

Fire Management Plan

Cape Forbin Integrated Fire Management Plan

2009-2014



Incorporating Cape Torrens Wilderness Protection Area, Western River Wilderness Protection Area, Crown Lands, Heritage Agreements, private forest plantations, rural residential and agricultural land.

Department
for Environment
and Heritage



Department for Environment
and Heritage
Kangaroo Island Natural
Resources Management Board



PREPARE. ACT. SURVIVE.



This Fire Management Plan has been produced through a partnership between the Kangaroo Island Council, Department for Environment and Heritage, Country Fire Service, Kangaroo Island Natural Resources Management Board and the Kangaroo Island Bushfire Prevention Committee.

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EXECUTIVE SUMMARY

This Integrated Fire Management Plan for the Cape Forbin area includes Cape Torrens and Western River Wilderness Protection Areas; Crown lands, Heritage Agreements; private forest plantations; rural residential and agricultural land. The plan has been developed as a partnership between Kangaroo Island (KI) Council, KI Natural Resource Management (NRM) Board, KI District Bushfire Prevention Committee (DBPC), Country Fire Service (CFS) and Department for Environment and Heritage (DEH). The plan will provide direction for fire management activities, including bushfire suppression in the area. The plan emphasises the protection of life and property and provides direction for land managers in the protection and enhancement of the natural and cultural heritage of the Cape Forbin Landscape Planning Area. It is important to note there will be a transitional phase where the activities and works proposed in the plan are implemented and implementation will be dependant upon ongoing prioritisation of fire management and regional resources. Some degree of flexibility will need to remain for fire suppression in the areas where there has only been partial implementation of works.

The Landscape Planning Area was identified as a priority for fire management planning on Kangaroo Island, to address the following issues.

- Protection of human life, property and the environment from the impact of unplanned fires.
- Improving the success and safety of fire suppression operations.
- Identification of fuel hazards and fire related risks within the Landscape Planning Area for protection of built assets and natural and cultural heritage values.
- Protection of natural, cultural and built values and maintenance of biodiversity.
- To ensure that sound conservation and land management principles are applied to fire management activities where applicable.
- Management of fire and fire regimes to meet ecological requirements of species and communities that may be at risk from inappropriate fire regimes and unplanned bushfire, based on best available knowledge
- Prioritisation of monitoring and research of fire behaviour and the effects of fire regimes within the Landscape Planning Area.
- Identifying the need for the preparation of a specific community preparedness, awareness and education program in collaboration with the CFS Community Fire Safe program.
- Contributing to the development of a model for community initiated prescribed burning.

These issues are addressed by:

- applying a risk assessment process to identify life, property and environmental values that may be threatened by bushfires
- applying DEH Fire Management zoning principles to guide the management of fuel in Asset and Buffer zones and designating Conservation-Land Management zones

- applying DEH Ecological Fire Management Guidelines to determine appropriate fire regimes in Conservation-Land Management zones
- auditing tracks using the Government Agencies Fire Liaison Committee's (GAFLC) guidelines for fire breaks and fire access tracks in South Australia.

A number of actions as a result of applying the above processes are recommended, including:

- fuel reduction:
 - in Asset and Buffer zones using a variety of methods including prescribed burning and mechanical removal
 - in strategic areas within the Conservation-Land Management zone to provide some landscape protection within native vegetation and increase patchiness within the vegetation (to reduce the possibility of a large areas of native vegetation burning in a single fire event)
 - in strategic areas in Conservation-Land Management zones to minimise the spread of fire through the landscape and the loss and damage to assets in this zone.
- alteration and/or upgrade of fire access points and track classifications to increase the:
 - safety of firefighting personnel involved in a fire suppression effort;
 - response time of fire suppression agencies; and
 - type of resources that can safely be deployed to assist in a fire suppression effort.
- identification of suppression considerations that may assist bushfire operations and contribute to improved fire management.

This draft plan was released for public comment for a period of four weeks. Comments were evaluated and incorporated where considered appropriate. A major review of this plan will occur after five years of implementation, or earlier if required.

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1 SCOPE AND PURPOSE

The purpose of this plan is to provide a strategic framework for fire management activities within the Cape Forbin Landscape Planning Area (27 193 ha) on the north-west of Kangaroo Island (Map 1). The plan defines objectives for life and property protection and ecological fire management and it outlines strategies and identifies priorities for works to meet these objectives.

Fire prevention planning for land use outside DEH managed land is the responsibility of the KI DBPC in accordance with the *Fire and Emergency Services Act 2005*. This unique integrated landscape fire management plan is a partnership between the KI Council, DEH, CFS, KI NRM Board and KI DBPC. Community linkages also include the KI CFS Group and an established reference group within the Landscape Planning Area.

1.1 Approach to Fire Management

Fire is a natural, dynamic, landscape phenomenon that is pivotal in shaping Australian landscapes and ecosystems. This plan takes an adaptive management approach where fire management activities are used to gain an informed understanding that can be applied to future activities. It is therefore important that management processes incorporate informed fire management practices.

1.2 Aims and Objectives of this Fire Management Plan

The aim of this fire management plan is to develop a landscape scale, integrated fire management plan, covering private and public lands, incorporating risk management strategies for protection of life, property and biodiversity assets in an ecologically sustainable manner.

The primary objectives of this plan are to protect human life, property and the environment from the impact of unplanned fires. Additional objectives are as follows.

- To increase the success and safety of fire suppression operations.
- To identify fuel hazards and fire related risks within the Landscape Planning Area for protection of built assets and natural and cultural heritage values.
- To protect natural, cultural and built values and maintenance of biodiversity.
- To ensure that sound conservation and land management principles are applied to fire management activities where applicable.
- To manage fire and fire regimes to meet ecological requirements of species and communities that may be at risk from inappropriate fire regimes.
- To prioritise the monitoring and research of fire behaviour and the effects of fire regimes within the Landscape Planning Area.
- To initiate the preparation of a specific community preparedness, awareness and education program in collaboration with the *CFS Community Fire Safe* program.
- To contribute to the development of a model for community initiated prescribed burning to assist in the implementation of using fire as a land management tool.

2 THE PLANNING FRAMEWORK

2.1 Legislation

2.1.1 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect biodiversity in Australia and integrate the management of important natural and cultural places. This Act requires specific approval for any proposed actions, including projects, developments, activities or alterations that are likely to have a significant impact on 'matters of national environmental significance' including threatened species and ecological communities. There are several flora and fauna species in the Landscape Planning Area (Appendix 1 and 2 respectively) which are afforded protection under this Act.

2.1.2 State Legislation

All landowners are obliged to comply with the *Fire and Emergency Services Act 2005* which outlines responsibilities for fire preparedness. Under this Act, the Chief Officer (CFS) must take steps to have any relevant provisions of a management plan brought to the attention of members of the CFS who might exercise powers under this section with respect to the reserve.

Following the adoption of this Plan by the Native Vegetation Council, any prescribed works or activities that involve vegetation clearance or the use of fire is endorsed under the *Native Vegetation Act 1991*. Works proposed for Heritage Agreement areas will require approval from the Minister for Environment and Conservation.

Under the provisions of the *National Parks and Wildlife Act 1972* (NPW Act) and the *Wilderness Protection Act 1992*, DEH has responsibilities for fire management activities within reserves constituted under these Acts. The *Wilderness Protection Act 1992* provides for the protection of wilderness and the restoration of land to its condition before European colonisation. The *Wilderness Code of Management* (DEH, 2004) has been adopted by the Minister for Environment and Conservation under Section 12 of the *Wilderness Protection Act 1992*. The Code of Management details requirements for fire, emergency and essential management operations in wilderness areas (see Appendix 3). This plan has taken the *Wilderness Code of Management* into account in developing strategies for fire management of Western River and Cape Torrens Wilderness Protection Areas.

The *Natural Resources Management Act 2004* establishes the Natural Resources Management (NRM) Council which has the responsibility to prepare and review the State NRM Plan.

The *Crown Lands Act 1925* is repealed by the *Crown Lands Management Act 2009*. Under the *Crown Lands Management Act 2009* Crown land is described as either:

- dedicated Crown land (land that has been dedicated as a reserve for a specified purpose to a Minister, person or body (including the Kangaroo Island Council or community groups)). Described as a 'dedicated reserve' in this fire management plan.
- Crown leasehold land

- Crown land owned by, or under the control of the Minister for Environment and Conservation
- unalienated Crown land (land that has not been alienated from the Crown, not including those as defined above).

Fire management responsibilities on Crown land falls with the Minister for Environment and Conservation, except where Crown land has been leased or dedicated to another party.

The *Development Act 1993* provides the Kangaroo Island Council with a legislative framework for planning and development and prescribes the establishment of the Kangaroo Island Council Development Plan including a periodic review. The planning strategies contained within the Kangaroo Island Council Development Plan provide specific directions on bushfire management and protection.

2.2 State Context

2.2.1 Local Government

Under Section 76 of the *Fire and Emergency Services Act 2005* (SA) local government(s) comprising a District Bushfire Prevention Committee is required to prepare bushfire prevention plans. Kangaroo Island is considered a district for this purpose and the Council, through its District Bushfire Prevention Committee, has identified the development of landscape scale fire management plans, such as the Cape Forbin Integrated Fire Management Plan, as an appropriate means to meet part of this legislative requirement.

2.2.2 Country Fire Service

Bushfire prevention in South Australia is currently supported through a three tier process: the South Australian Bushfire Prevention Advisory Committee (BPAC), Regional Bushfire Prevention Committees and District Bushfire Prevention Committees.

The CFS provides executive support to the State BPAC and the regional prevention committees, and input into the district committees. State and regional bushfire prevention plans are prepared by the CFS, with district plans prepared by Fire Prevention Officers within local government. As a result of the recent *Ministerial Review of Bushfire Management in South Australia* (Monterola, 2007) amendments to the *Fire and Emergency Services Act 2005* have been recommended as well as changes in regards to bushfire prevention planning and the management framework.

The main aim of the State Bushfire Prevention Plan is:

- *To provide a framework for the protection of life and the reduction of bushfire impact on property and the environment throughout South Australia* (Miller, 2007).

The CFS is the lead combatant agency for fire suppression activities. This plan enables the CFS, DEH and the Incident Management Team to provide recommendations and access information in order to make timely and considered decisions which support fire suppression activities. The remoteness of the Landscape Planning Area, the low resident population and the separation from the mainland mean that the Kangaroo Island CFS Group are heavily relied on for incident management and fire suppression activities for the first 24 hours, particularly in an escalating incident. The co-operation, support and understanding between

CFS and land management agencies such as DEH, private forestry companies and SA Water and the local community have been critical to successful fire suppression on Kangaroo Island, and will be vital to the success of this plan.

2.2.3 Department for Environment and Heritage

DEH has a *Fire Management Policy* (DEH, 2008c) in place with the core objective of managing fire in the State's reserve system to protect life, property and environmental assets, and to enhance the conservation of natural and cultural heritage. Fire management and fire operations on DEH land will be undertaken in accordance with the *Fire Policy and Procedures Manual* (DEH, 2008d).

Under this policy direction, appropriate consideration is given in DEH fire management planning to achieve the dual aims of environmental protection as well as the protection of human life, property and assets. Property protection activities, where recognised as a priority, will be carried out in such a way as to reflect, where practicable, the importance of protecting the dynamics of natural systems.

The State Government has also produced the *No Species Loss – A Nature Conservation Strategy for South Australia 2007 – 2017* (DEH, 2007a). The strategy sets targets for conserving the State's biodiversity, including managing threats such as inappropriate fire regimes.

2.2.4 Natural Resource Management

The State NRM Plan 2006 (DWLBC, 2006) sets the strategic policy framework and resource condition targets for managing the State's natural resources in an ecologically sustainable way by adopting a landscape scale approach, engaging the community and managing natural resources in an adaptive management framework.

The actions identified in the Cape Forbin Integrated Fire Management Plan (IFMP) will contribute to achieving the targets in both the State NRM Plan and No Species Loss Strategy.

2.3 Regional Context

2.3.1 KI District Bushfire Prevention Plan

Fire management planning for land outside of the DEH managed land is addressed through the *Kangaroo Island District Bushfire Prevention Plan* (KI DBPC, 2000) currently being prepared by the KI DBPC. Since the prevention plan was prepared there have been a number of changes to national and state policy and planning, changes to land use on Kangaroo Island (including land division), as well as reforms at the State Government level. These factors coupled with the heightened community concern as a result of the December 2007 fires on the Island provided a strategic opportunity to trial a unique and innovative approach to landscape planning using a model developed in New South Wales by the Rural Fire Service. The approach considers bushfire risk to life, property and the environment across the landscape, regardless of tenure or ownership and facilitates a risk assessment process to aid in the formulation and prioritisation of risk treatment strategies. The *KI Bushfire Risk Management Plan* (KI DBPC, In prep.) will ultimately build upon and replace the abovementioned prevention plan that was last updated eight years ago. DEH is working closely with the KI DPBC in order to ensure strategies, works and recommendations within this Fire Management Plan are reflected within the *KI Bushfire Risk Management Plan*, with the

interests of CFS and the KI DBPC being met through representation on the Cape Forbin Planning Team.

2.3.2 KI Council Roadside Vegetation Management Plan

The Roadside Vegetation Management Plan (KI Council, 2007) is administered by Kangaroo Island Council under delegation from the Native Vegetation Council. The plan has recently been reviewed and the current version was approved for operation for five years from January 2007.

The plan provides a framework for the routine maintenance of native vegetation, and includes specific provisions for fire management, the objective of which is “to manage roadside vegetation to minimise fire threat to life and property and for the conservation of flora and fauna” (p.34). A range of specific actions which can be undertaken in roadside vegetation are included in the plan. The inclusion of bushfire prevention works in roadside vegetation within District Bushfire Prevention Plans is also contemplated.

2.3.3 Natural Resources Management Plan

The Draft NRM Plan for Kangaroo Island has been developed by the KI NRM Board (2008), as a requirement under the *Natural Resources Management Act 2004* (NRM Act), in consultation with the community and stakeholders. The plan, which is linked to the *State NRM Plan* (DWLBC, 2006), describes the condition of the region and the natural resources within the region and identifies goals to improve NRM outcomes on KI. The plan identifies ‘inappropriate fire regime’ as a key threat to terrestrial diversity and also recognises ‘increased fire frequency’ as a potential future risk associated with a changing climate.

Landscape-scale fire management is specified as an objective within the NRM Plan for achievement in the next 5 to 10 years. Landscape-scale fire management planning has already begun on KI, with the initiation of the *Kangaroo Island Bushfire Risk Management Plan* pilot project (see Section 2.3.1) by the DBPC after the December 2007 fires. DEH is contributing to this process to ensure that strategies and actions within DEH fire management planning are integrated into the Risk Management Plan.

The NRM Plan also advocates for the inclusion of biodiversity outcomes into fire management planning. DEH has incorporated biodiversity and ecological management into fire management planning for a number of years (see Section 4.1).

2.3.4 Biodiversity Plan for Kangaroo Island

The Biodiversity Plan for Kangaroo Island states that the magnitude of fires compared to the amount of remaining native vegetation is the greatest threat to the maintenance of biodiversity on Kangaroo Island (Willoughby, *et al.*, 2001). It aims to improve fire management for biodiversity, by establishing baseline information and a detailed monitoring program for pre-fire and post-fire (both on and off reserve), and by using planned burns to protect biodiversity and built assets.

Achieving the objectives of both the INRM Plan and the Kangaroo Island Biodiversity Plan is dependent on the development and implementation of landscape scale fire management

plans. Consequently the Cape Forbin IFMP will make a significant contribution to achieving the fire management objectives of the INRM Plan for Kangaroo Island.

2.3.5 Plans of Management

Flinders Chase Fire Management Plan

The Flinders Chase Fire Management Plan (DEH, 2009) was subject to internal review process in 2008, after it was identified that a revision of the existing plan (DEH, 2003b) was required due to the extensive bushfires in December 2007. The review provided the opportunity to consider and address altered risks to life, property and the environment using recently developed policies, procedures and standards for fire management planning.

The Flinders Chase Fire Management Plan covers the area to the south of the Cape Forbin Landscape Planning Area, that is south of Playford Highway. The Flinders Chase Fire Management Plan incorporates Flinders Chase National Park, Ravine des Casoars Wilderness Protection Area, Cape Bouguer Wilderness Protection Area and Kelly Hill Conservation Park.

