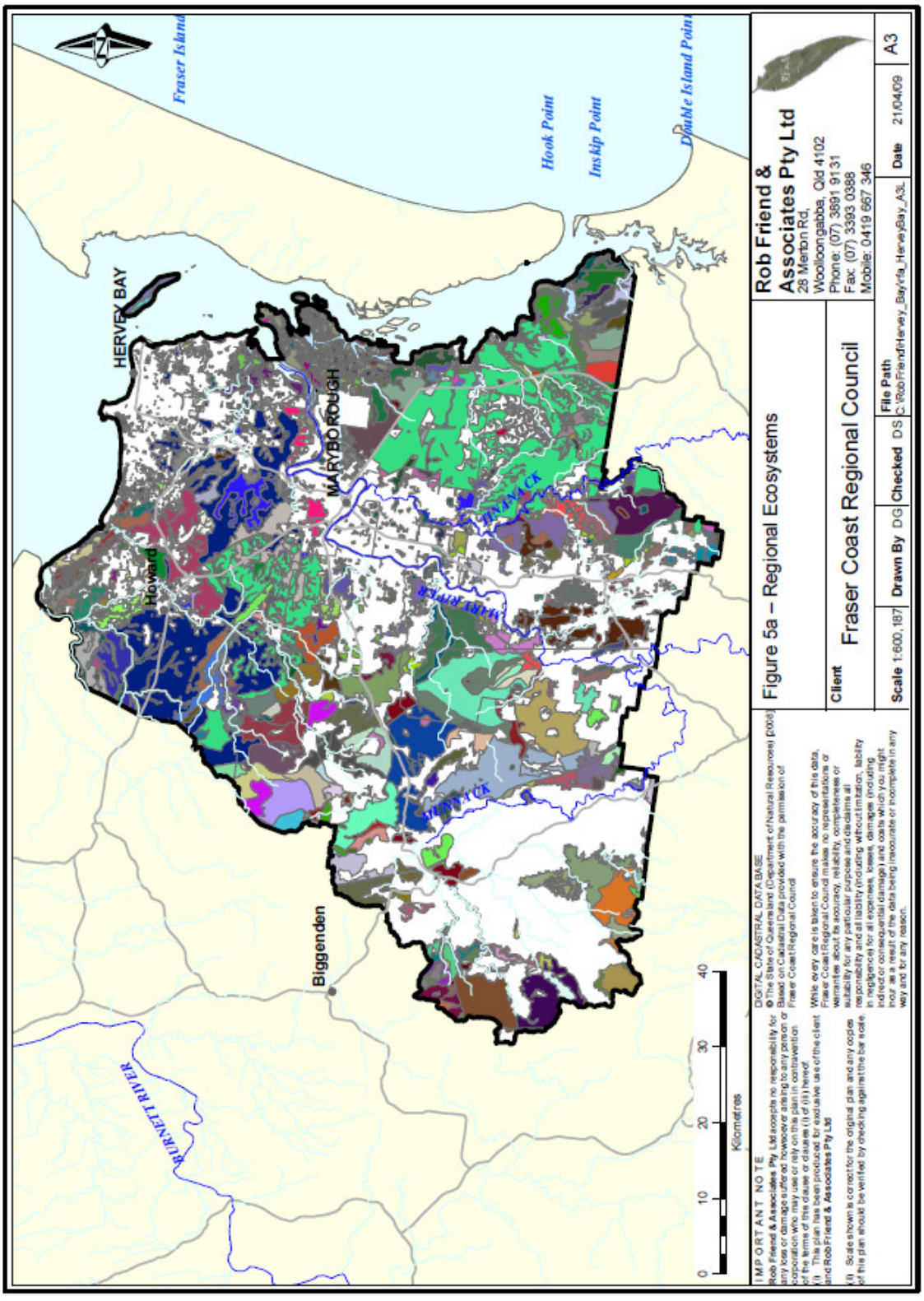


Figure 5 – Regional ecosystems map



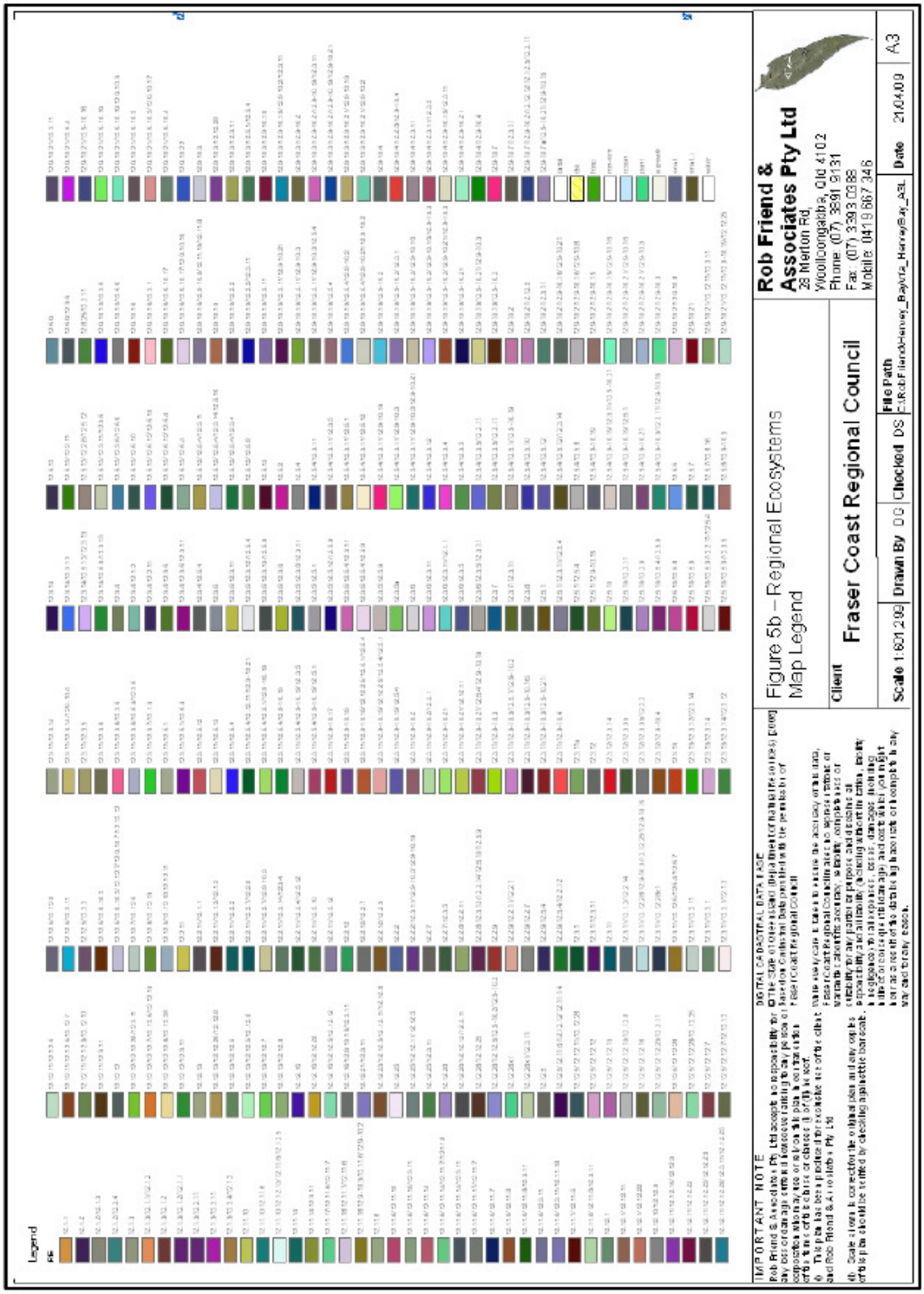

Legend
IMPORTANT NOTE
DIGITAL CADASTRAL DATA BASE
Figure 5b – Regional Ecosystems
Map Legend
Client
Fraser Coast Regional Council
Rob Friend &
Associates Pty Ltd
28 Merton Rd,
Woolloongabba, Qld 4102
Phone (07) 3891 9131
Fax: (07) 3393 0388
Mobile: 0419 667 346
Scale 1:801,202
Drawn By DG
Checked DS
File Path
Date 21/04/09
A3