DEH Reserve Management Plans

Section 31 of the *Wilderness Protection Act 1992* states that a management plan is required for each Wilderness Protection Area. Plans must, as far as practicable, implement the policies set out in the Wilderness Code of Management (DEH, 2004). DEH is responsible for the management of Wilderness Protection Areas through the Director of National Parks and Wildlife.

The *Cape Torrens and Western River Wilderness Protection Areas Management Plan* (DEH, 2006b) has the objective of “maintaining the wilderness and biodiversity values in the reserves through effective fire management”.

Fire management planning is to:

- be consistent with the *Wilderness Code of Management* (DEH, 2004)
- identify natural and cultural heritage values and built assets
- provide a framework for the management of bushfire suppression, including identification of strategic access and control lines
- provide a framework for prescribed burning for ecological management and fuel reduction purposes
- identify an appropriate fire regime to protect the integrity of mature Drooping Sheoak (*Allocasuarina verticillata*) and aged Sugar Gum (*Eucalyptus cladocalyx*) for the protection of Glossy Black-Cockatoo habitat.

Heritage Agreements

The prescribed use of fire within Heritage Agreements contained within this plan may be used for the following purposes.

- Fuel reduction around or adjacent built assets (refer to 8.3 Asset Zones).

- To provide landscape protection for populations and/or communities of significant flora and fauna.
- Achieving specific ecological objectives such as weed management, threatened species population management or habitat restoration.

Note: all proposed burns within Heritage Agreement areas require the consent of the Minister for Environment and Conservation without an approved fire management plan.

To facilitate a consistent approach across the Landscape Planning Area and to ensure that the objective of any prescribed action is aligned with the objectives stated within this plan, any fire management actions prescribed and implemented on Heritage Agreements are undertaken by individual landholders within the following constraints.

- Any prescribed action undertaken on private land will comply with the guidelines stated within this plan and the relevant Policies and Acts listed.
- All prescribed burning planned for Heritage Agreement areas will be prepared in accordance with the DEH *Policy and Procedures for Prescribed Burning* (DEH, 2008e) and the GAFLC *South Australian Prescribed Burning Code of Practice* (GAFLC, 2004).
- All prescribed burning conducted within Heritage Agreement areas will be completed only in conjunction with an adequate monitoring program (refer to Section 9 and the GAFLC *South Australian Prescribed Burning Code of Practice* (GAFLC, 2004)).
- The final decision to implement any prescribed action listed within the plan for a specific Heritage Agreement, once Ministerial consent has been obtained, rests with the landowners.
- DEH, through the relevant Bush Management Adviser or other relevant NRM funded staff, may provide technical support and expertise in the preparation of prescribed burn plans, environmental assessments and pre- and post-fire monitoring. Funding for monitoring programs can be sought through the Native Vegetation Council grants scheme.
- DEH will not contribute toward the implementation (either through resources or financially) of any prescribed action on private land unless it is demonstrated that there is a benefit or shared risk to public land.

Recommendation

Heritage Agreements

1. To assist in the implementation of prescribed burning and other pre-suppression works within Heritage Agreements it is recommended that funding be sought through the Kangaroo Island NRM Board to assist in fire management and monitoring on private land. These funds should be managed through the Conservation Programs Unit (Kangaroo Island Region).

2.3.6 Development Plans

Planning Strategy for Regional South Australia

The Planning Strategy for Regional SA (DTUP, 2003) makes mention of bushfire prevention and management issues for regional South Australia, with the primary concerns being that land should be managed in accordance with Bushfire and Fire Prevention Plans and landholders should be aware of the need for development to be located and designed in accordance with bushfire prevention policies that include fuel reduction (p.17).

Specific strategies within the Planning Strategy include:

- establishing guidelines for bushfire prevention measures associated with development
- restricting development in bushfire prone areas
- ensuring that the nature and scale of development in areas of high conservation value is of minimal impact to the environment.

Kangaroo Island Development Plan

There are two objectives listed in the *Kangaroo Island Development Plan* (Planning SA, 2003) that are related to bushfire protection.

- The protection of life and property from the effects of bushfire.
- To direct development away from sites and areas with an unacceptably high level of bushfire hazard (p.19).

The plan includes principles regarding land division to minimise the likelihood of damage to property resulting from bushfire, ensuring good fire access, provision of adequate water supply, landscaping to minimise bushfire risk, design and construction of buildings to minimise loss of life and property in a fire, and development in accordance with a fire management plan for the property.

Most of the land within the Landscape Planning Area has been zoned as *High Bushfire Risk* for planning assessment purposes, with a number of properties zoned *Medium Bushfire Risk* (refer maps KI(BPA)5 and 6 in Planning SA, 2003). In addition to the requirements under the Building Code, there are specific planning requirements for construction of dwellings in these Bushfire Risk zones.

Plantation Management Guidelines

Standard guidelines for plantation design and layout incorporating fire management are contained within the *Kangaroo Island Development Plan* (Planning SA, 2003), the *Forest Owners Conference Plantation Design Guidelines* (FOC, 2003), and the *CFS Guidelines for Farm Forestry* (CFS, 2006a). These guidelines are generally incorporated within the conditions of development approval in applications for land use change for plantation development.

In essence they require:

- 20 m perimeter fire breaks around all plantations of 100 ha or greater

- internal tracks of a minimum of 7 m around compartments of no greater than 40 ha in size
- water point signs
- provision of straight through access at junctions
- avoidance of dead ends or provision of turn around areas where these cannot be avoided.

2.4 Consultation

Kangaroo Island Council, DEH, the CFS, the KI NRM Board and the KIDBPC are committed to close cooperation and involvement with local, State and Commonwealth organisations, special interests groups, residents within the Landscape Planning Area and the broader community to achieve the goals of protection of life and property and biodiversity conservation. The KIDBPC, local CFS Group, landholders, conservation groups and ecologists have been consulted during the development of this plan.

2.5 Plan Review and Currency

Following adoption, the currency of this plan is five years. A major review will be conducted after this period, and will include the Cape Forbin Integrated and Flinders Chase Fire Management Plans. It is intended that the review will incorporate both plans into a single DEH fire management plan. It is anticipated that the off-reserve component of the Cape Forbin Integrated Fire Management Plan will be addressed through the Kangaroo Island Risk Management Plan (KI DBPC, In prep.). The review will include an evaluation of all sections of the plan. A similar process of community consultation and public exhibition will be followed in the preparation of the plan.

A review of this plan will occur following fire incidents as part of the adaptive management process, and annually through the preparation of on-ground management works. The review of the plan should also include a review of any changes to the risk assessment across the landscape.

3 BUSHFIRE ENVIRONMENT

3.1 Location Description

The Landscape Planning Area covers approximately 27 193 ha in the north-west of the Island (Map 1). It is bordered by Investigator Strait to the north and by the North Coast and Western River Roads to the east, the Playford Highway on the south, and by the tenure boundary of Ravine des Casoars Wilderness Protection Area to the west. Approximately 50% of the area is native vegetation, existing in a number of large blocks (Cape Torrens and Western River Wilderness Protection Areas) and smaller vegetation fragments.

3.1.1 Land Use History

Initial clearance for primary production in the Landscape Planning Area was concentrated around two of the sheltered coves. The property known as 'Snug Cove' and the adjacent coastal land to the west of that property was initially leased by John Hirst in 1864, and the area around Western River Cove was first leased by Henry Snelling in the same year. By 1872 the Hirst family held land from Cape Borda to Seal Beach (Bell, 1997). Sugar Gums (*Eucalyptus cladocalyx*) covering these areas were ring-barked and the land then burnt. These areas were heavily grazed. In 1879 a sawmill was established at De Mole River and Sugar Gum timber was harvested and milled for shipment to the copper mines at Moonta and Wallaroo for pit props. The legacy of this early and thorough clearance is that the properties at Snug Cove (in particular) and Western River have relatively little retained native vegetation and probably minimal seed bed.

The next wave of clearance commenced in the 1930s and 40s, and following the end of world War Two. A number of properties in the Landscape Planning Area, particularly those adjacent to Flinders Chase National Park (Gosselands) and the Ravine des Casoars Wilderness Protection Area, were only cleared in the 1960s and 1970s. A number of primary production properties in the Landscape Planning Area are therefore characterised by substantial and vigorous regrowth of native vegetation. The regrowth often features Yaccas (*Xanthorrhoea semiplana* ssp. *tateana*), but on some properties also include a range of understorey species and young eucalypts. The pasture on a number of properties is also very rough, due to the presence of rocks and stumps that have not been raked following clearance.

Forestry plantings commenced in the Landscape Planning Area in 1982, with the Coleman's Radiata Pine (*Pinus radiata*) plantation. Subsequent plantings of both softwood and hardwood species were undertaken each year between 2000 and 2002, and hardwood species each year between 2004 and 2006. The Western River and Cape Torrens Wilderness Protection Areas were gazetted as such in 1993, following the proclamation of the *Wilderness Protection Act* in 1992. Most of the Western River protected area was originally gazetted in 1971.

3.2 Climate

Kangaroo Island has a cool, temperate climate (based on the Koppen classification system). It has relatively mild winters and summers due to the moderating influence of the surrounding

ocean and the low elevation of the Island. Rainfall is distinctly seasonal, with 42 - 49% of the rain occurring in winter (Burrows, 1982).

The Landscape Planning Area has, on average, less variation in annual temperature range than the eastern and central regions of the Island. The monthly mean temperature at Cape Borda, 5 km to the west of the Landscape Planning Area, ranges from 8.9°C in August, to 23.3°C in February. The annual means range from 11.3°C to 18.2°C. Mean relative humidity ranges from 65% in January to 79.7% in June (9 am measurements), and 54% in January to 74% in July (3 pm measurements) (BOM, 2007).

The annual mean rainfall in the Landscape Planning Area is 621.4 mm, which is substantially higher than Kingscote in the east, due to the topographical effect of the main ridge that occupies the western half of the Island. Rainfall is highest in June, with a mean maximum of 106.9 mm, while January is the lowest rainfall month with a mean of 15.4 mm (BOM, 2007). In an Australian context, rainfall on the Island is relatively reliable although still subject to considerable annual variation.

From October to December Kangaroo Island can experience severe weather conditions with thunderstorm and associated lightning activity, often concentrated around the more elevated areas of the Island on the Gosse and Seddon Plateaus. The hottest months are January and February, which coincide with grass curing and low soil moisture.

During summer, frontal activity can rapidly change the moderate prevailing south easterly wind direction to strong north to north westerly winds accompanied by high temperatures and low humidity creating extreme fire weather conditions.

The dominant wind direction across Kangaroo Island during summer is from the south east, and in winter from the west (Burrows, 1982). There is minimal variation in wind speed during the day or during the year; the minimum average wind speed is 19.8 km/h (April) and the maximum is 26.5 km/h (July and August).

3.3 Fuel

The majority of native vegetation communities within the Cape Forbin Landscape Planning Area have an understorey dominated by shrubs within predominantly eucalypt woodlands. These areas also correspond to areas of high fuel accumulation and consequently *Very High* to *Extreme* overall fuel hazard in mature vegetation. Areas of low fuel accumulation, not surprisingly, coincide with area of pasture or open grasslands.

During *Very High* to *Extreme* conditions spotting is a common feature of the native vegetation both in woodlands and mallee, but in particular Messmate Stringybark (*Eucalyptus obliqua*) and Brown Stringybark (*E. baxteri*) areas. Under these conditions spot fires caused by wind-blown firebrands or embers can occur several kilometres from the fire front.

Within the Landscape Planning Area, grass is usually 100% cured by the end of November. However, in the southern section grasses may not be fully cured until mid to late December due to the relatively higher rainfall.

3.4 Landform

Dissected bedrock hills form a band along the northern boundary of the Landscape Planning Area, while the south-eastern corner and southern boundary are on the western edge of the Gosse lateritic plateau (Willoughby, *et al.*, 2001).

The plateau area is typically highly dissected by streams, leading to the formation of steeply-sided, deep rocky gullies (KI NRM Board, 2003). These creek gullies continue into the steep, hilly country of the bedrock hills and flow to the coast. The bedrock hills terminate on the north with high cliffs along the coastline. Elevation is highest along the Playford Highway (southern boundary) and slopes down to the coastal cliffs.

Topsoils on the plateau are a permeable loam or sand, overlying relatively impermeable mottled clay. The north coast hills are predominately shallow grey-brown sand with deeper soils along the rivers and drainage lines (Willoughby, *et al.*, 2001).

3.5 Extreme Fire Conditions

Extreme fire conditions are those that lead to 'extreme fire behaviour' and includes high fuel load, severe weather, steep terrain and low soil moisture (as defined by the Australasian Fire Authorities Council (AFAC) (2007)).

Generally on the western end of Kangaroo Island between October and December there is a high incidence of lightning strikes, in particular along the lateritic plateau, which extends from Cape Borda to the west to Parndana to the east. During this period there is a dramatic increase in the likelihood of large fires occurring where the weather conditions are severe, soil moisture is low and there is high fuel accumulation, particularly in native vegetation.

Within the Landscape Planning Area there is predominantly *Very High* to *Extreme* fuel loads within native vegetation and this is combined with some of the steepest terrain on Kangaroo Island, particularly within the Western River Wilderness Protection Area, resulting in environmental conditions that have the potential for very large fire events. Given the concurrence of these environmental conditions, low soil moisture and severe weather of high temperatures, low humidity and strong winds, the resulting bushfire is likely to be very large with extreme fire behaviour and difficult to contain until weather conditions moderate.

4 VALUES AND ASSETS

4.1 Biodiversity Values and Ecological Assets

4.1.1 Vegetation

Records from the Biological Database of South Australia (BDBSA) indicate that 470 native species of plants have been recorded in the Landscape Planning Area. Of these, 27 are endemic to Kangaroo Island (Willoughby, *et al.*, 2001). Each of these species responds in different ways to the occurrence of fire and our current understanding of these responses is limited (see Section 6 and Appendix 1). Therefore the management of fire in areas of native vegetation needs to be undertaken cautiously, within an adaptive management framework, with adequate pre- and post-fire monitoring of flora and fauna to inform future management actions.

Floristic mapping (Map 2) for this plan uses a compilation of regional vegetation mapping data that has been reclassified to comply with the National Vegetation Information System (NVIS) classification for Australia. The Major Vegetation Sub-group (MVS) level of the NVIS classification emphasises the structural and floristic composition of the dominant stratum but with additional types identified according to typical shrub or ground layers occurring with a dominant tree or shrub stratum. There are seven MVS within the plan area that have been mapped by DEH.

The Major Vegetation Sub-groups represented in the plan area are:

- *Eucalyptus* woodland MVS No 8
- *Acacia* tall open shrublands and shrublands MVS No 21
- *Casuarina* and *Allocasuarina* forests and woodlands MVS No 26
- Mallee heath and shrublands MVS No 29
- Other shrublands MVS No 32
- *Eucalyptus* open woodlands with shrubby understorey MVS No 47
- *Melaleuca* shrublands and open shrublands MVS No 49

Analysis of fuel hazard and ecological fire management guidelines for this plan is based on mapping and detailed analysis of vegetation communities on Kangaroo Island by Ball and Carruthers (1998). Communities were identified using the tallest overstorey species, or Primary Species Groups. Five Primary Species Groups were used to determine overall fuel hazard for the Landscape Planning Area, and as the basis for the development of ecologically sustainable fire regimes (Dowie, 2006).

There are five Primary Species Groups that occur within the Landscape Planning Area:

1. *Eucalyptus cosmophylla* very open mallee (MVS No 29)
2. *Eucalyptus remota* open low mallee (MVS No 29)
3. *Eucalyptus baxteri* low woodland (MVS No 8, 47)
4. *Eucalyptus cladocalyx* woodland (MVS No 8, 29, 47)

5. *Allocasuarina verticillata* low woodland (MVS No 26)

Note that MVS No 21, MVS No 32 and MVS No 49 are not included in the Primary Species Groups because of their restricted spatial distribution (near the coast).

4.1.2 Fauna

The diversity of the vegetation composition and structure in the Landscape Planning Area supports a diversity of fauna species including a range of small and large mammals, birds, reptiles and insects. Records from the Biological Database of South Australia (BDBSA) indicate that 112 native species of fauna have been recorded in the Landscape Planning Area. Each of these species respond in different ways to fire and are affected by fire to varying degrees, depending on their mobility and habitat preferences, and our current understanding of these responses is limited (see Section 6 and Appendix 2). Therefore the management of fire in areas of native vegetation needs to be undertaken cautiously, within an adaptive management framework, with adequate monitoring to inform future management actions.