Figure 6 – SPP1/03 vegetation communities

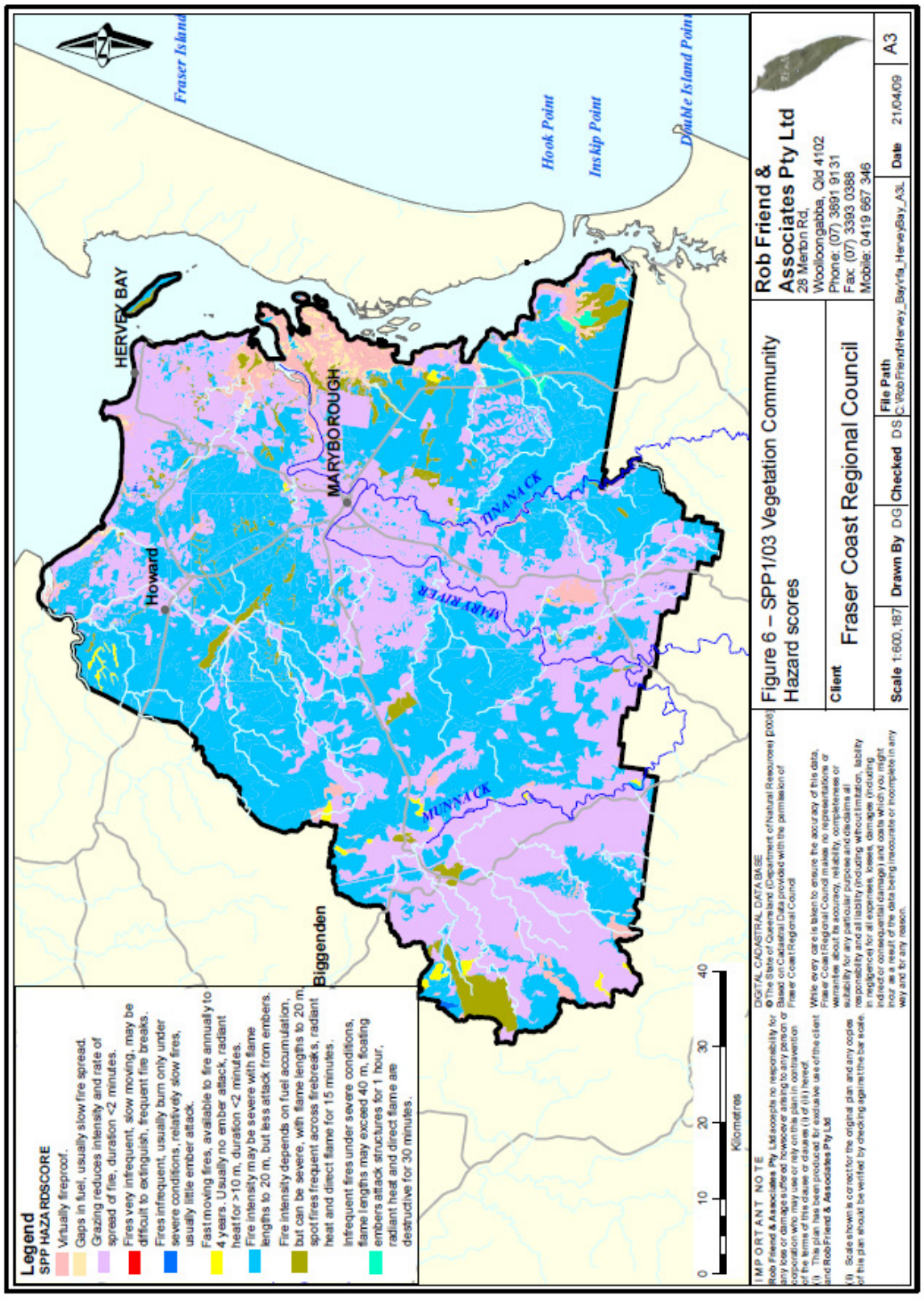


Figure 7 – Slope hazard map

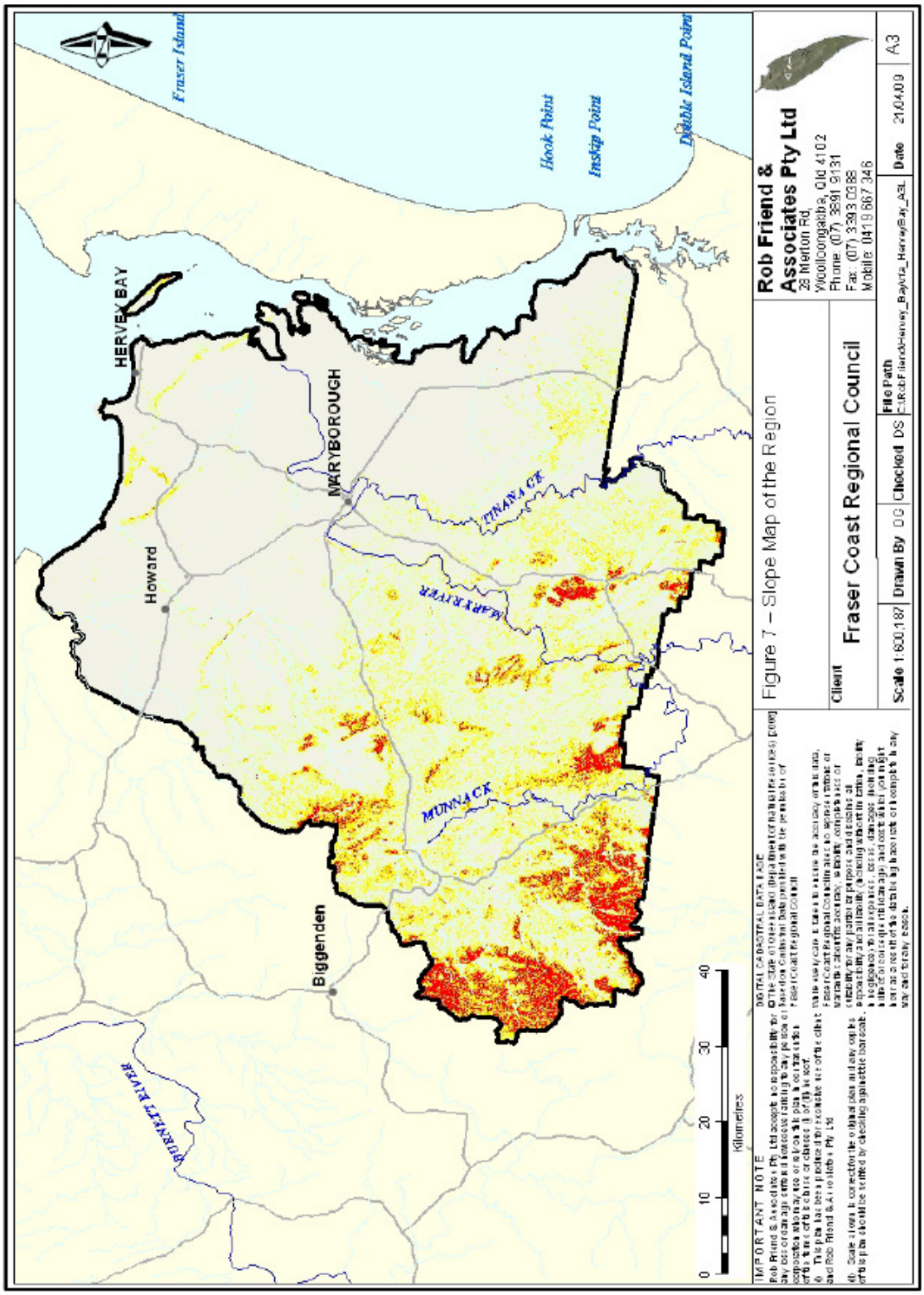


Figure 8 – Aspect hazard map

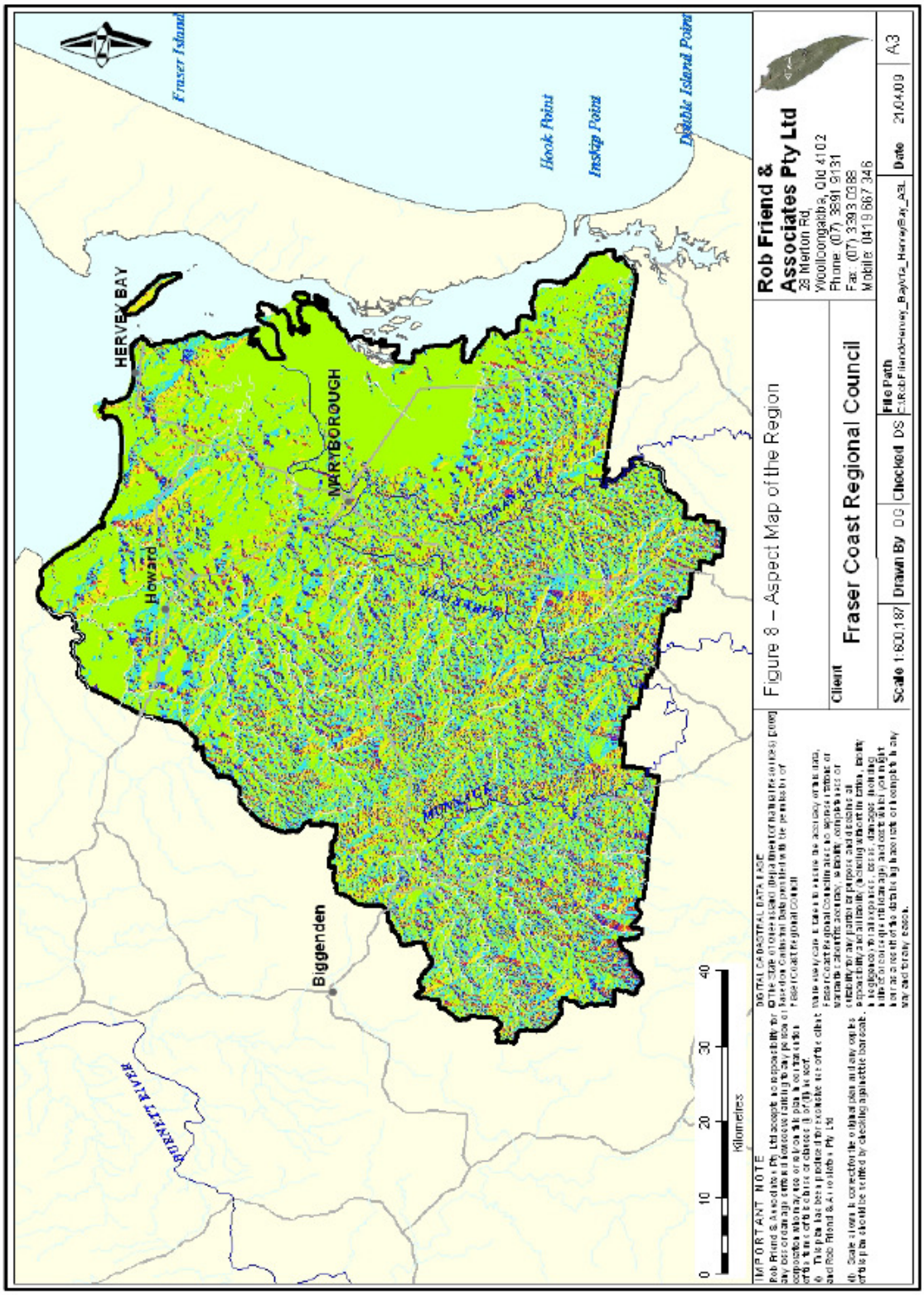