4.1.3 Species of Conservation Significance

In this plan 'of conservation significance' is used to describe important or 'rated' populations or species of flora and fauna. Species and communities may be:

- Nationally rated, that is, listed as Threatened (with a rating of Extinct, Critically Endangered, Endangered, Vulnerable or Conservation Dependent) under the federal EPBC Act.
- South Australian rated, listed as Threatened (with a rating of Endangered, Vulnerable or Rare) under the NPW Act, Revised Schedules 7, 8 and 9.

The Environmental Database of South Australia has a total of 66 rated flora species and 17 listed fauna species recorded for the Landscape Planning Area. The Environmental Database of South Australia contains records from several data sources including the Threatened Plant Population Database, the Biological Survey of South Australia, Reserve database and Opportunistic sightings of significant flora and fauna. Flora and fauna species of conservation significance that have been recorded in the Landscape Planning Area are listed in Appendices 1 and 2 respectively, and fire management guidelines are provided. These guidelines are to be taken into consideration when preparing the environmental assessment process for all prescribed burns (for more detail refer to Figure 2).

For the majority of these species there is limited data on their distribution as records are derived from limited surveys and opportunistic observations and are recorded as point data only. Records for highly mobile species, such as birds, provide little indication of their distribution within the Landscape Planning Area. Due to the low level of survey effort within the Landscape Planning Area the absence of records for a species in a particular area does not necessarily mean that the species does not occur there.

Extensive surveying and observations over a number of years of the Glossy Black-Cockatoo (*Calyptrorhynchus lathamii halmaturinus*) has made it possible to identify key areas that are used for nesting and foraging (Map 2).

4.1.4 Aquatic Ecosystems

The drainage in the Landscape Planning Area can be characterised as relatively steep and partly confined, northerly flowing streams that are typically ephemeral, flowing following winter rains. The main catchments are those of the De Mole and Western rivers, with a number of smaller catchments located along the North Coast between Cape Forbin and the mouth of Western River. Three species of native fish have been recorded in the Landscape Planning Area (Common Galaxia (*Galaxia maculatus*), Climbing Galaxia (*Galaxia brevipinnis*), and Bluespot Goby (*Pseudogobis olorum*)), as well as introduced marron (*Cherax tenuimanus*) (Nilsen, 2006).

The majority of the watercourses have intact vegetation buffers. However, occasional heavily cleared sub-catchments occur in some agricultural areas. In general less than 10% of rainfall run-off is captured by farm dams, with small areas where up to 50% may be captured (Nilsen, 2006). Water quality may be affected by nutrient and sediment rich run-off from agricultural areas, particularly following heavy rainfall events.

4.1.5 Threats to Biodiversity

There are a number of threats to the biodiversity of the Landscape Planning Area that may be either directly or indirectly attributable to fires. Inappropriate fire regimes, i.e., variations in fire interval, frequency, season, intensity and scale can impact negatively on the response of flora and fauna to fire events. The influence of fire regimes on biodiversity is addressed in detail in Section 1.

Plant Pathogens

Phytophthora cinnamomi (Pc) is a soil-borne water mould that affects the root systems of native plant species, resulting in extensive damage or the death of the plant. It is a major threat to natural ecosystems and some agricultural crops in areas of high rainfall and acid to neutral soils. Pc can spread either in water or infected soil, thriving in warm and moist conditions, and there is no known method of eradicating it once an area has become infected. Pc has been positively identified in a number of locations within and adjacent to the Landscape Planning Area and there is a high potential for it to be spread by earth moving equipment and vehicles during fire suppression activities.

Recommendations

Phytophthora	2.	Ensure the <i>Standard Operating Procedure – Phytophthora Threat Management</i> (SOPP-002) (DEH, 2002) is adhered to in Pc risk areas.
	3.	Ensure hygiene practices are implemented at all times during fire operations to reduce the spread of Pc across the planning area. In Phytophthora free areas consider the risks of machinery use and implement hygiene measures if machinery and vehicle access is necessary. Refer to DEH Operating Procedure – <i>Phytophthora Vehicle Disinfection Units</i> (DEH, 2003a).
	4.	Where possible, wash down stations should be established at appropriate points as soon as possible during a fire incident. Refer to DEH Operating Procedure – <i>Phytophthora Vehicle Disinfection Units</i> (DEH, 2003a).

Weeds

Weeds can have significant impacts on native vegetation and ecological communities (Saunders, *et al.*, 1991). Disturbance (e.g. grazing, nutrient inputs, erosion, fragmentation) is likely to promote weed invasion, and fire in areas already affected by one or more of these disturbance mechanisms is likely to lead to weed proliferation (Hobbs, 1991; Hobbs, 2002; Hobbs and Huenneke, 1992). It is well known that disturbance, especially fire, is an important mechanism in natural systems (Hobbs and Huenneke, 1992). Large areas of intact native vegetation, which predominate in the Landscape Planning Area, will generally be less susceptible to weed invasion following fires than smaller areas.

Recommendations

Weeds	5.	Identify the potential impact of weed species prior to any prescribed burn in prescribed burn planning, as part of the environmental assessment process. This will identify any priority weed species and recommend any post-fire actions to mitigate the impact of weeds.
	6.	Monitor weeds pre and post-fire to determine what post-fire weed control is required and its effectiveness.
	7.	Implementation of the KI roadside vegetation management plan which includes pre and post-fire weed management strategies.
	8.	Ensure hygiene practices are implemented to reduce weed spread across the planning area.

Pest Fauna and Overabundant Species

Feral animals also have the potential to invade recently burnt areas as a result of increased access, prey or food availability. Increased numbers of feral animals such as Goats (*Capra hircus*), Fallow Deer (*Dama dama*), Red Deer (*Cervus elaphus*) and Pigs (*Sus scrofa*) following fires have the potential to impact on regenerating native vegetation and facilitate the spread of Pc. Herbivores, such as native Kangaroos (*Macropus* sp.) can benefit from the post-fire regeneration, finding suitable food within the recently burnt area (Gill and Catling, 2002; Murphy and Bowman, 2007). Feral cats (*Felis catus*) have the potential to impact on native wildlife in the post-fire period as a result of reduced cover for their prey. The degree of impact by these species post-fire depends on a number of factors, including the pre-fire abundance of the species and characteristics of the fire (e.g. fire size, shape, season, intensity and location).

Recommendations

Pest Fauna	9.	Collect relevant information in prescribed burn planning as part of the environmental assessment process on pest animals, to determine appropriate management post-fire.
	10.	Implement appropriate management programs post-fire to address issues with overabundant species, if necessary.

Turbidity

Depending upon the season in which a fire incident occurs and the size and intensity of the fire, there is the potential to impact on aquatic ecosystems by increasing turbidity due

to the increased surface run-off and changing water chemistry. The duration of these impacts will differ in each incident. It is generally considered that the impacts of fire events on aquatic systems, while they may be significant in the short-term, do not generally have long-term impacts. However, larger scale incidents are more likely to have longer term significant impacts on water resources, including on water quantity due to the water requirements for regenerating vegetation.

4.2 Community Values and Assets

4.2.1 Current Land Use

The Landscape Planning Area is characterised by a small number of larger grazing holdings (sheep and cattle) of between 500 ha to 1 000 ha, private forestry plantations totalling 5 976.3 ha and currently owned and managed by four separate companies, and a large number of small holdings of between 33 ha and 250 ha in size. Retained native vegetation and conservation areas are also a significant part of the Landscape Planning Area. Table 1 indicates both the proportions and hectare area of the Landscape Planning Area associated with each land use.

TABLE 1 – CURRENT LAND USE BY PROPERTY IN THE PLANNING AREA¹

Land Use	Area (ha)	Total (%)
Primary Production	7625.4	28.0
Forestry	5976.3	22.0
<i>sub-total</i>	<i>13601.7</i>	<i>50.0</i>
Public Conservation Reserves	3389.7	12.5
Lifestyle Blocks	9302.9	34.2
Other (state heritage areas, road reserves, etc.)	898.9	3.3
TOTAL	27193.1	100.0

Small holdings are a feature of the Landscape Planning Area, with many owned by absentee landholders who visit the area with varying degrees of regularity, the majority visiting for holidays (Table 2).

TABLE 2 – ESTIMATED DWELLING OCCUPANCY BY PROPERTY IN THE PLANNING AREA

Landholder Type	No. of Properties	% of Properties
Full-time residents	12	15.0
Part-time residents (KI based)	24	30.5
Absentee landholders	43	54.5
TOTAL	79	100.0

¹ This calculation of land use is based upon local knowledge and is not related to the Land Use Codes allocated by the Valuer General to properties within the Landscape Planning Area.

4.2.2 Built Assets

Built assets are scattered across the planning area (Map 1), and consist primarily of houses and farming structures such as sheds. Approximately one third of the built assets are within areas of native vegetation, particularly those within the De Mole Estate in De Mole Block (Map 1). Another third are situated within, or on the boundary of forestry plantations. The remaining third are within agricultural areas, with a 'cluster' of assets around Western River Road on the eastern boundary of the planning area.

There are minor (unmapped) built assets associated with DEH reserves, including signs, Pc hygiene stations (one located on Jump Off Road adjacent to Cape Torrens WPA, and another located at the start of the walking trail to Waterfall Creek Falls within Western River WPA), and wooden trail barriers.

Recommendations

Built Assets	11. Any new built assets comply with Development Plan and Building Code requirements.
	12. Landholders are encouraged and provided with relevant information and support to retrofit existing dwellings and other built assets to better manage bushfire risk.
	13. Consideration is given to restricting further development within De Mole estate given the high bushfire risk.
	14. Consideration is given to developing alternative access and egress routes and/or refuge areas for De Mole estate residents.

4.2.3 Tourism

There are a number of tourism assets within the planning area which need to be considered with respect to bushfire management. Accommodation, touring routes, and features of the natural environment are the major assets. A summary is given in Table 3.

TABLE 3 – TOURISM ASSETS WITHIN THE PLANNING AREA

Tourism Asset Type	Name	Description
Accommodation (private)	Western River Valley Cottages	Located across the Landscape Planning Area. Visitation statistics not available.
	De Mole River Retreat	
	Yacca Creek	
	Bout du Monde	
Walking trails	Waterfall Creek Hike	Located within Western River WPA and is the only hiking trail identified in the Landscape Planning Area.
Fishing tours	KI Fishing Adventures	Located 1.5 km west of Western River Cove. Boats and equipment are housed on the beach.
Camping ground	Western River Campground	Located at Western River Cove and is managed by KI Council; includes toilet and BBQ facilities.

Tourism Asset Type	Name	Description
Natural features	Cape Torrens and Western River Wilderness Protection Areas	Western River WPA is a popular destination for visitors, the main access point and activity is the Waterfall Creek Hike. Cape Torrens is less commonly visited, with no public access.
	Western River Cove	Popular with self-drive tourists and a stop for licensed commercial tour operators. Received approximately 16000 visitors in 2005-2006 financial year ² .
Cultural heritage	Cape Borda Lighthouse	Visitors travelling to Cape Borda Lighthouse will often travel through the Landscape Planning Area. Cape Borda received approximately 31000 visitors in 2005-2006 financial year ² .

4.2.4 Cultural Heritage

There are three Aboriginal heritage sites in the planning area, but no known European sites or artefacts. The heritage sites have been in the landscape for hundreds of years, and have been subjected to previous fires. As such, the threats to these sites posed by bushfire and/or prescribed burning is minimal and the likelihood of damage occurring is small.

Aboriginal Heritage

The Kaurna, Ngarrindjeri, Narungga and Ramindjeri people maintain a spiritual connection with wilderness protection areas on Kangaroo Island (DEH, 2006b). There are three sites of aboriginal heritage within the Landscape Planning Area which are listed on the Register of Aboriginal Sites and Objects, administered by the Aboriginal Affairs and Reconciliation Division. These sites are described as 'archaeological' sites, and are of importance both in terms of their heritage and scientific values. All three sites exist on private property; two are located on cleared land which is currently used for primary production, and the third is located across a primary production-native vegetation boundary.

These sites have existed for many years in a landscape which has been subjected to previous bushfires and/or prescribed burns (see Map 3), as well as disturbance resulting from European settlement. Furthermore, the archaeological nature of these sites is such that bushfire is unlikely to negatively impact on them. In order to avoid any further interference with, or damage or disturbance to these sites, specific strategies for their protection are detailed in Section 8. These strategies target activities associated with bushfire suppression, such as the construction and maintenance of control lines, and off-track vehicle based suppression.

European Heritage

There are no sites or objects of European heritage listed in the *South Australian Heritage Register* (DEH, 2007b) for the planning area. Immediately adjacent to the planning area are the State registered Harvey's Return landing site (ID 12353) and cemetery (ID 12354).

² Brunton, C (2006) *Tourism Optimisation Management Model Visitor Exit Survey 2005-2006*. Colmar Brunton Intelligence, Australia.

5 RISK ASSESSMENT

The *Policy and Procedures for Risk Assessment in DEH Fire Planning* (DEH, 2006d) was formally adopted and applied to the Landscape Planning Area. As a consequence a risk assessment was undertaken as a requirement of the compilation of this fire management plan. The risk assessment is a tool used to gauge the risks arising from bushfire to life, property and environmental values, within and adjacent to the reserves in the Landscape Planning Area. The risk assessment considered assets (built, services, primary production, and business), environmental values (biodiversity) and social values (including safety, tourism, visitor use and heritage) within the Landscape Planning Area.

Risk assessment is a function of likelihood and consequence:

- Likelihood considers the possibility that a fire related risk will occur and is assessed on a basis of Rare to Almost Certain (Rare, Unlikely, Possible, Likely, Almost Certain)
- Consequence considers bushfire risk based on impacts to life, property and environmental values and is ranked from Insignificant to Critical (Insignificant, Minor, Moderate, Major, Critical)
- Based on the derived likelihood and consequence ratings, the overall risk is determined and ranked from Low to Extreme (Low, Moderate, High, Extreme).

Refer to the *Policy and Procedures for Risk Assessment in DEH Fire Planning* for further information (DEH, 2006d). Risk assessment is ongoing and needs to be formally reviewed as part of the major review and where applicable following a fire event. The application of fire management zones as well as the recommendations in this plan are derived from the risk assessment process.

5.1 Fire History

The fire history of the Landscape Planning Area has been compiled from a combination of records documented in *Fire History of Western Kangaroo Island* (Overton, 1994) and aerial photographs from 1945 onwards. The capture methods for fire scars vary from interpretation of hand drawn maps to digitised aerial photographs (generally at a 1:40,000 scale). Fire scar boundaries produced from these sources have been added to the fire history layer in the DEH Egis data spatial database. It should be noted that many smaller fires associated with land clearing operations, recorded in the Landscape Planning Area by Overton (1994), have not been mapped and are not represented in the database.

The pre-European fire history of the area is unknown, however due to the Island being unoccupied by humans for several thousand years, fires would have only originated from lightning strikes as there was no other source of ignition. This may have resulted in less frequent fires than those that have occurred since settlement of the island by Europeans when, due to additional sources of ignition and the use of fire to clear land for farming, fires would probably have become more frequent.

No fires have been documented in the Landscape Planning Area prior to 1953. Since then fires that are recorded in the spatial database have occurred in 1953, 1954, 1958, 1960, 1968, 1970, 1977, 1980, 1983, 1985, 1988, 2001, 2002 and 2007 (see Map 3). Map 3 indicates the last

fires that have occurred in the Landscape Planning Area. The most recent fire burnt 2 950 hectares and occurred in 2007. This fire burnt the southern parcel of Western River Wilderness Protection Area in its entirety as well as other land, some of which is outside of the Landscape Planning Area. Fires greater than 5 000 ha in size occurred in 1953 (43 313 ha), 1958 (64 711 ha) and 1968 (21 517 ha). The remaining fire sizes ranged from 74 ha to 4 023 ha.

5.2 Risk of Ignition

Lightning has been the major cause of bushfires on the western end of Kangaroo Island in the past, with a higher incidence of lightning strikes occurring on the lateritic plateau (36.5% of Landscape Planning Area) as a result of increased thunder storm activity between October and December. The frequency of human induced fires is relatively small. However, there has been a significant increase in land divisions and construction of dwellings within the last 20 years that has increased the risk of human induced fires (Ellis, 2007 pers. comm.) Some of these developments are located within native vegetation within very high to extreme fuel loads.