Figure 9 – Bushfire hazard map

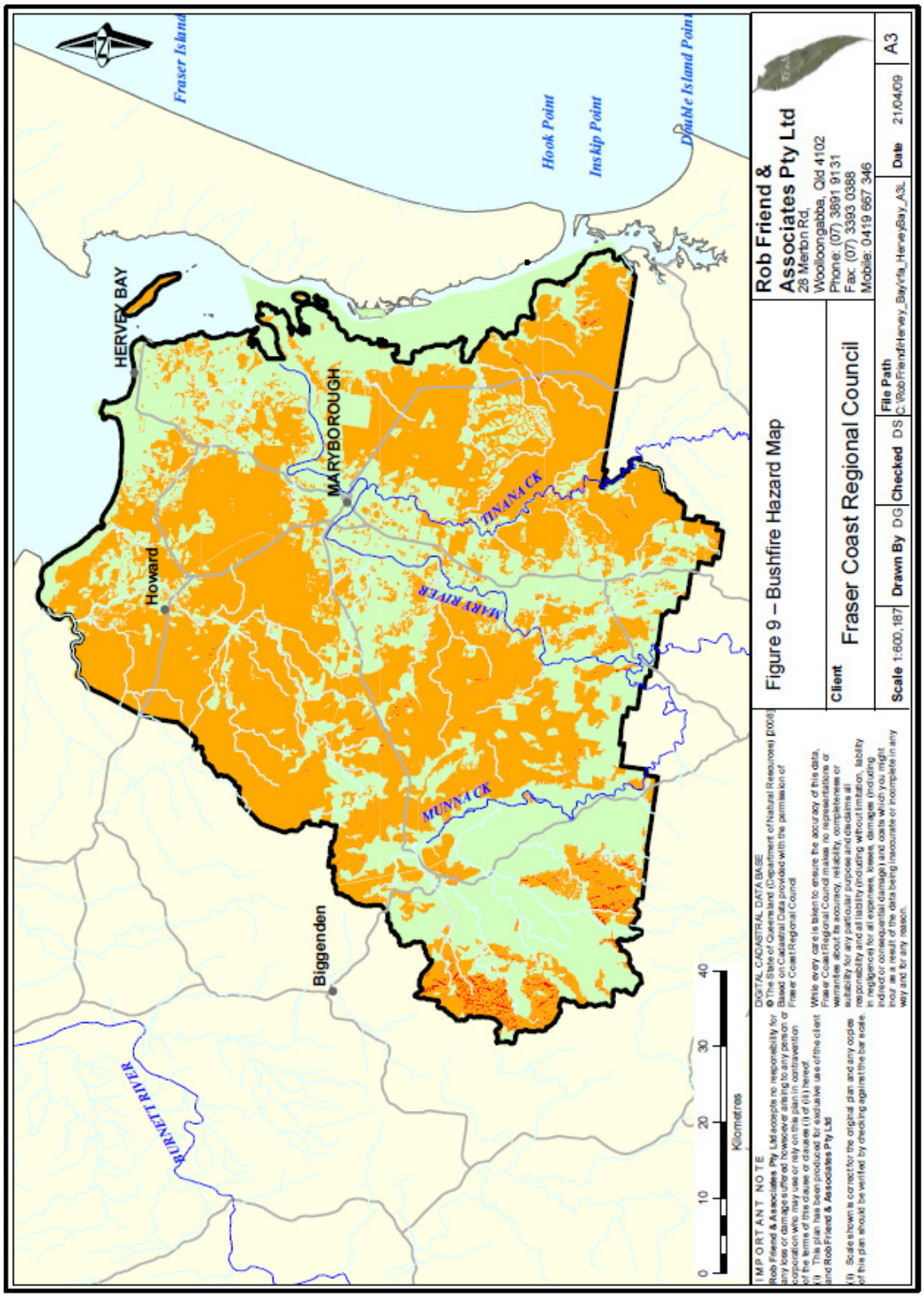
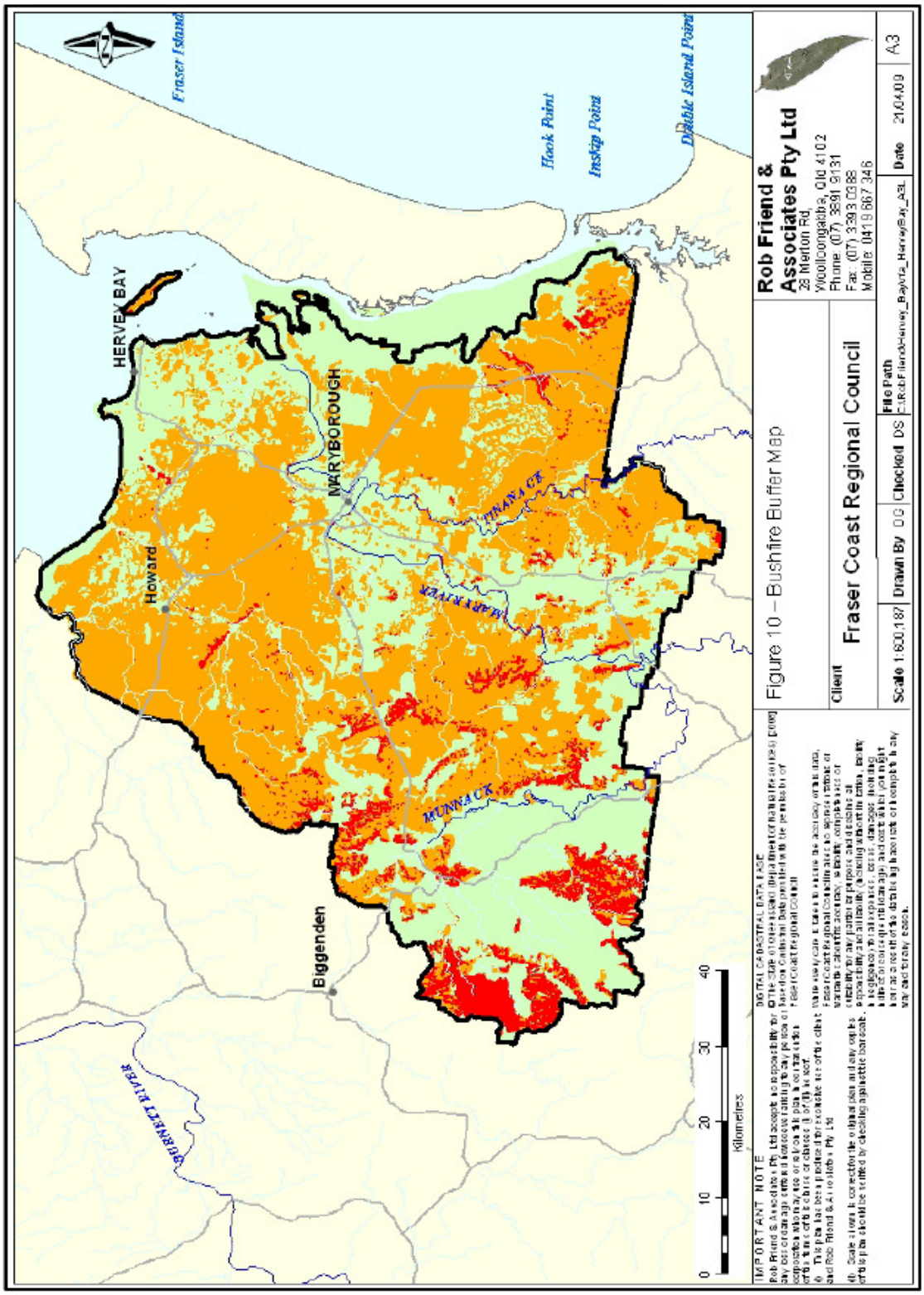


Figure 10 – Bushfire buffer map



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Appendix II – Indicative Fire Management Plan

Fire Management Plan

Generic Format

Fraser Coast Regional Council

July 09

Table of Contents

Introduction

The introduction outlines the plan, the site and objectives.

Legislative requirements

Qld Fire and Rescue Service Act (1994)

Fraser Coast Regional and its corporatised entities as well as all other entities which are owned and/or managed on behalf of Fraser Coast Regional Council and who are responsible for the management of land, are considered to be a land occupier under the *Qld Fire and Rescue Service Act* 1994 (s67). The *Qld Fire and Rescue Service Act* (1994) is the head of power for the Qld Fire and Rescue Service (QRFS) who administers the provisions of the Act and Regulations.

The definition of a land occupier under the act is:

"occupier of land" includes, where there is no person in actual occupation of the land, the person charged by the owner or by law with the management of the land.

The act also defines the term occupier.

"occupier", used with reference to any premises, means the person in actual occupation or, if there is no such person, the owner.

Section 67 of the Act requires Fraser Coast Regional Council to ensure it manages fire within its property and takes all reasonable steps to ensure a fire within its property does not impact on life property and/or the environment within neighbouring properties.

The act also requires Fraser Coast Regional Council to obtain a permit to burn from the closest QFRS station or fire warden prior to conducting any burns within their property.

Other relevant State or Federal Acts may be included here

Local Laws - Fraser Coast Regional

The relevant local law and its requirements are to be inserted into this section.

Site description

Location

Describe the location e.g. where it is, it property description, size and the general landscape within which it is located.

Landscape

The landscape within which the site is located including significant geological features such as steeply sloping land, waterways etc.

Vegetation

A detailed description of the vegetation communities identified and described within the site is to be placed here. Significant flora species which are listed in the Nature Conservation regulations 1994 are also highlighted here.

Fauna

A detailed description of the fauna and habitat values of the site is recorded here. Significant fauna species as identified in the Nature Conservation regulations 1994 are also highlighted within this section.

Summary of Ecological Issues

A summary of the significant ecological features or issues within and immediately adjacent to the site is to be recorded here.

Fire hazard

State Planning Policy - Fire Hazard Assessment Methodology

The State Government has recently released a State Planning Policy (SPP01/03) titled Mitigating the Adverse Affects of Flood, Bushfire and Landslip.

This SPP is predominantly to be referred to with respect to development within Queensland and stipulates that each local government is to develop a set of maps which clearly identify areas which a fire prone.