The effect of climate change on fire frequency and intensity is the subject of much speculation however, estimates indicate that the incidence of extreme bushfires may increase 25% by the year 2050. The potential impact of increased fire frequency and intensity as a result of climate change may require more active measures to be adopted to limit the impact of fire on the community (Lucas, *et al.*, 2007)

5.3 Fuel Hazard

Fuel characteristics are a major determinant of fire behaviour, affecting intensity, forward rate of spread, and flame height. Fire behaviour in turn affects the response of the biota to fire, the degree of difficulty in suppressing bushfires and managing prescribed burns, and the threat to assets. In order to undertake effective fire management it is necessary to have an understanding of the characteristics and distribution of fuels in the Landscape Planning Area.

The fuel hazard in the Landscape Planning Area has been assessed using the Victorian *Overall Fuel Hazard Guide* (DNRE, 1999). This method assesses surface, near surface, elevated and bark fuels into five classes (low, moderate, high, very high and extreme) and then combines these values using a matrix to determine the overall fuel hazard.

Dowie (2006) used the Victorian *Overall Fuel Hazard Guide* to carry out extensive fuel hazard assessments on Kangaroo Island in 18 vegetation groups (based on the dominant overstorey species and structural formation) and eight post-fire age classes. The results of this study, and supplementary fuel hazard sampling in the Landscape Planning Area, have been used to generate maximum overall fuel hazard values for the Primary Species Groups in the Landscape Planning Area (Table 4).

TABLE 4 – LIKELY MAXIMUM OVERALL FUEL HAZARD RATING FOR PRIMARY SPECIES GROUPS

MVS No	Primary Species Group	Likely Maximum Overall Fuel Hazard
8	<i>Eucalyptus cladocalyx</i> woodland	Extreme
29	<i>Eucalyptus remota</i> open low mallee	Extreme
29	<i>Eucalyptus cosmophylla</i> very open mallee	Extreme
8, 47	<i>Eucalyptus baxteri</i> low woodland	Extreme
26	<i>Allocasuarina verticillata</i> low open forest	Extreme
8	<i>Eucalyptus obliqua</i> very low open woodland	Extreme

The native vegetation in the Landscape Planning Area has a maximum overall fuel hazard of either very high or extreme. Just under 30% of the Landscape Planning Area is utilised for grazing and occasionally cropping, and the fuel loads and characteristics of these areas change within and between seasons. It has been assumed that these areas have an average overall fuel hazard of low. As there is currently no proven methodology in use for the assessment of fuel hazard in commercial forestry plantations these areas have been assigned the maximum overall fuel hazard of extreme for the purpose of this plan. However, it is well understood that the fire behaviour characteristics of plantations change over their life cycle (rotation), and this has significant implications for incident response planning and management.

6 ECOLOGICAL FIRE MANAGEMENT

Fire management planning and implementation aimed at achieving ecologically sustainable management of areas of native vegetation and fauna needs to be based on an understanding of the effect of fire on the biota (Whelan, *et al.*, 2002). The approach used here is based on accumulating knowledge of species, populations and communities and their response to fire regimes, and then applying this knowledge to fire management practices to maximise biodiversity outcomes. This approach is being used as a sound basis for the management of fire for biodiversity across Australia (FEWG, 2004; Hopkins and Saunders, 1987; Whelan, *et al.*, 2002) and is discussed in more detail in the *Draft DEH Guidelines for Ecological Fire Management* (DEH, 2006a). Ecological Fire Management Guidelines are used to assist in achieving management objectives in native vegetation within CLM-zones. For more information on CLM-zones refer to Section 8.2 of this Fire Management Plan.

6.1 Context

6.1.1 Fire Regimes for Biodiversity Conservation

Fire regime is described as the history of fire in a particular vegetation type or area including the fire frequency, interval, intensity, extent and seasonality of burning (Brooks, *et al.*, 2004). It is therefore assumed that avoiding adverse fire regimes across the majority of the habitat for any given species should minimise the risk of adverse impacts or local extinction. That is, an adverse fire regime confined to a minor proportion of the habitat of any particular species may influence local distribution, but will have little effect on the persistence of that species across the landscape, and therefore minimal impact on the structure of the ecosystem. A range of different fire intensities, frequencies, seasons and scales of burning need to be incorporated into ecologically based regimes if they are to result in the conservation of biodiversity.

6.2 Development of Ecological Fire Management Guidelines

6.2.1 Vital Attributes

Currently our understanding of fire effects on biodiversity is limited due to the number and diversity of species affected, the number of variables and the complexity of the interactions involved (Whelan, *et al.*, 2002). A useful way of simplifying the complexity of these interactions is to group species according to their functional response to fire (Keith, *et al.*, 2002). Noble and Slatyer's (1980) vital attribute scheme uses this approach to classify flora species based on their response to disturbance events such as fire. Similar classification systems are being developed for fauna species, but are less advanced (Kenny, *et al.*, 2003).

Ecological fire management guidelines for an area will be developed from knowledge of the vital attributes (or life histories) of the flora and fauna species that inhabit that particular area. The vital attributes of a species are the characteristics which affect its persistence at a site after fire, the environmental conditions required for re-establishment, and the longevity of the species following disturbance (Noble and Slatyer, 1981). For fauna, these vital attributes are habitat and life history characteristics: shelter, food, and breeding requirements of species (Friend and Williams, 1996).

6.2.2 Key Fire Response Species

Examination of the vital attributes of the species present in a particular area assists in defining the Key Fire Response Species for a particular community or vegetation type. These are the species most susceptible to decline due to inappropriate fire regimes: either too frequent or too infrequent fire, low or very high intensity fire, or fire in a particular season. These species and their needs in relation to fire regime provide a guide to the acceptable thresholds of fire regime (interval, season or intensity) for that particular area.

6.2.3 Methodology

Ecological Fire Management Guidelines for the Landscape Planning Area have been developed from research and the analysis of available data relating to the Key Fire Response Species within the Landscape Planning Area. The approach used to define the Ecological Fire Management Guidelines involves the identification of fire regime thresholds using flora and the assessment of the potential impacts of these thresholds against known faunal requirements, particularly the requirements of species of conservation significance. The steps taken in the development of the Ecological Fire Management Guidelines are as follows:

- Vital attributes data of plant and animal species, and ecological communities are gathered and assessed;
- This knowledge is used to identify the Thresholds of Potential Concern (TPC) of fire regime (fire interval, intensity, season and type) where species significantly decrease (Section 6.3);
- Ecological Fire Management Guidelines are formed from these thresholds and are then used to guide the fire management practices to ensure that adequate habitat is available to maintain biodiversity (i.e. species, populations and communities) (Section 6.3.3).

Figure 1 illustrates this process.

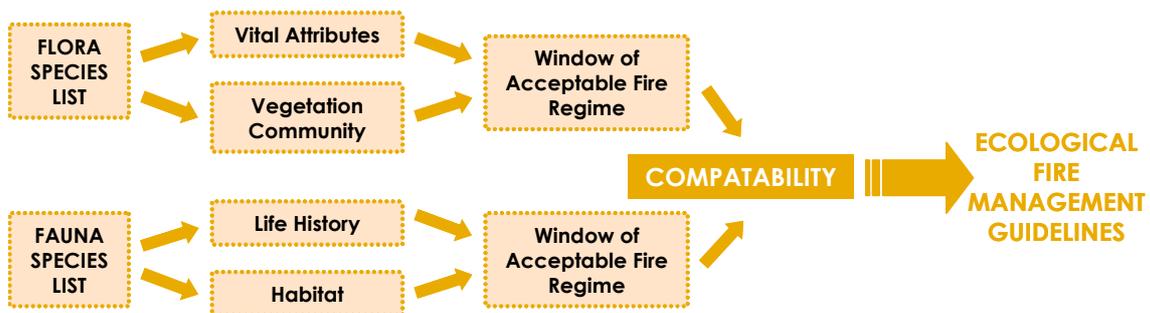


FIGURE 1 – APPROACH FOR DETERMINING ECOLOGICAL FIRE MANAGEMENT GUIDELINES

Adapted from DEH (2006a)

6.3 Interpreting Ecological Fire Management Guidelines

6.3.1 Vegetation Communities

Guidelines for five aspects of fire regime (interval, frequency, spatial, intensity and season) have been determined for the five Primary Species Groups that occur within the Landscape Planning Area (Table 5). The upper and lower limits of fire interval for each Primary Species

Group have been proposed, as well as recommendations on the management of fire frequency. Fire intensity requirements for species regeneration and undesired seasonal burning patterns have also been identified. Ecological Fire Management Guidelines should not be used as prescriptions; instead they define a window of “acceptable” fire regime that ensures the conservation of existing species.

6.3.2 Threshold of Potential Concern

The Threshold of Potential Concern (TPC) for a vegetation type or community is the level of fire regime element (i.e., fire interval, frequency, intensity or season) where Key Fire Response Species are likely to significantly decline if exceeded (Table 5). Fire regimes beyond that level are likely to lead to local extinction of significant biodiversity.

- TPC1 identifies the lower threshold for fire interval for a particular Primary Species Group in years. That is, vegetation within this group will be represented predominantly by early successional species if the inter-fire interval is less than the time specified, and those species that require longer to flower and set seed can disappear from a community.
- TPC2 identifies the upper threshold for fire interval for a particular Primary Species Group in years. That is, populations of some species (e.g. obligate seeders) are likely to reduce within this Primary Species Group if fire is absent for more than the time specified.

TABLE 5 – ECOLOGICAL FIRE MANAGEMENT GUIDELINES FOR PRIMARY SPECIES GROUPS

Taken from Dowie (2006)

		FIRE REGIME						
		Thresholds of Potential Concern (TPC)		Spatial Criteria	Frequency		Intensity	Season
MVS	Primary Species Group	TPC1: Lower threshold in years	TPC2: Higher threshold in years	Inter-fire intervals within TPC1 and TPC2 across more than X% of the extent of this MVS within the Landscape Planning Area	Avoid 2 or more fires less than X years apart in the same location	Avoid 3 or more fires of low intensity in the same location	Some medium to high intensity fire needed to regenerate some species	Avoid 2 or more successive fires in season
29	<i>Eucalyptus cosmophylla</i> Very open mallee	17	40	50	17	Y	Y	Same season
29	<i>Eucalyptus remota</i> Open low mallee	17	40	50	17	Y	Y	Same season
8, 47	<i>Eucalyptus baxteri</i> Low woodland	17	40	50	17	Y	Y	Same season
8, 29, 47	<i>Eucalyptus cladocalyx</i> Woodland	17	40	50	17	Y	Y	Same season
26	<i>Allocasuarina verticillata</i> Woodland	17	40	50	17	Y	Y	Same season

6.3.3 Ecological Fire Management in the Cape Forbin Landscape Planning Area

For the five primary vegetation groups for which maximum and minimum fire interval thresholds have been developed, the species that is most sensitive to frequent fire is the Desert Banksia (*Banksia ornata*). This species only regrows from seed, is killed by low intensity fires, requires some form of disturbance to initiate seedling recruitment and has a short-lived seedbank. Desert Banksia has been recorded as taking as long as 14 years to reach maturity and produce seeds on Kangaroo Island. An additional three reproductive years are required for a sufficient seedbank to be developed to enable successful regeneration, resulting in a recommended minimum inter-fire interval of 17 years (Dowie, 2006).

The species that are most sensitive to infrequent fire are Golden Wattle (*Acacia pycnantha*), Hop Goodenia (*Goodenia ovata*) and Downy Dodder-laurel (*Cassytha pubescens*), all of which only regenerate from seed, are killed by low intensity fires, require some form of disturbance to initiate seedling recruitment and have seedbanks which are exhausted after a single disturbance event. The maximum recorded lifespan of these species and their seedbanks is 40 years. Consequently the recommended maximum inter-fire interval is 40 years (Dowie, 2006).

It is recommended that at least 50% of the total area of any Primary Species Group should be within the minimum and maximum fire interval thresholds. In addition to the above minimum and maximum inter-fire intervals it is recommended that three or more successive low intensity fires should be avoided as some species may require medium or high intensity fires to initiate regeneration. Fires should generally occur between September and February, when natural ignitions would have been expected to occur in the past, and two or more successive fires in the same season should be avoided.

Recommendation

Ecological

15. Fire regime data in the Landscape Planning Area will need to be reviewed periodically in order for the modifications that result from bushfires and prescribed burns to be incorporated into the data. This in turn will enable the prescribed burning component of the Operational Works Schedule to be adjusted to take account of these modifications.

7 BUSHFIRE MANAGEMENT OBJECTIVES AND STRATEGIES

7.1 Community Preparedness, Awareness and Education

The CFS has prepared a *Bushfire Community Education and Awareness Strategy* for Kangaroo Island (CFS, 2006c). The community education strategies proposed below complement the approaches taken in, and draw upon, the survey work conducted in preparation of that strategy.

The land use and estimated dwelling occupancy in the Landscape Planning Area (refer Table 1 and Table 2) provide a community profile to inform the development of community education strategies for the Cape Forbin area.

7.1.1 Population

A critical feature of the Landscape Planning Area is the very low full time resident population, with full-time residents estimated to be present on only 12 properties, or 15% of the landholdings. A further 30% of (or 24) properties have part-time residents based on Kangaroo Island. The remaining 54.5% of (or 43) properties are held by absentee landholders.

Tourist traffic through the Landscape Planning Area is significant, with Cape Borda Lightstation attracting nearly 31 000 visitors in 2005/2006, and Western River Cove attracting in excess of 16 000 visitors annually (Table 3). There are also several private accommodation facilities in the Landscape Planning Area.

7.1.2 Stakeholders

Primary producers, plantation forestry companies, the Department for Environment and Heritage, absentee landholders, primarily lifestyle block owners, and visitors to the Island are the major stakeholders in the area. The small number of residents in the Landscape Planning Area includes farmers, tenants renting farm houses who work in the district and lifestyle block owners.

7.1.3 Bushfire Awareness Issues

Surveys of residents and tourists were undertaken by the CFS in the development of the *Community Education and Awareness Strategy* for Kangaroo Island in 2006 (CFS, 2006c). The survey results indicated that there was a generally high level of awareness of bushfire risk among residents, but varying degrees of understanding of appropriate actions to take in the face of a fire and varying levels of preparedness. The level of awareness of bushfire risks among tourists was generally low, and their understanding of appropriate actions to take in the face of a bushfire was poor.

These survey results are taken as relevant in the development of strategies for the Landscape Planning Area.

7.1.4 Communication

Residents

The key strategy is to ensure that residents have a high level of preparedness for a bushfire incident. Further to the existing strategies in the *Bushfire Community Education and Awareness Strategy* it is suggested that workshops should be held with residents in the planning area to assist them in developing a Bushfire Action Plan.

Absentee Landholders

Specific communications need to be undertaken with absentee landholders to attempt to make them aware of the risks in the area and ensure that their land management practices minimise these risks for permanent residents and their own assets. Further to the existing strategies in the *Bushfire Community Education and Awareness Strategy* it is suggested that annual correspondence with absentee landholders in the planning area to identify risks and management responsibilities.

Visitors

The key strategy is to attempt to ensure that visitors are aware of the risk of bushfire in the area and have ready access to information regarding what actions they can take in the event of a bushfire. Further to the existing strategies in the *Bushfire Community Education and Awareness Strategy* it is suggested that specific information is provided and made available to visitors within the planning area identifying risks associated in being in a vehicle during a bushfire, in accordance with AFAC guidelines.

Recommendations

These recommendations are specific to the planning area and are in addition to the general strategies included in the *Bushfire Community Education and Awareness Strategy* (CFS, 2006c).

Community Preparedness	16.	Workshops to be held with residents in the planning area to assist them in developing a Bushfire Action Plan.
	17.	Correspondence is provided annually directly to absentee landholders within the planning area, making them aware of the risks in the area and their land management responsibilities under the <i>Fire and Emergency Services Act 2005</i> .
	18.	Fixed signs to be implemented at strategic locations within the planning area targeting visitors and identifying risks associated with being in a vehicle during a bushfire.
	19.	Investigate the development of an information booth within the planning area targeting visitors and identifying risks associated with being in a vehicle during a bushfire and implement where appropriate.

7.2 General Objectives for Fire Suppression

The objectives for fire suppression in the planning area are to:

- provide for the protection of human life during fire suppression activities
- provide for the protection of built and environmental assets during fire suppression activities
- develop a framework for the management of bushfire suppression, including identification of strategic response, fire access and infrastructure
- provide for the strategic containment of bushfires to minimise the likelihood of a fire entering or exiting blocks of native vegetation as defined by this plan
- ensure fire management practices endeavour to minimise the further spread of Pc and weed species through the area
- provide for site stabilisation and rehabilitation as part of the suppression operation.