The SPP also provides a methodology for the assessment of Fire Hazard, which alters the previous methodology which has been used in Queensland until September, 2003.

The State Planning Policy uses the following parameters to determine a fire hazard rating for a specific area of land:

- Vegetation

The Qld Rural Fire Service in conjunction with the Qld Herbarium has developed a set of fire hazard ratings for vegetation using regional ecosystems as described by Sattler P & Williams R (1999) as the basis for prescribing a fire hazard score. This rating is at a higher level than those provided within the SPP01/03 Guidelines.

A list of the vegetation communities / regional ecosystems is placed here along with their fire hazard rating.

Vegetation community	Hazard score

- Slope

Slope is classified into four slope categories as detailed below.

Slope	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%)	1

*[**Note:** For site-specific assessment of bushfire hazard, if the site is downhill from the hazard, the slope effect may be taken as zero as the fire intensity will be less. However, burning heavy fuels may roll downhill and trees may fall down, so recommended setbacks from the hazard still need to be observed.]*

- Aspect

Aspect is classified into four classes which are detailed below.

Aspect	Hazard score
North to North-West	3.5
North-West to West	3
West to South	2
North to East	1
East to South and all land under 5% slope	0

The scores for the individual factors determined for vegetation communities, slope and aspect are added together to give a total for each sub-unit as follows:

Total hazard score = vegetation community hazard score + slope hazard score + aspect hazard score.

The total hazard score determines the severity of bushfire hazard for each sub-unit as set below.

Table A3.4: Hazard score ranges to identify the severity of bushfire hazard

Total hazard score	Severity of bushfire hazard
13 or greater	High
6 to 12.5	Medium
1 to 5.5	Low

Site Fire Hazard Assessment

The calculation of the fire hazard rating for the site or for specific sections of the site depending on how the site is configured or on its size is recorded here.

Map 1 - Site Map

Insert a site map here

Map 2 - Vegetation map

Insert a vegetation map here

Planning methodology

Field assessment

The site assessment was undertaken in conjunction with the vegetation survey and recorded data such as slope, fuel loads and aspect and dominant species associations.

Planning method

To provide a method to describe appropriate bushfire management prescriptions it is essential to identify are within the study are which require or are managed for particular purposes or particular outcomes.

This definition is undertaken using two spatial areas:

- Fire Management Zone (FMZ); and
- Fire Management Units (FMU)

Fire Management Zones

Fire Management Zones (FMZ) are those areas within a planning area which have specific management requirements.

The list of Fire Management Zone which can be used may include:

- *Bushland zone - BZ*
- *Infrastructure Zone - IZ*
  - *Buffer Zone - BZZ*
- *Non-burning Zone - NBZ*
- *Rehabilitation Zone - RZ*

FMZ	Description
	▪

Fire Management Units

Fire Management Units (FMU) are those areas within which fire can be managed to achieve the management objectives as identified in the FMZs.

The FMUs are defined by existing firebreaks, fire trails, internal tracks and property boundaries. The FMUs have been identified in Map 4.

The fire management units allow for the development of management objectives of particular areas which have relevance to either:

- Property protection,
- Protection of sensitive and significant vegetation or habitats; and
- Management of appropriate fuel loads.

Map 3 - Fire Management Zones

Insert a map identifying the Fire Management Zones

Map 4 - Fire Management Units

Insert a map identifying the Fire Management Units

Fire Management Units - Management Prescriptions

Insert descriptions of each of the Fire Management Units in the tables below.

Block Number	
Description	
Access to FMU	
Water sources	
Vegetation communities	
Fire Management Zones	
Management objectives	➢
Management prescriptions	1.
Burning regime	

General recommendations

Recommendations relating to fire management and the site in general are noted here.

Glossary of terms

Term	Definition
Access Point	Point of safe entry and exit onto a reserve area, of sufficient width and level surface to allow fire fighting and management vehicles entry into the reserve.
AFAC	Australian Fire Authorities Council. This national body has been established to coordinate research, training and education in fire throughout Australia.
Aspect	Aspect of a landscape is the direction that the face or slope of land faces when aligned to the magnetic compass. e.g., a slope facing west has a westerly aspect. In Fraser Coast Regional, the westerly and northerly aspects are usually the driest and hence more fire prone than easterly and southerly aspects.
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Fire prone	Fire prone is an assessment of an area of vegetation that has the potential to burn under suitable conditions.
Fire risk	The potential for a fire event to impact on infrastructure, cultural, historical or ecological assets within or contiguous with a bushland area.
Fire trail	A track, path or trail capable of being used as a point to conduct fire prevention or suppression activities. Fire trails are primarily for use for vehicles such as four-wheel drives.
Foliage Projected Cover (FPC)	Measure of canopy projection for a given community or area given as a percentage of the total area.
Fuel Free Zone (FFZ)	A Fuel Free Zone is an area of a firebreak, which contains virtually no fuel. This area usually consists of the firebreak proper and provides a fuel free zone against a property boundary of a built asset.
Fuel Load	Estimated volume of combustible fuels available in a defined area of vegetation type expressed as tonnes per hectare (t/ha).