7.3 Strategies and Actions to Achieve Objectives

Where fuel management strategies have been implemented, an effort to contain bushfires will be made by using and strengthening control lines, previously burnt areas and natural low fuel areas. Predicted fire intensity should be considered before adopting a suppression strategy or combination of strategies. Firefighter safety and the protection of life are paramount.

Suppression strategies may include:

- direct attack when fire intensities are at safe/acceptable levels
- parallel attack
- indirect attack when conditions are unsafe for firefighters to attack the head of the fire
- leaving a fire to burn out if it does not pose any significant threat (depending on risk, weather conditions and forecast and the location)
- use of aerial suppression techniques where appropriate and when conditions permit
- strengthening control lines ahead of an approaching bushfire
- the confinement of suppression activities to life and property protection during extreme conditions.

7.4 Suppression Considerations

In terms of fire suppression the overall fuel hazard provides a guide to the probability of first attack success, assuming that:

- direct attack using a combination of light and heavy firefighting vehicles
- direct attack is undertaken with a 50 kW (D3/4 class) bulldozer supported by a 14 fire appliance and crew
- attack occurs within 30 minutes of ignition
- the fire is burning on level ground with good access
- the Drought Factor is less than 10
- the wind speed is 20 kph (at 10 metres in the open).

While this matrix is used a benchmark, the elements of first attack success listed above may not be available in any given incident in the planning area. Table 6 summarises the range of Forest Fire Danger Index (FFDI) and overall fuel hazard values and the probability that first attack will succeed.

TABLE 6 – PROBABILITY OF FIRST ATTACK SUCCESS BASED ON FFDI AND OVERALL FUEL HAZARD

Source: DEH (2006c)

		Forest Fire Danger Index				
		Low (0-4)	Moderate (5-12)	High (13-24)	Very High (25-49)	Extreme (50-100)
Overall Fuel Hazard	Low	100%	100%	100%	100%	99-100%
	Moderate	100%	100%	100%	100%	96-100%
	High	100%	100%	100%	96-100%	64-96%
	Very High	96-98%	94-96%	92-94%	70-92%	10-70%
	Extreme	74-78%	65-74%	48-65%	18-48%	1-18%

7.4.1 Ground Crews

- Adhere to the Pc recommendations listed in Section 4.1.5.
- Water for fire suppression can be sourced from dams as shown on Map 4. Water may also be sourced from creeks; alternatively bulk water carriers may be deployed to the incident.
- Public roads and access tracks that have been classified to GAFLC standards are shown on Map 4.
- Public roads and access tracks classified as Service Tracks under the GAFLC standard (Map 4) should not be used during fire suppression operations unless verified by on ground inspection and approved by IMT.
- Maps should be checked carefully to determine escape routes and reduce the likelihood of entrapment.
- Coastal/sea breezes may influence fire behaviour.

7.4.2 Heavy Machinery

- Machinery use must adhere to the Phytophthora hygiene procedures as described in Section 4.1.5.
- Machinery use and deployment during fire suppression is to be in accordance with:
 - the DEH *Fire Policy and Procedure for Earthmoving Equipment* (DEH, 2008f);
 - the CFS *Supervision of Machinery Guidelines* (CFS, 2007); and
 - the SA *Wilderness Code of Management* (DEH, 2004).
- When using earthmoving equipment, the Incident Controller must consider all practical options, effectiveness, the likelihood of success and likely positive and negative impacts on environmental and cultural values.

- Minimum Impact Suppression Techniques (MIST) and specialised equipment that reduces impacts to the landscape shall be used wherever possible and control methods will not be greater than the potential or actual impact of the fire.
- The decision to deploy heavy machinery for direct attack should be made by the Incident Management Team at the earliest point in time given:
 - the fire weather and associated fire behaviour conditions under which the machinery will be operating
 - the response time and anticipated time of work commencement is acceptable (e.g. to minimise the overall area cleared in the establishment of control lines and increase the likelihood of success)
 - that the actions are authorised by the IMT, following liaison with the DEH Liaison Officer or the relevant landholder/s.
- Heavy machinery is only to be used where the Incident Management Team has determined that:
 - use is required to minimise the threat of the fire to life and property
 - the topography is suitable and/or safe for heavy machinery (e.g. not on steep slopes, creek lines or swampy areas)
 - the risk of spreading *Phytophthora* has been minimised
 - the line will be trafficable by 14 fire appliances to support implementation and mop-up
 - the sensitivity of vegetation and habitat define a critical need to stop the fire entering an adjacent area
 - there is unlikely to be irreversible or an unacceptable level of environmental impact significant communities, species or habitats
 - the size of any spot-over being tracked is of a size that can be successfully contained within one 12 hour shift
 - known areas of cultural heritage significance can be avoided.
- Ideally, machinery should only traverse a maximum of 1km out from an existing control line or reserve boundary.

7.4.3 Aerial Operations

- Implementation of aerial suppression is to be in accordance with the:
 - *Fire Policy and Procedure for Aerial Operations* (DEH, 2008b)
 - *Fire Policy and Procedure for Fire Suppression Chemicals* (DEH, 2008a)
 - *Memorandum of Understanding on Aerial Application of Chemical Fire Retardants between SA Water and CFS* (CFS, 2006b).
- The use of retardant should be approved by an Incident Controller and restricted, where possible, to critical situations, such as the protection of human life and built assets, or to contain a fire to enable ground crew access. Retardant should only be used where ground crews are available to back up and should not be dropped in

creeklines or in close proximity to standing water as retardant creates an increase in nutrients, which increases the potential to favour weed species and can affect nutrient-sensitive native species.

- The use of foams should be minimised in catchment areas and creek lines.
- Aerial ignition should be considered in the implementation of large scale prescription burns or to be used during bushfires to reduce the impact of head fires on control lines and increase the probability of success in limiting the propagation of a bushfire within the landscape.

7.5 Fire Access, Fire Breaks, and Control Lines

'Fire access tracks' are defined as a track constructed and maintained expressly for fire management purposes. A 'fire break' is an area where vegetation has been removed or modified to reduce the risk of fires starting and reduce the intensity and rate of spread of fires that may occur (GAFLC, 2008). A 'control line' is the combined effects of a natural or constructed barrier, or treated fire edge, and any activities undertaken at that edge, which are used in fire suppression and prescribed burning to limit the spread of fire.

Control lines have not specifically been designated within the LPA. Fire access tracks, fire breaks and other natural or constructed areas may be used for this purpose.

The standards for fire access tracks and fire breaks within the Cape Forbin Landscape Planning Area have been adopted from the guidelines prepared by the Government Agencies Fire Liaison Committee (GAFLC) (2008). The GAFLC standards have been developed for public lands, and include prescriptions and standards for various fire access tracks and breaks. They also provide guidelines for adjacent fuel management, positioning and maintenance, mapping, signage and safety.

All track classifications in the Landscape Planning Area were recorded using GAFLC standards during the preparation of this plan, including on private lands where appropriate. In the interests of improved access for fire management, private landholders are encouraged to maintain access to GAFLC standards. However, it is recognised that these standards are not currently enforceable on private lands. It should be noted that the track classification as shown on Map 4 (Fire Management and Access), may vary depending on what works have been completed and whether there has been any degradation of tracks since the assessment was conducted.

Gates providing access that have been audited are also presented on Map 4.

Fire access points and tracks have been reviewed as part of this plan and are shown in Map 4. These changes are aimed to increase the:

- safety of firefighting personnel involved in a fire suppression effort
- response time of fire suppression agencies
- type of resources that can safely be deployed to assist in a fire suppression effort.

Additional fire access points and tracks will only be established for the purpose of fire suppression during a bushfire, where provided for in planning, or where approved by an Incident Controller.

The use of control lines should be determined by the Incident Management Team (IMT), based on fire severity and weather conditions, giving due consideration to safety and strategic advantage.

All stakeholders have an obligation to maximise safety for fire suppression activities. For this plan, standards for control lines are in accordance with the GAFLC standards. Where the combination of vegetation, fuel loads and terrain is likely to reduce the effectiveness of these control lines, they may be widened, or perimeter burns may be undertaken in their immediate vicinity. This will minimise the likelihood of bushfires crossing control lines. Bulldozers should be used blade up.

By utilising control lines and through the strategic use of previous fire scars and fuel patterns, the need to undertake other high impact suppression measures, such as chaining or mineral earth breaks during a running fire will be reduced.

Recommendations

Fire Access	20. Undertake recommended fire access works as described in Table, Section 10.2.
	21. Avoidance of the construction of control lines and access in drainage lines to minimise the impact of fire on catchment water quality and aquatic fauna.
	22. It is recommended that the GAFLC (2008) standards be adopted by all landowners in the planning area to maintain consistency in the standard of fire access tracks and signs.

7.6 Fire Management Utilities and Facilities

Utilities and facilities are infrastructure that are used during the suppression of fire. In the Landscape Planning Area they include water sources and airstrips. The existing water sources and facilities have been mapped for the area (Map 4). Access to water sources for fire-fighting purposes should be negotiated directly with neighbours, through the CFS Group. The Cape Forbin IFMP will be regularly reviewed and updated to reflect alterations and additions to utilities and facilities.

8 FIRE MANAGEMENT ZONES AND BLOCKS

8.1 Fire Management Blocks

Zones have been divided into eight blocks to clarify and simplify the location of particular areas within a zone. Map 4 (Fire Management and Access) shows the spatial location of these blocks. The blocks are: Borda, Torrens, Jump-off, De Mole, Back Valley, Coleman, Western River and Berryman. Note that the purpose of identifying these blocks is for the purpose of geographic reference only.

8.2 Fire Management Zones

Fire management zones as detailed in the *Policy and Procedure for Fire Management Zoning in DEH Fire Planning* (DEH, 2008g) were formally adopted, with modifications, and applied to the Landscape Planning Area. These zones:

- ensure that appropriate management actions are implemented to meet the requirements for asset protection and ecological management
- clarify the areas where different fire management activities will be undertaken
- assist in the development of fire management plans and programs.

Fire management zones are categorised according to the primary objective for fire management – Asset Zone (A-zone), Buffer Zone (B-zone) or Conservation-Land Management Zone (CLM-zone). These zones were determined with consideration to overall fuel hazard levels in different habitat types and the level of risk to assets including life, property and cultural heritage and biodiversity assets. The zones allocated to the Landscape Planning Area are described in Sections 8.3 to **Error! Reference source not found.**, and also displayed on Map 4 - Fire Management and Access. A summary of fire management zones by tenure is illustrated in Table 7.

TABLE 7 – FIRE MANAGEMENT ZONES BY TENURE WITHIN THE PLANNING AREA

	Tenure by Area (Ha)					Total Area	
	Government			Private		Ha	% of LPA*
	Protected Areas	Dedicated reserves	Unalienated Crown Lands	Leasehold	Freehold / Other		
A-zone	0	0.5	0.2	37.7	84.8	123.21	0.5
B-zone	151.9	24.0	0.6	36.6	108.5	321.7	1.2
CLM-zone	3223.3	533.4	364.5	8254.9	14372.3	26748.3	98.4
Total	3375.2	557.9	365.3	8329.2	14566.0	27193.1	100.0

*LPA: Landscape Planning Area

8.3 Asset Zone (A-zone)

8.3.1 A-zone Description

An Asset Zone, or A-zone aims to provide the highest level of protection to human life and property by implementing the most intensive fuel management strategies. An A-zone will mainly be sited immediately adjacent to high value assets requiring protection from bushfires

(e.g. residential areas, public utilities, historical features, visitor areas). The A-zone may comprise fire access tracks, fire breaks and fuel reduced areas through mechanical means or the use of fire.

The depth of an A-zone will range from 40 to 100 metres, however under some circumstances, as described in the policy (DEH, 2008g), the depth may be reduced to less than 40 metres. Justification for the reduction in depth must be included within this fire management plan.

The only areas designated as A-zones within the Landscape Planning Area are 50 metre buffers around all buildings, including dwellings, and 20 metre buffers surrounding all communication towers. The latter were identified through the risk assessment process (see Section 5) as at *Moderate* risk.

8.3.2 Prescriptions for Fuels in A-zones

The overall fuel hazard should not exceed *Moderate* for the areas designated as A-zones. There should be *Low* to *Moderate* fine fuel at ground or near surface levels and fuels should also be discontinuous. This will minimise the risk of a fire carrying across the zone at, or close to ground level and to reduce the path for transfer of fire into adjacent property.

8.3.3 A-zone Objectives

- To provide a low fuel buffer of at least 40 m to protect life (owners, occupiers and firefighters) and property/built assets (including lease buildings, homes, historical values and neighbouring assets) from radiant heat damage, flame contact and short distance ember attack.
- To provide a suppression advantage should a fire ignite in the zone.
- To modify the fire intensity and provide a control line for the suppression of bushfires as safely and efficiently as possible.
- To provide access between properties and the bushland interface.

8.3.4 Strategies for Achieving Objectives in A-zones

Slashing, mowing, selective fine fuel removal, trail or fire break construction and prescribed burning are acceptable methods of fuel management in A-zones. Fuel reduction by prescribed burning or other techniques should be undertaken, as appropriate when fuel levels exceed prescribed limits. Within bushland in this zone, the exemptions contained within the *Native Vegetation Act 1991* permit the complete removal of most native vegetation to a distance of 20 m from a dwelling. Selective shrub removal, thinning and clearing of woody weeds is possible, as part of this approved landscape fire management plan to a further 30 m. Where additional clearance is considered desirable for the purpose of bushfire protection, the landowner should refer to the *Kangaroo Island Bushfire Prevention Plan* (KI DBPC, 2000), as amended.

Recommendations

A-zones	23.	Encourage residents and home owners within the planning area to prepare Bushfire Action Plans and consider the 'Stay and Defend' or 'Go Early' CFS policy.
	24.	Encourage residents within the planning area to clear vegetation to a width of 20 m around dwellings and selective thinning of vegetation to a further 30 m.
	25.	Encourage residents in collaboration with the Fire Prevention Officer prepare prescription burn plans to undertake hazard reduction burns within 50 m of a dwellings.

8.3.5 Suppression Considerations in A-zones

- Life and property protection is a high priority.
- Where multiple assets are under threat from a bushfire, a triage risk assessment (whereby assets are prioritised based on their defendability) would need to be undertaken on each dwelling to determine the capacity for crews to protect individual houses.
- In several areas within the planning area including De Mole Estates, crews would be required to traverse narrow creek crossings and steep terrain along dead-end tracks. Under high to extreme conditions a risk assessment may preclude crews from entering the area to undertake life and property protection.

8.4 Buffer Zone (B-zone)

8.4.1 B-zone Description

A Buffer Zone, or B-zone aims to provide a fuel reduced area to assist in decreasing the rate of spread, intensity and spotting potential of a bushfire, and hence minimise the extent of the fire. This zone is usually 40 to 1000 m wide and may apply in bushland areas in close proximity to assets requiring protection from bushfire. It may also be used to provide strategic fuel reduction for a landscape, which would otherwise carry *Very High* to *Extreme* overall fuel hazard levels.

In this plan, the majority of B-zones have been sited across the Landscape Planning Area to provide specific fuel reduced areas between continuous areas of vegetation. Where B-zones are located within tracts of native vegetation B-zone widths of 200 m are considered appropriate. This is based on the spotting distance of fire in moderate conditions. Where the B-zone is within a narrow strip of vegetation (along creek lines) the appropriate width is less than 100 m. Forestry plantations within the Landscape Planning Area have a B-zone buffer width of 20 m around the boundary of the plantation.

Refer to Map 4 for an overview of all buffers in the Landscape Planning Area.

8.4.2 Prescriptions for Fuels in B-zones

The Overall Fuel Hazard should not exceed *High* for the areas designated as B-zones.

8.4.3 B-zone Objectives

- To minimise the loss of life, property and ecological assets due to bushfire.
- To assist in reducing bushfire intensity, ember attack, and spotting potential.
- To provide a suppression advantage to assist in containing bushfires within defined areas. That is, to minimise the likelihood of fires entering or exiting the planning area and entering blocks from adjacent blocks.
- To increase safe access for firefighters.
- To provide strategic fuel reduction in contiguous vegetation.

8.4.4 Strategies for Achieving Objectives in B-zones

- Fuel management will primarily be undertaken by prescribed burning to achieve the desired level of fuel, once the available fuels exceed the prescribed limit.
- Undertake a closed burn where the burn is contained within control lines.
- Undertake an open ended burn where the burn is not contained on one or more sides by a control line.
- Where a control line needs to be created for a prescribed burn in a B-zone, the first priority is to implement a hydro-axe line or a rolled control line. If a bulldozer is to be used then the blade must be raised.
- Monitor the impacts on wilderness value from the construction and maintenance of firebreaks and if any additional impacts are identified and assessed as significant, rehabilitate areas as necessary.
- Where a control line needs to be created within a B-zone in a bushfire suppression situation then a bulldozer may be used with the blade up.
- Monitor the impacts of wilderness values of fire break construction and rehabilitating any areas where necessary.

Recommendations

B-zones	26.	A B-zone of $\leq 100\text{m}$ to be created and maintained for the central Glossy Black Nesting habitat in Torrens Block. This area is a critical nesting habitat and the buffer prescription must detail a low intensity burn with protection works for each Sugar Gum. See Appendix 2 for information on the Glossy Black-Cockatoo.
	27.	A B-zone of $\leq 100\text{m}$ to be created and maintained: <ul style="list-style-type: none"> • in the northern section of Heritage Agreement (HA) 496 within Borda Block • in the central area of Borda Block on private land (x2) • on the western boundary of Cape Torrens WPA within Torrens Block • in the central area of Torrens Block on private land • between HA 993 and HA 146 within Jump-off Block • north of HA 1240 on private land within Back Valley Block • east of Snug Cove Road on private land within Coleman Block • west of Snug Cove Road on private land within Back Valley Block • between HA 179 and North Coast Road on private land within Berryman Block • south of Berrymans Road on private land within Berryman Block • west of HA 1072 on private land within Berryman Block
	28.	A B-zone of $\sim 200\text{m}$ to be created and maintained: <ul style="list-style-type: none"> • along the eastern boundary of Cape Torrens WPA in Torrens Block continuing south to Jump-off Block on private land • south of Flinders Way along the western boundary of Back Valley Block on private land • west of Snug Cove Road within Back Valley Block on private land • along the southern boundary of the northern parcel of Western River WPA within Coleman Block • along Colemans Road and the southern boundary of the northern parcel of Western River WPA within Coleman Block • along the northern boundary of the southern parcel of Western River WPA where it abuts Colemans Road in Western River Block • north of Sheridan Road on private land within Coleman Block
	29.	Recommend the implementation of a B-zone along the southern edge of the Playford Highway (west from West End Highway). The width/placement to be detailed within the Flinders Chase Fire Management Plan (DEH, 2009). <ul style="list-style-type: none"> • <i>Note: several populations of Nationally threatened plant species exist in proposed buffer zone. This zone will be reviewed in the Flinders Chase Fire Management Plan and widths may be altered.</i>

8.4.5 Suppression Considerations in B-zones

Refer to Section 7.4.

8.5 Conservation-Land Management Zone (CLM-zone)

8.5.1 CLM-zone Description

The Conservation-Land Management Zone, or CLM-zone, within this Plan is defined as all reserves, heritage agreement areas, remnant vegetation patches and road reserves as well

as grazing land (sheep, cattle and deer), occasional cropping and plantation forestry.. The CLM-zone allows for fire management activities to meet ecological and conservation management objectives as well as specific land management objectives depending on land use.

Most farming and forestry properties within the Landscape Planning Area also include built assets, being a combination of dwellings and sheds. These assets are covered within the A- and B-zone prescriptions outlined above.

8.5.2 CLM-zone Objectives

- To assist in the conservation of species, populations, communities, habitats, wilderness areas or cultural heritage values, through the application of appropriate fire regimes in native vegetation.
- To minimise the likelihood that an entire block of native vegetation is burnt in any single bushfire event.
- To ensure that no more than 50% of the identified Glossy Black-Cockatoo feeding habitat and 50% of nest sites in either the De Mole or Western River flocks is burnt in any single fire event.
- To minimise the likelihood that weeds and pathogens, including Pc, are introduced or spread as a result of fire management activities.
- To manage fire to meet the specific objectives of any plans of management.
- To minimise the fragmentation of native vegetation through fire suppression strategies.
- To minimise the impact of fires on catchment water quality and aquatic fauna.
- To minimise the impact of suppression activities on wilderness quality.
- To ensure that more than 50% of any Major Vegetation Sub-group in the planning area has a minimum fire interval of 17 years and maximum post fire-age of less than 40 years.
- To minimise the loss of life and property, including livestock, crops, pasture and plantations within private lands.
- To minimise the likelihood of spread of fire through a farming or forestry property via native vegetation corridors and through appropriate management of primary production land.
- To work with landholders to improve property access by upgrading tracks and crossings on properties within the Landscape Planning Area.

Fire management for native vegetation areas within the CLM-zone should aim to meet fire management guidelines for that vegetation community, as set out in Table 5.

8.5.3 Strategies for Achieving Objectives in CLM-zones

The strategies for achieving objectives in the CLM-zone are to:

- undertake ecological burns to create a mosaic of age-classes in all Major Vegetation Sub-groups. In the absence of an approved procedure on non-DEH managed lands, the *GAFLC Prescribed Burning Code of Practice* (GAFLC, 2004) or the *DEH Policy and*

Procedures for Ecological Burning (DEH, 2008h) should be applied to burns within CLM-zone areas. Ecological burns within CLM-zones must follow the Policy on DEH managed lands. The *Policy and Procedures for Ecological Burning* states that ecological burns should:

- aim to meet Ecological Fire Management Guidelines for the vegetation communities that occur within the Landscape Planning Area
 - have explicit ecological and burn objectives, which are consistent with this plan
 - have specific monitoring established to assess that burn and ecological objectives are achieved and collect additional vital attribute data to contribute to refining fire management guidelines.
- undertake prescribed burning for Landscape Protection (i.e. a Landscape Protection Burn) where necessary within CLM-zones. The primary aim of a Landscape Protection Burn is to reduce the likelihood of a whole reserve or continuous block of vegetation burning in a single fire event. The appropriate Ecological Fire Management Guidelines (Table 5) for the vegetation communities (MVS) concerned should be met. If the proposed burn is outside the stated guidelines for the MVS in question then justification must be provided in the EAT developed for the proposed prescribed burn. Priority should be given to burns that link existing areas of low fuel hazard (e.g. recent bushfires) to create strategic corridors that will assist in restricting the extent of bushfires
 - undertake hazard reduction works (burn or mechanical) to protect specific biodiversity assets. These include Glossy Black-Cockatoo feeding habitat, nesting habitat and individual nesting trees
 - develop strategic control lines to reduce the likelihood of extensive areas of habitat being burnt in one fire event
 - minimise the introduction of weeds or pathogens
 - only conduct hazard reduction burns when fuel loads reach levels that result in unacceptable risks to assets to reduce the frequency of burning.
 - identify appropriate buffer areas to minimise the spread of fire through the landscape and the loss of and damage to assets in the CLM-zone
 - undertake low intensity burns to reduce the overall fuel hazard to *Moderate* in native vegetation corridors within the CLM-zone at strategic points (e.g. adjacent to A- and B-zones, adjacent to property boundaries adjoining large tracts of remnant vegetation)
 - utilise crossings through drainage lines and fence lines (e.g. boundaries) at strategic points to provide control lines for managed burns and in suppression situations. This may include widening of crossings to a maximum width of 6 m, and expansion of fence line breaks up to 15 m.

Recommendations

CLM-zones

30. Implement ecological burns in native vegetation to create a mosaic of age classes in the following locations (see Map 4 for more detailed spatial information).
 - North-western section of Torrens Block, adjacent Cape Torrens
 - North-eastern boundaries of Torrens Block and Jump Off Block
 - Central section of Jump Off Block, within Heritage Agreement (HA 146)
 - Within De Mole Block, north-east of Investigator Way Track and Flinders Way
 - North-western corner of Back Valley Block, south of Flinders Way
 - Northern section of Back Valley Block, bounded by the northern boundary line (south of Wilkinson Road)
 - *Note: each burn area identified may not be burnt in its entirety within a season, (i.e. the burn may itself be patchy, or the area could be divided and burnt over a number of seasons).*
31. Implement habitat protection burns in native vegetation adjacent to identified habitat areas for species of conservation significance. Priorities for this strategy are located:
 - at the south-eastern corner of Jump Off Block, to provide protection from the proposed B-zone burn along the Playford Highway
 - within the central section of Torrens Block, which constitutes critical nesting habitat for the Glossy Black-Cockatoo
 - at the north-eastern corner of Torrens Block and north-western corner of De Mole Block (one burn) to provide protection for a population of De Mole River Correa (*Correa calycina*) from the proposed B-zone burn in Torrens and Jump Off Blocks.
32. Implement bounded landscape protection burns in native vegetation adjacent access tracks in areas that have known populations of species of conservation significance (which are not otherwise referred to above). Refer to Figure 2 (Section 8.7) for detail on the burn planning process to be followed, and to Appendix 1 and 2 for ecological fire management guidelines for the particular species.
33. Identify areas in the CLM-zone for low intensity burning (which may be open ended) and/or utilise crossings and fence lines to provide strategic suppression capacity.
34. Identify additional/extensions of B-zone buffers to minimise the spread of fire through the landscape.
35. Promote use of the voluntary *Harvest Code of Practice* for grain harvesting operations (CFS, 2008).
36. Promote land management practices to manage fire risk, such as strategic grazing of paddocks adjacent to large blocks of native vegetation, and observance by plantation managers of planning approval requirements in relation to fire management.
37. Work with landholders to identify property access issues and implement appropriate upgrades.

8.5.4 Suppression Considerations in CLM-zones

- Minimum impact suppression techniques (MIST) should be used in native vegetation areas where possible.

- In the event of a bushfire which is likely to burn Glossy Black-Cockatoo critical nesting habitat, protection of individual nest trees by removing ground and elevated fuels surrounding them, or if time permits implementing a habitat protection burn adjacent to the nesting habitat.
- In order to minimise fragmentation of significant areas of native vegetation as a result of fire suppression activities (construction of control lines and access tracks), implementation of rehabilitation programs following bushfire events should be undertaken in CLM-zones (See Section 9.1).

Corridors of remnant native vegetation less than 50 ha in size occur along drainage lines transecting private properties within the CLM-zone. These corridors are likely to promote the movement of fire along creek lines and road reserves across the landscape. During extreme fire events the rate of spread of fire through cured grassland is significantly greater than through native vegetation.

It is often a more effective strategy to suppress fires from open pasture. This may involve either direct firefighting or indirect using graders to create breaks or burning out strips of land to minimise the spread of fire out of native vegetation areas. Strategies will be dependant on fuel loads, curing and predicted fire behaviour. Consideration will also be given to using boundary breaks or tracks within plantations or protected areas.

Boundary breaks around plantations, and major service tracks within plantations, may also provide important control lines for suppression.

Access within private properties within the Landscape Planning Area is highly variable. There are extensive drainage line systems and many of these remain wet and boggy all year round. Particular attention therefore needs to be paid to ensuring that advice is sought from local landholders regarding property access during an incident and landholders are also encouraged and supported to upgrade access (including crossings) over time.

8.6 Prescribed Burn Preparation

In the absence of an approved process, all prescribed burning undertaken within the Landscape Planning Area will be in accordance with the planning process for DEH managed lands as described in the *DEH Fire Policy and Procedure for Prescribed Burning* (DEH, 2008e). The development of the Prescription Burn Plan, subject to an approval process with Native Vegetation Council, will include identifying the type of burn being considered, the prescription or threshold under which the burn will be conducted, an environmental assessment and any actions required to mitigate the identified risks. The Operational Burn Plan will include a risk assessment of the proposed burn and the details of how the burn will be conducted. Finally the process should include the implementation of any post-burn monitoring and evaluation and this should feed back into this plan. This process is summarised in Figure 2.

Alternatively, if an approved delegated process is developed to enable landholders to undertake prescription burning on private land, this process may be utilised instead of the DEH framework referred to above to undertake works on private land in accordance with the strategic framework established by this plan.

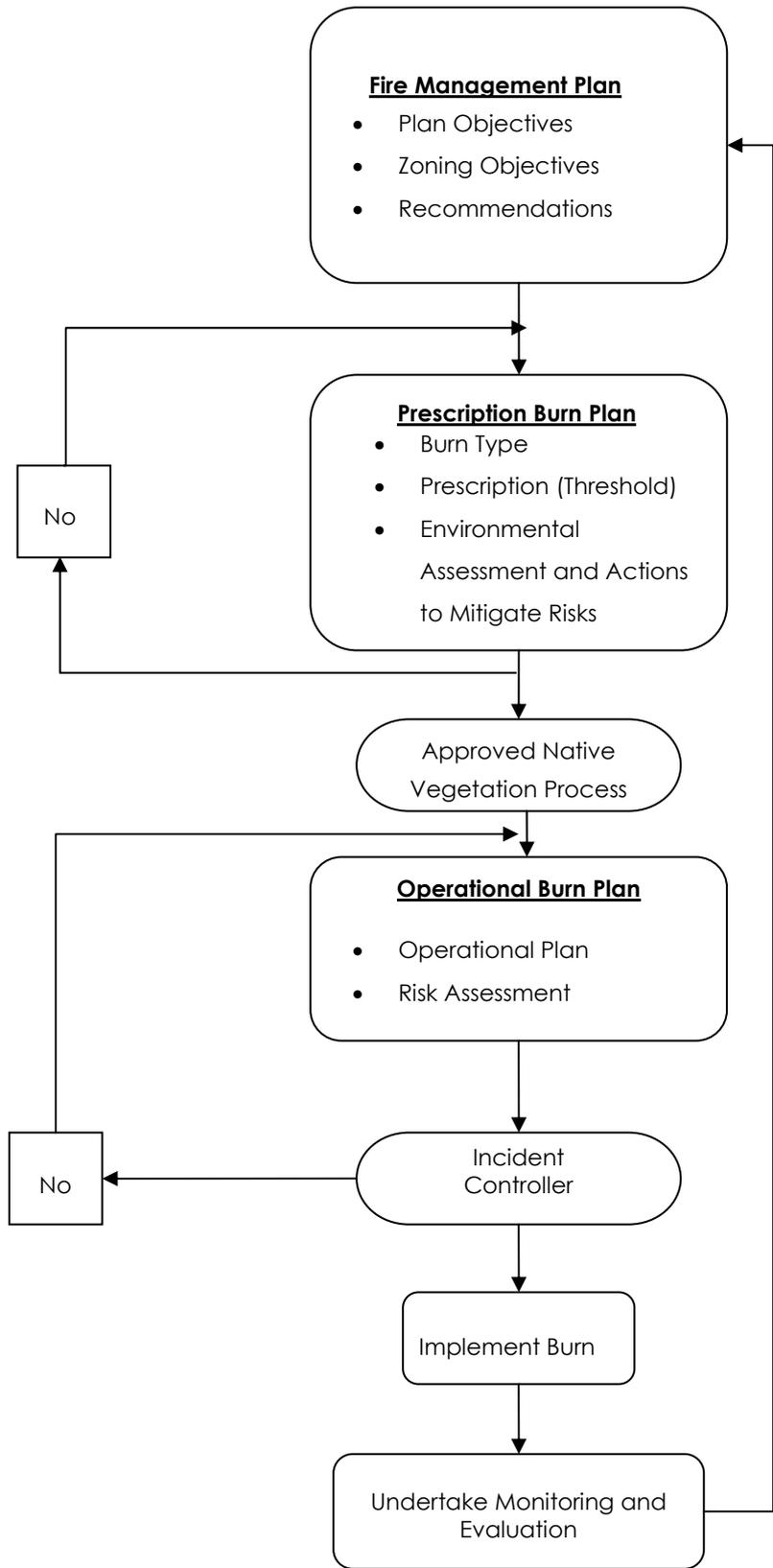


FIGURE 2 – PRESCRIBED BURN PLANNING PROCESS FOR NATIVE VEGETATION ON ALL LANDS

9 BIODIVERSITY WORKS – RECOVERY, RESEARCH AND MONITORING

9.1 Post-fire Rehabilitation and Recovery

DEH has a Policy and Procedure for Post-fire Rehabilitation (DEH, 2008i) to ensure that the post-fire rehabilitation and recovery of a reserve is identified during an incident. Specific objectives of post-fire rehabilitation plans are outlined in the policy and procedure.

A post-fire rehabilitation plan should be prepared after a bushfire and should describe the areas affected by fire and impacts on the natural and built environment.