Term	Definition
Fuel matrix	Fuel matrix is a description of the types and locations of fuels within an area of vegetation e.g. a fuel matrix may consist of ground fuel made up of leaves and sticks as well as suspended fuels in shrubs and bark in trees.
Fuel Reduced Zone (FRZ)	An area where available fine fuel or standing vegetation has been removed or reduced to a height less than 100 mm.
Hazard	A hazard is fuel complexes defined by volume, type, condition, arrangement and location that determine both the ease and probability of ignition, and fire suppression difficulty.
Inter Burn Period	The minimum or otherwise recommended time stated in years, between successive application of planned burns and occurrence of wildfire in an area.
Ladder Fuels	Arrangement of combustible material or vegetation structure providing potential for carrying fire vertically into the vegetation canopy. (see "suspended fuels")
Management Plan	A document relating to a specific area, outlining the variety of values and issues contained in that area and which describes the management objectives and actions to enable ongoing management of that area. Specific plans for fire management, weed management, visitor management etc. relate to single issues and form part of an integrated Management Plan for a specific area.
Planned burn	A fire which has been ignited by a person authorised under a QFRA "permit to burn" in an area of standing vegetation. The fire should conform to specific timing, extent and intensity as prescribed in a Fire Management Plan, and is under the control of the authorised person.
QFRA	Queensland Fire & Rescue Authority, including the Rural Fire Service and the Urban Division (Formerly the Queensland Fire Service)
Rate of spread	The relative forward movement of a fire thorough an area of standing vegetation. Rate of spread is usually based on the measurement of the size of the fire perimeter or the increase in area of the fire front.
Remnant Vegetation	Refers to areas of bushland or other vegetation types that have been separated from larger bushland areas within the city.
Standing Vegetation	Describes living and dead vegetation above the ground, including grasslands, heaths, wetlands, and open woodland to closed forest communities.
Stick Raking	Physical removal of dead vegetation and coarse forest litter.
Suspended Fuels	Elements of fine fuel elevated from the normally compressed ground layer fuels, and thereby drier and liable to create wind-borne "embers"(e.g. bark and leaves caught in branches, dead standing vegetation, flammable live vegetation).
Wildfire	Any unplanned or uncontrolled fire occurring in any area of standing vegetation.

Bibliography

Short Fire Management Plan

(insert Reserve / Park Name)

Site Description: -

Insert general site description, Location, Reserve type & general vegetation description

Adjacent Land-Use and Fire Hazards : -

Insert a description of adjacent land use i.e. rural, rural residential, urban, significant or community infrastructure

Firebreak descriptions: -

Provide a description of existing bushfire protection infrastructure such as firebreaks, fire trails etc

Management Prescriptions: -

Management Prescriptions	Action Required	Cost / Implementation time
1. Firebreaks	•	•
2. Prescribed burns	•	•
3. Other Actions	•	•

Site Map

Insert map identifying firebreaks, fire trails vegetation types and access points as well as significant infrastructure and or flora and fauna species.

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Appendix III – Pro-formas

1

REPORT VERIFICATION		
Title	Initial	Date
BMO		
Input		

Bushfire Report Form

Officer completing form: -..... Date: -.....

1 LOCATION

Reserve/Park Name: -.....

Fire Management Unit No.:-.....

Location: -.....

2 FIRE TYPE

☐ Wildfire (complete sections 2a and 3 to 6)

☐ Controlled burn (complete sections 2b and 3 to 6)

2a Wildfire

Fire was known OR Estimated To have commenced.....hrs on .....

Detected at.....hrs on.....by Resident Council officer Other

Fire report to:.....at.....hrs on.....

Area burnt on arrival.....ha; Area burnt at blackout.....ha.

Duration of burn:.....hrs. Unknown

Cause of fire: Arson Accidental escape Unknown

2b Prescribed Burn

Burn Commenced at.....Hrs on..... Black out.....hrs on.....

Burn as per FMP YES / NO. (if no why).....

3 Fire Behaviour & Control

Location of fire, points of ignition, description of fire movement and success of bushfire protection infrastructure i.e. firebreaks/control lines

.....

.....

.....

.....

2

Who attended the fire? Council FRT Fire Brigade Local residents Unknown

4 Burn Area Details (include details on vegetation fire burnt through, fire intensity, climatic conditions occurring on the day or days the fire burnt on)

.....

.....

.....

.....

.....

5 Injuries and/or damage to equipment (note all injuries are to be reported on the appropriate incident report. All damage to vehicles are to be report to the insurer)

.....

.....

.....

.....

Injuries reported YES / NO

Equipment damaged reported YES / NO

5 Impacts (include impacts to assets/infrastructure such as fences, signage, structures and death of trees)

.....

.....

.....

.....

.....

6 General or Other Comments

.....

.....

.....

.....

.....

Attach copy of burn area map

Reporting Officer..... Date:.....

Bushfire Management Officer.....Date.....

Fire Monitoring Pro-forma: - Vegetation Data

Park_____ Site No._____ Date __/___/____

Recorder_____ Photo Number_____ Transect W)_____L)_____

Species	Stratum	Diameter

Understorey

Height class						
Species	0-.5m	Total	0.5 1 m	Total	1 m – 5 m	Total

Photo Monitoring Point Establishment

Park/Reserve Name: -	Recorder: -
Date: -	
Plot location: - (Mark location with GPS, on map and attaché to form)	
Monitoring Plot No. (Eg CCC FM site 04)	
Vegetation Type (regional ecosystem &/or local description	
Soil type: -	
Topographical position: - ▪ Ridge top ▪ Hill slope ▪ Plain or flat ▪ River bank/Flood plain/Riparian zone	
Plot aspect:	
General comments: -	

Species List – Photo Monitoring Point

Growth form: - G – grass; S – shrub; t – small tree; T – Large tree; V – vine; W - weed

No.	Species Name	Common name	Form
1			
2			
3			
4			
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36			

Fuel Load Sampling

Park:

GPS:

Site Number -
Collected by :

Date:
Quadrate size - 0.5 m2

Sample No	H/M/L	Wet weight (g)	Bag weight (g)	Total weight (g)	Dry weight(g)	Bag weight (g)	Total (g/0.5m2)	Total T/Ha

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Appendix IV – Bushfire Management Equipment

Bushfire Management

- Four wheel drive tray back vehicle (one per fire response team)
- 500 litre slip on fire tank and pump and hose real (Rural Fires compliant)
- Couplings for urban hydrant and stand pipes as well as rural tanks
- Dam filling hose & coupling
- Rake hoes
- Back pack spray units
- Drip touch
- Chainsaw and tree limb extension bar
- Safety signs for road and track closure
- UHF radios with linkage to State Emergency Service radio network
- Each team member is required to be issues with a Personal Protection Kit containing: -
  Fire resistant overalls
  Hard hat
  Fire resistant gloves
  Breathing masks
  Fire resistant goggles
  Fire resistant boots

Bushfire Monitoring and Fuel Load assessment

Vegetation Monitoring

- Two star pickets;
- 1x 1.8m unpainted with a mark 120cm up from the base
- 1x 2.4m painted black and white at 20cm intervals. The top interval should be painted white with at least nine intervals (180cm) painted.
- Star picket rammer;
- Compass;
- Dymo steel labeller or aluminium tags;
- Flagging tape;
- Clipboard, pen and paper;
- Measuring tape;
- Photo monitoring point establishment form;
- Vegetation monitoring form;
- Small wooden stake for marking location of monitoring point on side of track; and
- Plant press, newspaper and secateurs.