Areas on Kangaroo Island adversely impacted as a result of previous fires or fire suppression activities have been restored and rehabilitated. After the recent bushfires in December 2007 the Department established a recovery program to assess the impact to biodiversity, tourism and built assets, establish priorities for rehabilitation and undertake recovery actions.

9.2 Research and Monitoring

The implementation of this plan will provide opportunities to increase our knowledge of how species and ecological communities respond to fire, to fill gaps in knowledge, and to contribute new information and concepts to the adaptive management process. A number of issues surrounding fire and its management for biodiversity conservation remain unresolved. For example, fire regimes are complex sets of conditions that link fire and biota, and, for a given area, biodiversity will respond to time between fires, time since last fire, intensity of the most recent fire, the type of fuel burnt, season of occurrence and spatial patterns of fire (McCarthy and Cary, 2002; Whelan, *et al.*, 2002).

On Kangaroo Island, the Kangaroo Island Monitoring Biodiversity Assets (KIMBA) project provides an example of a research program designed to investigate community-scale responses to fire (Gates and Moss, 2002) and recent investment has seen the development of new fire projects through implementation of the Fahrenheit 451 and Island Refuge programs (Conservation Programs Unit, Kangaroo Island). The scientific focus of this work makes it ideal for adaptive management, which is based on integration of planning, an experimental approach and comprehensive monitoring for testing different management systems (Keith, *et al.*, 2002; Possingham, 2001; Sabine, *et al.*, 2004). A range of situations are likely to provide opportunities for measuring the response of biota to fire, including bushfire, planned fire and the activities associated with fire management that impact on natural systems.

Recommendations

Biodiversity	38. Investigate the fuel accumulation rates of the various MVS that occur within the planning area. These data will help to determine if and when fuel reduced works are required, ultimately assisting in the scheduling of operational works and activities in B-zones.
	39. Investigate the suitability of the Ecological Fire Management Guidelines for MVS through the assessment of historic fire regimes in similar communities across the state (Table 5)
	40. Effects of fire on Southern Brown Bandicoot populations and habitat to be monitored

10 RECOMMENDATIONS

All recommendations within this plan will be reviewed annually by a working group. All works will be implemented based on resource availability.

10.1 Summary of Recommendations

Heritage Agreements

1. To assist in the implementation of prescribed burning and other pre-suppression works within Heritage Agreements it is recommended that funding be sought through the Kangaroo Island NRM Board to assist in fire management and monitoring on private land. These funds should be managed through the Conservation Programs Unit (Kangaroo Island Region).

Phytophthora

2. Ensure the *Standard Operating Procedure – Phytophthora Threat Management* (SOPP-002) (DEH, 2002) is adhered to in Pc risk areas.
3. Ensure hygiene practices are implemented at all times during fire operations to reduce the spread of Pc across the planning area. In Phytophthora free areas consider the risks of machinery use and implement hygiene measures if machinery and vehicle access is necessary. Refer to DEH Operating Procedure – *Phytophthora Vehicle Disinfection Units* (DEH, 2003a).
4. Where possible, wash down stations should be established at appropriate points as soon as possible during a fire incident. Refer to DEH Operating Procedure – *Phytophthora Vehicle Disinfection Units* (DEH, 2003a).

Weeds

5. Identify the potential impact of weed species prior to any prescribed burn in prescribed burn planning, as part of the environmental assessment process. This will identify any priority weed species and recommend any post-fire actions to mitigate the impact of weeds.
6. Monitor weeds pre and post-fire to determine what post-fire weed control is required and its effectiveness.
7. Implementation of the KI roadside vegetation management plan which includes pre and post-fire weed management strategies.
8. Ensure hygiene practices are implemented to reduce weed spread across the planning area.

Pest Fauna

9. Collect relevant information in prescribed burn planning as part of the environmental assessment process on pest animals, to determine appropriate management post-fire.
10. Implement appropriate management programs post-fire to address issues with overabundant species, if necessary.

Built Assets

11. Any new built assets comply with Development Plan and Building Code requirements.

12. Landholders are encouraged and provided with relevant information and support to retrofit existing dwellings and other built assets to better manage bushfire risk.
13. Consideration is given to restricting further development within De Mole estate given the high bushfire risk.
14. Consideration is given to developing alternative access and egress routes and/or refuge areas for De Mole estate residents.

Ecological

15. Fire regime data in the Landscape Planning Area will need to be reviewed periodically in order for the modifications that result from bushfires and prescribed burns to be incorporated into the data. This in turn will enable the prescribed burning component of the Operational Works Schedule to be adjusted to take account of these modifications.

Community Preparedness

16. Workshops to be held with residents in the planning area to assist them in developing a Bushfire Action Plan.
17. Correspondence is provided annually directly to absentee landholders within the planning area, making them aware of the risks in the area and their land management responsibilities under the *Fire and Emergency Services Act 2005*.
18. Fixed signs to be implemented at strategic locations within the planning area targeting visitors and identifying risks associated with being in a vehicle during a bushfire.
19. Investigate the development of an information booth within the planning area targeting visitors and identifying risks associated with being in a vehicle during a bushfire and implement where appropriate.

Fire Access

20. Undertake recommended fire access works as described in Table 9, Section 10.1.
21. Avoidance of the construction of control lines and access in drainage lines to minimise the impact of fire on catchment water quality and aquatic fauna.
22. It is recommended that the GAFLC (2008) standards be adopted by all landowners in the planning area to maintain consistency in the standard of fire access tracks and signs.

A-zones

23. Encourage residents and home owners within the planning area to prepare Bushfire Action Plans and consider the 'Stay and Defend' or 'Go Early' CFS policy.
24. Encourage residents within the planning area to clear vegetation to a width of 20 m around dwellings and selective thinning of vegetation to a further 30 m.
25. Encourage residents in collaboration with the Fire Prevention Officer prepare prescription burn plans to undertake hazard reduction burns within 50 m of a dwellings.

B-zones

26. A B-zone of $\leq 100\text{m}$ to be created and maintained for the central Glossy Black Nesting habitat in Torrens Block. This area is a critical nesting habitat and the buffer prescription must detail a low intensity burn with protection works for each Sugar Gum. ee Appendix 2 for information on the Glossy Black-Cockatoo.

27. A B-zone of $\leq 100\text{m}$ to be created and maintained:
- in the northern section of Heritage Agreement (HA) 496 within Borda Block
 - in the central area of Borda Block on private land (x2)
 - on the western boundary of Cape Torrens WPA within Torrens Block
 - in the central area of Torrens Block on private land
 - between HA 993 and HA 146 within Jump-off Block
 - north of HA 1240 on private land within Back Valley Block
 - east of Snug Cove Road on private land within Coleman Block
 - west of Snug Cove Road on private land within Back Valley Block
 - between HA 179 and North Coast Road on private land within Berryman Block
 - south of Berrymans Road on private land within Berryman Block
 - west of HA 1072 on private land within Berryman Block
28. A B-zone of $\sim 200\text{m}$ to be created and maintained:
- along the eastern boundary of Cape Torrens WPA in Torrens Block continuing south to Jump-off Block on private land
 - south of Flinders Way along the western boundary of Back Valley Block on private land
 - west of Snug Cove Road within Back Valley Block on private land
 - along the southern boundary of the northern parcel of Western River WPA within Coleman Block
 - along Colemans Road and the southern boundary of the northern parcel of Western River WPA within Coleman Block
 - along the northern boundary of the southern parcel of Western River WPA where it abuts Colemans Road in Western River Block
 - north of Sheridan Road on private land within Coleman Block
29. Recommend the implementation of a B-zone along the southern edge of the Playford Highway (west from West End Highway). The width/placement to be detailed within the Flinders Chase Fire Management Plan (DEH, 2009).
- *Note: several populations of Nationally threatened plant species exist in proposed buffer zone. This zone will be reviewed in the Flinders Chase Fire Management Plan and widths may be altered.*

CLM-zones

30. Implement ecological burns in native vegetation to create a mosaic of age classes in the following locations (see Map 4 for more detailed spatial information).
- North-western section of Torrens Block, adjacent Cape Torrens
 - North-eastern boundaries of Torrens Block and Jump Off Block
 - Central section of Jump Off Block, within Heritage Agreement (HA 146)
 - Within De Mole Block, north-east of Investigator Way Track and Flinders Way
 - North-western corner of Back Valley Block, south of Flinders Way
 - Northern section of Back Valley Block, bounded by the northern boundary line (south of Wilkinson Road)
 - *Note: each burn area identified may not be burnt in its entirety within a season, (i.e. the burn may itself be patchy, or the area could be divided and burnt over a number of seasons).*

31. Implement habitat protection burns in native vegetation adjacent to identified habitat areas for species of conservation significance. Priorities for this strategy are located:
 - at the south-eastern corner of Jump Off Block, to provide protection from the proposed B-zone burn along the Playford Highway
 - within the central section of Torrens Block, which constitutes critical nesting habitat for the Glossy Black-Cockatoo
 - at the north-eastern corner of Torrens Block and north-western corner of De Mole Block (one burn) to provide protection for a population of De Mole River Correa (*Correa calycina*) from the proposed B-zone burn in Torrens and Jump Off Blocks.
32. Implement bounded landscape protection burns in native vegetation adjacent access tracks in areas that have known populations of species of conservation significance (which are not otherwise referred to above). Refer to Figure 2 (Section 8.7) for detail on the burn planning process to be followed, and to Appendix 1 and 2 for ecological fire management guidelines for the particular species.
33. Identify areas in the CLM-zone for low intensity burning (which may be open ended) and/or utilise crossings and fence lines to provide strategic suppression capacity.
34. Identify additional/extensions of B-zone buffers to minimise the spread of fire through the landscape.
35. Promote use of the voluntary *Harvest Code of Practice* for grain harvesting operations (CFS, 2008).
36. Promote land management practices to manage fire risk, such as strategic grazing of paddocks adjacent to large blocks of native vegetation, and observance by plantation managers of planning approval requirements in relation to fire management.
37. Work with landholders to identify property access issues and implement appropriate upgrades.

Biodiversity

38. Investigate the fuel accumulation rates of the various MVS that occur within the planning area. These data will help to determine if and when fuel reduced works are required, ultimately assisting in the scheduling of operational works and activities in B-zones.
39. Investigate the suitability of the Ecological Fire Management Guidelines for MVS through the assessment of historic fire regimes in similar communities across the state (Table 5)
40. Effects of fire on Southern Brown Bandicoot populations and habitat to be monitored

10.2 Recommended Works

TABLE 8 – TABLE OF RECOMMENDED FIRE ACCESS WORKS

Recommended Works	Responsibility	Priority
<u>KI Council Access Road Network</u>		
Upgrade and maintain Berryman's, Colemans, Western River, Snug Cove, North Coast and Jump-Off Roads to a Major Track.	KI Council	High
Upgrade and maintain Sheridan Road to a Minor Track.	KI Council	High
<u>Western River WPA Access Tracks</u>		
Upgrade and maintain Snug Cove Boundary, Correll Boundary, Fence Line, Castle Hill, Red Hill, Coleman Boundary, Watters Boundary, Thistleton and Sheridan Track to a Standard Track.	DEH	High
Upgrade and maintain Billygoat Falls Track to a Service Track.	DEH	Medium
<u>De Mole Estate Area Access Tracks</u>		
Upgrade and maintain Wilkinson Track, Cape Forbin Track and ford west to edge of Wilmot's to Major Track.	Private	High
Upgrade and maintain Wilkinson to Ford Track and Snug Cove Track to a Standard Track.	Private	High
Upgrade access tracks to residences to a Minor Track.	Private	High
<u>De Tong Ling ("Yacca Creeks") Access Tracks</u>		
Upgrade and maintain the main tracks between the entrance, the stupa and the lodge to Standard Tracks.	Private	High
Upgrade and maintain southern boundary to stupa track to a Minor Track.	Private	High
Upgrade and maintain retreat house to southern boundary track as a Service Track.	Private	High
<u>Other Access Tracks</u>		
Upgrade and maintain Borda Vale Track along south west boundary of Cape Torrens WPA and Torrens Block Rural Aus Plantation Tracks to a Standard Track.	Private	High

Recommended Works	Responsibility	Priority
Investigate possibility to construct and implement where possible, a creek crossing, at the northeast corner of the southern parcel of the Western River Wilderness protection Area to provide continuous fire access.	KI Council/DEH	High
Upgrade and maintain Gum Creek and Florance's SWER Line Tracks to a Standard Track.	Private	High
Maintain Snug Cove Track to a Standard Track.	Private	Low
Identify all access gates with numbers and MGA grid references	All Land Managers	High

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12 APPENDICES

Appendix 1 – Ecological Fire Management Guidelines for Rated Flora

Species	Common Name	EPBC Act Status	NPW Act Status	Primary Vegetation Group	Fire Response	Fire Management Guidelines	Data Source
<i>Acacia dodonaeifolia</i>	Hop-bush Wattle		R	Remota Baxteri Allocasuarina			
<i>Achnophora tatei</i>	Kangaroo Island River Daisy		R	Remota Cosmophylla Cladocalyx	Resprouts. Requires 2 years to set seed. Tolerant	Avoid inter-fire intervals of <5 years	KI
<i>Amphibromus recurvatus</i>	Dark Swamp Wallaby Grass		R	Not recorded in any of the 5 primary vegetation groups	Resprouts. Requires 1 year to set seeds. Tolerant	Avoid inter-fire intervals of <4 years	Aust
<i>Anogramma leptophylla</i>	Annual Fern		R	Remota			
<i>Asterolasia muricata</i>	Rough Star-bush		R	Remota Cladocalyx Baxteri	Regenerates from seed. Requires 2 years to set seed. Intolerant	Avoid inter-fire intervals of <5 years and > lifespan + seedbank	KI
<i>Asterolasia pheballoides</i>	Downy Star-bush	VU	V	Remota	Regenerates from seed. Requires 6 years to set seed. Intolerant	Avoid inter-fire intervals of <9 years and > lifespan + seedbank	KI
<i>Bauera rubioides</i>	Wiry Bauera		R	Remota Cladocalyx Baxteri	Regenerates from seed. Requires 4 years to set seed. Tolerant	Avoid inter-fire intervals of < 7 years.	Aust
<i>Baumea acuta</i>	Pale Twig-rush		R	Remota	Resprouts. Requires 2 years to set seeds. Lifespan + seedbank 100 years. Tolerant	Avoid inter-fire intervals of < 5 years	Aust
<i>Blechnum nudum</i>	Fishbone Water-fern		R	Remota Cladocalyx Baxteri	Resprouts. Requires 3 years to set seeds. Seeds dispersed. Lifespan + seedbank 100 years. Tolerant	Avoid inter-fire intervals of < 6 years	Aust

Species	Common Name	EPBC Act Status	NPW Act Status	Primary Vegetation Group	Fire Response	Fire Management Guidelines	Data Source
<i>Blechnum wattsi</i>	Hard Water-fern		R	Remota Cladocalyx Baxteri	Resprouts. Seeds dispersed. Lifespan + seedbank 100 years. Tolerant	Avoid inter-fire intervals < SJP + 3 years	Aust
<i>Boronia parviflora</i>	Swamp Boronia		R	Remota Baxteri	Resprouts and regenerates from seed. Requires 6 years to set seeds. Lifespan + seedbank 35 years. Tolerant	Avoid inter-fire intervals of < 9 years	Aust
<i>Caladenia valida</i>	Robust Spider-orchid		R	Remota Cladocalyx	Resprouts. Requires 1 year to reach maturity. Tolerant	Avoid inter-fire intervals of < 4 years	Aust
<i>Cheiranthra volubilis</i>	Twining Hand-flower	VU	V	Remota Cosmophylla Allocasuarina			
<i>Choretrum spicatum</i>	Spiked Sour-bush		R	Remota Cladocalyx Baxteri Allocasuarina	Regenerates from seed, Requires 4 years to set seed. Intolerant	Avoid inter-fire intervals of < 7 years and > lifespan + seedbank	KI
<i>Correa calycina</i>	De Mole River Correa	VU		Cladocalyx			
<i>Daviesia benthami</i> <i>ssp. humilis</i>	Mallee Bitter Pea		R	Remota Baxteri			
<i>Deyeuxia densa</i>	Heath Bent Grass		R	Not recorded in any of the 5 primary vegetation groups	Resprouts. Requires 1 year to set seeds. Tolerant	Avoid inter-fire intervals of < 4 years	Aust
<i>Diuris brevifolia</i>	Short-leaf Donkey-orchid		R	Remota Baxteri	Resprouts and seeds dispersed. Intolerant	Avoid inter-fire intervals < SJP + 3 years and > lifespan + seedbank	KI
<i>Drosera binata</i>	Forked Sundew		R	Remota Baxteri	Resprouts. Requires 1 year to reach maturity. Lifespan + seedbank 100 years Intolerant	Avoid inter-fire intervals of < 4 years and > 100 years	Aust
<i>Drosera praefolia</i>	Early Sundew		R	Remota	Resprouts and seeds dispersed. Flowers after 3 years. Intolerant	Avoid inter-fire intervals of < 6 years	KI
<i>Echinopogon ovatus</i>	Rough-beard Grass		R	Remota Allocasuarina	Regrows from seed. Requires 1 year to set seeds. Tolerant	Avoid inter-fire intervals of < 4 years	Aust