Fuel Load Monitoring

Field

- 1- 1 sq. m. steel quadrate;
- Large double thickness paper or hessian bags;
- Pair of secateurs or grass cutters;
- Hammer / mallet;
- Hand held weight scale (max 30 kg.)
- Permanent ink pens;
- Fuel load monitoring data sheets
- Digital camera; and
- Clipboard, pen and paper.

Office

- Drying ovens;
- Thermometers; and
- Electronic scales.

Appendix V – Priority species threatened by inappropriate fire regimes - Burnett Mary region

Inappropriate fire regimes were identified as a major threat to the following species as part of the EPA Back on Track project

Classification	Scientific Name	Common Name	Threat details
Trees	*Alectryon ramiflorus*		This species is killed by fire. Weed increase risk of fire.
	Cadellia pentastylis	ooline	Fire sensitive.
	Callitris baileyi	Bailey's cypress	Fire sensitive, threatened by too frequent fires
	Cossinia australiana	cossinia	Killed by fire. Weeds increase risk of fire.
	Eucalyptus broviniensis		Requires fire for regeneration, but too frequent fires pose threat
	Eucalyptus pachycalyx subsp. *waajensis*		Fire kills trees outright, high frequency fires limits recruitment
	Quassia bidwillii	shiny-barked gum quassia	Fire kills plants, so fire needs to be excluded. Weeds increase risk of fire.
Shrubs	*Acacia attenuata*	whipstick wattle	Too frequent fires deplete soil seed bank and prevent young plants reaching maturity. Too infrequent fires reduces density.
	Acacia baueri subsp. baueri	tiny wattle	Needs fire at least once every 7 years but not more frequently than every 5 years.
	Acacia eremophiloides		High frequency fires lower rate of recruitment of seedlings to maturity
	Acacia porcata		High frequency fires lower rate of recruitment of seedlings to maturity
	Acacia tingoorensis		Needs fire at least once every 7 years but not more frequently than every 5 years.
	Apatophyllum olsenii		Too frequent fires reduce population
	Boronia keysii	Keys boronia	Fire exclusion is current problem. Needs fire every 10-15 years
	Denhamia parvifolia	Denhamia	Killed by fire. Exotic grasses increase flammability of vegetation.
	Melaleuca groveana		Fire frequency is too high to allow for trees to survive to reproductive age.
	Phebalium distans		Fire needs to be excluded
	Pomaderris clivicola		Fire needs to be excluded
	P. coomingalensis		Fire needs to be excluded
	Swainsona fraseri		Should be burnt every 5-7 years
Cycads	*Cycas megacarpa*		High intensity fire kills seed banks. Cumulative seedling loss will result in population decline
	Macrozamia crassifolia		Fire kills seeds and seedlings. Burn every 5-7 years
	M. longispina		Fire kills seeds and seedlings. Burn every 5-7 years
	M. parcifolia		Fire kills seeds and seedlings. Burn every 5-7 years
	M. pauli-guilielmi		Fire kills seeds and seedlings. Burn every 5-7 years
Orchids	*Diuris parvipetala*		Timing of fires is critical. 5-10 year fire interval
	Sarcochilus weinthalii	blotched sarcochilus	Exclude fire from key habitats/
Herbs	*Blandfordia grandiflora*	Christmas bells	Too frequent or too infrequent fires threaten survival

Classification	Scientific Name	Common Name	Threat details
	Macarthuria complanata		Current fire regime too infrequent, needs fire every 10 years
	Rhaponticum australe		Current fire regime too infrequent
Insects	*Telicota eurychlora*	sedge darter butterfly	Needs micro-mosaic patch burning and retention of unburnt refuges containing food plants.
Reptiles	*Acanthophis antarcticus*	common death adder	Too frequent or too intense fires remove habitat.
	Delma torquata	collared delma	Too frequent or too intense fires remove habitat.
	Lampropholis colossus		Lack of burning has altered habitat.
	Phyllurus caudiannulatus	ringed thin-tailed gecko	Rainforest habitat needs to be protected from fire.
	Strophurus taenicauda	golden-tailed gecko	Maybe threatened from winter fires
Birds	*Calyptorhynchus lathami lathami*	glossy black-cockatoo	Hot fires destroy hollows required for nesting
	Dasyornis brachypterus	eastern bristlebird	Inappropriate fire regimes modify and degrade habitat.
	Turnix melanogaster	black-breasted button-quail	Frequent fires reduce dispersal capabilities through destruction of habitat
	Ninox strenua	powerful owl	Fire intensity can degrade habitat, reduce nest hollows and prey densities
	Pezoporus wallicus wallicus	eastern ground parrot	Inappropriate fire intensity and frequency destroys habitat
Mammals	*Dasyurus hallucatus*	northern quoll	Late season fires degrade habitat
	Kerivoula papuensis	golden-tipped bat	Fire can destroy foraging and roosting habitats
	Petaurus australis australis	yellow-bellied glider (southern subspecies)	Too frequent and too intense fires result in loss of hollows and feed trees.

Minor threat

Classification	Scientific Name	Common Name	Threat
Cycad	*Macrozamia lomandroides*		Fire kills seeds and seedlings. Burn every 5-7 years. Fires required for reproduction. Exclude fire Oct – Mar while plants carrying pollinating cones.
Shrub	*Zieria verrucosa*		Fire needs to be excluded
Insects	*Ornithoptera richmondia*	Richmond birdwing	Inappropriate fire regimes contribute to habitat destruction.
Mammals	*Dasyurus maculatus maculatus*	spotted-tailed quoll (southern subspecies)	Too frequent and too intense fires result in loss of den logs and disruption of breeding.