Species	Common Name	EPBC Act Status	NPW Act Status	Primary Vegetation Group	Fire Response	Fire Management Guidelines	Data Source
<i>Gahnia hystrix</i>	Spiky Saw-sedge		R	Cladocalyx	Resprouts and regrows from seed. Intolerant	Avoid inter-fire intervals > lifespan + seedbank and < PJP + 3 years	KI
<i>Gleichenia microphylla</i>	Coral Fern		R	Remota Cladocalyx Baxteri	Resprouts. Requires 2 years to set seeds. Lifespan + seedbank 100 years. Tolerant	Avoid inter-fire intervals of < 5 years	Aust
<i>Gonocarpus micranthus</i> ssp. <i>micranthus</i>	Creeping Raspwort		R	Baxteri	Regenerates from seed. Requires 1 year to set seed. Tolerant	Avoid inter-fire intervals of < 4 years	Aust
<i>Grevillea lavandulacea</i> ssp. <i>rogersii</i>	Roger's Spider Flower		R	Remota Cladocalyx	Regenerates from seed. Requires 6 years to set seed. Intolerant	Avoid inter-fire intervals of < 9 years and > lifespan + seedbank	KI
<i>Hakea aenigma</i>	Enigma Hakea		R	Remota Baxteri	Resprouts. Intolerant	Avoid inter-fire intervals > lifespan and 2 or more fires at short intervals	KI
<i>Haloragis brownii</i>	Swamp Raspwort		R	Remota Cladocalyx			
<i>Histiopteris incisa</i>	Bat's Wing Fern		E	Cladocalyx Remota	Resprouts. Seeds dispersed. Lifespan 100 years	Avoid inter-fire intervals > 100 years and 2 or more fires at short intervals	Aust
<i>Hydrocotyle comocarpa</i>	Fringe-fruit Pennywort		R	Remota Cosmophylla Cladocalyx Baxteri Allocasuarina	Regrows from seed. Intolerant	Avoid inter-fire intervals > lifespan + seedbank and < PJP + 3 years	KI
<i>Hypericum japonicum</i>	Matted St John's Wort		R	Remota	Mixed response, assume seeder. Requires 2 years to set seeds. Tolerant	Avoid inter-fire intervals < 5 years	Aust
<i>Hypolepis rugosula</i>	Ruddy Ground-fern		R	Remota Cladocalyx	Resprouts. Requires 2 years to set seeds.	Avoid inter-fire intervals < 5 years and > lifespan + seedbank	Aust
<i>Lepyrodia valliculae</i>	Kangaroo Island Scale-rush		R	Remota Baxteri	Resprouts. Requires 2 years to set seeds. Intolerant	Avoid inter-fire intervals < 5 years and > lifespan + seedbank	KI
<i>Leucopogon clelandii</i>	Cleland's Beard-heath		R	Remota			

Species	Common Name	EPBC Act Status	NPW Act Status	Primary Vegetation Group	Fire Response	Fire Management Guidelines	Data Source
<i>Leucopogon hirsutus</i>	Hairy Beard-heath		R	Remota Cladocalyx Baxteri	Regenerates from seed. Tolerant	Avoid inter-fire intervals < PJP + 3 years	KI
<i>Logania scabrella</i>	Rough Logania		R	Remota Cladocalyx			
<i>Melaleuca squamea</i>	Swamp Honey-myrtle		R	Remota Cladocalyx Baxteri	Regrows from seed. Requires 5 years to set seed. Lifespan + seedbank 60 years. Intolerant	Avoid inter-fire intervals < 8 years and > 60 years	Aust
<i>Myriophyllum amphibium</i>	Broad Milfoil		R	Remota	Resprouts. Requires 1 year to set seeds. Tolerant	Avoid inter-fire intervals < 4 years	Aust
<i>Philothea angustifolia</i> ssp. <i>angustifolia</i>	Narrow-leaf Wax Flower		R	Not recorded in any of the 5 primary vegetation groups			
<i>Phylloglossum drummondii</i>	Pigmy Clubmoss		R	Remota	Resprouts. Requires 2 years to set seeds. Tolerant	Avoid inter-fire intervals < 5 years	Aust
<i>Pilularia novae-hollandiae</i>	Austral Pillwort		R	Not recorded in any of the 5 primary vegetation groups			
<i>Prasophyllum australe</i>	Austral Leek-orchid		R	Remota	Resprouts and grows from seed. Requires 1 year to set seeds. Lifespan + seedbank 60 years. Intolerant	Avoid inter-fire intervals < 4 years and > 60 years	Aust
<i>Pseudanthus micranthus</i>	Fringed Pseudanthus		R	Remota Baxteri			
<i>Pterostylis furcata</i>	Forked Greenhood		E	Remota Cladocalyx			
<i>Ptilotus beckerianus</i>	Ironstone Mulla Mulla	VU	V	Remota Cosmophylla Cladocalyx Baxteri			

Species	Common Name	EPBC Act Status	NPW Act Status	Primary Vegetation Group	Fire Response	Fire Management Guidelines	Data Source
<i>Pultenaea scabra</i>	Rough Bush-pea		R	Remota	Regrows from seed. Requires 4 years to set seeds. Tolerant	Avoid inter-fire intervals < 7 years	Aust
<i>Pultenaea teretifolia</i> var. <i>brachyphylla</i>	Short-leaf Bush-pea		R	Remota Cladocalyx			
<i>Pultenaea villifera</i> var. <i>glabrescens</i>	Splendid Bush-pea	VU	V	Remota Cladocalyx Baxteri			
<i>Rhytidosporum procumbens</i>	White Rhytidosporum		R	Cladocalyx	Regenerates from seed. Requires 4 years to set seed. Intolerant	Avoid inter-fire intervals < 7 years and > lifespan + seedbank	Aust
<i>Schizaea fistulosa</i>	Narrow Comb-fern		V	Remota	Resprouts. Requires 2 years to set seeds. Tolerant	Avoid inter-fire intervals < 5 years	Aust
<i>Schoenus discifer</i>	Tiny Bog-rush		R	Remota Cladocalyx			
<i>Scutellaria humilis</i>	Dwarf Skullcap		R	Baxteri			
<i>Sprengelia incarnata</i>	Pink Swamp-heath		R	Remota Cladocalyx Baxteri	Mixed response, assume seeder. Requires 4 years to set seeds. Lifespan + seedbank 35 years. Tolerant	Avoid inter-fire intervals < 7 years	Aust
<i>Spyridium bifidum</i> var. <i>integrifolium</i>			R	Remota Baxteri	Regenerates from seed. Requires 6 years to set seed. Tolerant	Avoid inter-fire intervals < 9 years	KI
<i>Spyridium halmaturinum</i> var. <i>scabridum</i>	Rough Spyridium		R	Remota Cladocalyx Baxteri Allocauarina			
<i>Spyridium spathulatum</i>	Spoon-leaf Spyridium		R	Cladocalyx Baxteri Allocauarina	Regrows from seed. Requires 2 years to set seeds	Avoid inter-fire intervals < 5 years and > lifespan + seedbank	SA
<i>Stellaria caespitosa</i>	Starwort		V	Baxteri			

Species	Common Name	EPBC Act Status	NPW Act Status	Primary Vegetation Group	Fire Response	Fire Management Guidelines	Data Source
<i>Stylidium beaugleholei</i>	Beauglehole's Trigger-plant		R	Remota	Regenerates from seed. Requires 2 years to set seed. Tolerant	Avoid inter-fire intervals < 5 years	KI
<i>Thelymitra flexuosa</i>	Twisted Sun-orchid		R	Remota Cosmophylla Baxteri Cladocalyx	Mixed response, assume seeder. Requires 2 year to set seeds. Tolerant	Avoid inter-fire intervals < 5 years	KI and Aust
<i>Thelymitra holmesii</i>	Blue Star Sun-orchid		V	Not recorded in any of the 5 primary vegetation groups	Resprouts. Requires 1 year to set seed. Tolerant	Avoid inter-fire intervals < 4 years	Aust
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	E	Remota	Resprouts. Requires 1 year to set seeds. Tolerant	Avoid inter-fire intervals < 4 years	Aust
<i>Tricostularia pauciflora</i>	Needle Bog-rush		E	Remota	Resprouts. Requires 2 years to set seeds. Lifespan + seed bank 100 years. Tolerant	Avoid inter-fire intervals < 5 years	Aust
<i>Viminaria juncea</i>	Native Broom		R	Remota	Regrows from seed. Requires 6 years to set seeds. Lifespan + seedbank 55 years. Intolerant	Avoid inter-fire intervals < 9 years and > 55 years	Aust
<i>Wurmbea latifolia ssp.vanessae</i>	Broad-leaf Nancy		R	Not recorded in any of the 5 primary vegetation groups	Resprouts. Requires 3 years to set seed. Tolerant	Avoid inter-fire intervals < 6 years	KI
<i>Xanthosia tasmanica</i>	Southern Xanthosia		R	Cladocalyx Baxteri	Resprouts. Requires 2 years to set seeds. Tolerant	Avoid inter-fire intervals < 5 years	Aust
<i>Xyris operculata</i>	Tall Yellow-eye		R	Remota Baxteri	Resprouts. Requires 1 year to set seeds. Lifespan + seedbank 110 years. Tolerant	Avoid inter-fire intervals < 4 years	Aust

Appendix 2 – Ecological Fire Management Guidelines for Rated Fauna

Species	Common Name	EPBC Act Status	NPW Act Status	Vegetation Group	Preferred Habitat	Food	Breeding	Fire Response	Fire Management Guidelines	Data Source
<i>Burhinus grallarius</i>	Bush Stone-curlew		V	Baxteri Remota Cladocalyx	Farmland/ bush interface and coastal mallee, mallee/open scrub and forest	Invertebrates such as beetles and grasshoppers	Aug-Jan	Moderate mobility. High risk of significant impact on populations from extensive fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in spring/summer	KI Aust
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo		V	Baxteri Allocasuarina Remota Cladocaylyx	Nests in <i>E. cladocalyx</i> hollows	<i>Banksia</i> and <i>Pinus spp.</i> seeds	Summer	High mobility. Potential long term loss of breeding habitat from extensive, high intensity fires. Fire exclusion may inhibit hollow development	Avoid burning more than 20% of nesting habitat patches in a single fire event. Avoid 2 or more successive fires in summer. Avoid high intensity fires in nesting habitat	KI
<i>Calyptorhynchus lathami halmaturinus</i>	Glossy Black-Cockatoo	EN	E	Baxteri Allocasuarina Remota Cladocaylyx	Nests in <i>E. cladocalyx</i> , <i>E. leucoxyton</i> and <i>E. viminalis</i> hollows	<i>Allocasuarina verticillata</i> and <i>A. muelleriana</i> seeds	Jan-July	High mobility within flock areas. Potential long-term loss of feeding and breeding habitat from extensive, high intensity fires. Fire exclusion may inhibit hollow development and feeding habitat regeneration	Avoid burning more than 5% of critical feeding and nesting habitat in any individual flock area in any 5 year period. Avoid high intensity fires in nesting habitat. Avoid late summer to early winter burns	KI

Species	Common Name	EPBC Act Status	NPW Act Status	Vegetation Group	Preferred Habitat	Food	Breeding	Fire Response	Fire Management Guidelines	Data Source
<i>Chrysococcyx lucidus</i>	Shining Bronze-Cuckoo		R	Baxteri Remota Cladocaylyx	Tall <i>Eucalypts</i> and <i>Melaleuca</i> belts around lagoons	Insects, caterpillars and larvae	Spring/early Summer	Moderate mobility. High risk of significant impact on populations from extensive fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in spring/early summer	KI
<i>Egretta sacra</i>	Eastern Reef Egret		R	Baxteri Remota	Breeds in rocky coastal locations	Marine crustaceans and fish	Sept-Jan	High mobility. Unlikely to be adversely affected by fire events		KI Aust
<i>Gallinago hardwickii</i>	Latham's Snipe		V							
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		V	Baxteri Remota Cladocaylyx	Nests on rocky cliffs and forages along coast and over large bodies of water	Fish, seabirds, inland water birds and carrion	May-Oct	High mobility. Unlikely to be adversely affected by fire events		KI Aust
<i>Isodon obesulus</i>	Southern Brown Bandicoot	EN	V	Baxteri Cladocalyx	Heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland and woodland. Often sites that are regularly burnt	Omnivorous (invertebrates, skinks, tree frogs, grasses, fungi, fruits and seeds)	June-Dec	Moderate mobility. Can survive in areas burnt in high intensity fires where unburnt patches occur. Increased exposure to predation following fires. Appear to prefer early to mid-successional stages (5-20 years) which provide dense understorey cover	Maintain a mosaic of post-fire age classes. Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in winter-early summer. Some long unburnt areas are probably desirable	SA

Species	Common Name	EPBC Act Status	NPW Act Status	Vegetation Group	Preferred Habitat	Food	Breeding	Fire Response	Fire Management Guidelines	Data Source
<i>Neophema petrophila</i>	Rock Parrot		R	Baxteri Remota Cladocalyx	Coastal areas	Seeds of saltbush, pigface, nitrebush and samphire	Not recorded breeding on KI	High mobility. Unlikely to be adversely affected by fire events		KI
<i>Pandion haliaetus</i>	Osprey		R	Baxteri Remota Cladocalyx	Nests on rocky cliffs and forages along coast and estuaries	Fish	Spring/ Summer	High mobility. Unlikely to be adversely affected by fire events		KI Aust
<i>Phascolarctos cinereus</i>	Koala		R	Remota Baxteri Cladocalyx	Forest, woodland and mallee, but primarily riparian	Eucalypt leaves – <i>E. leucoxylon</i> , <i>E. viminalis</i> & <i>E. camaldulensis</i>	Summer	Moderate mobility. High potential for significant mortality and loss of feeding habitat as a result of extensive, high intensity fires	Avoid high intensity fires burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in summer	KI
<i>Psophodes nigrogularis lashamri</i>	Western Whipbird		R	Baxteri Remota Cosmophylla	Dense scrub and undergrowth in mallee	Invertebrates	Late Winter/ Spring	Moderate mobility. High potential for significant mortality and loss of habitat as a result of extensive, high intensity fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in late winter/spring	KI
<i>Stagonopleura bella</i>	Beautiful Firetail		R	Remota Baxteri Cladocalyx Allocasuarina Cosmophylla	Mallee-bullock scrubs and <i>Allocasuarina verticillata</i> forest	<i>Allocasuarina verticillata</i> , <i>A. muelleriana</i> , <i>Caustis pentandra</i> and <i>Lepidosperma</i> ssp. seeds	Sept-Jan	Moderate mobility. High potential for significant impact on populations from extensive fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in spring/early summer	KI Aust

Species	Common Name	EPBC Act Status	NPW Act Status	Vegetation Group	Preferred Habitat	Food	Breeding	Fire Response	Fire Management Guidelines	Data Source
<i>Sterna nereis</i>	Fairy tern		V							
<i>Stipiturus malachurus halmaturinus</i>	Southern Emu-wren		R	Remota Baxteri Cladocalyx	Low coastal mallee scrub and coastal heath, low open mallee over laterite soils	Insectivorous	Aug-Dec	Moderate mobility. High potential for significant impact on populations from extensive fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in spring/early summer	KI Aust
<i>Turnix varia</i>	Painted Button-quail		V	Baxteri Remota	Mallee scrub	Seeds, invertebrates and plant material	Spring/ Summer	Moderate mobility. High potential for significant impact on populations from extensive fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in spring/summer	KI Aust
<i>Varanus rosenbergi</i>	Heath Goanna		R	Cladocalyx Remota Baxteri Allocasuarina Cosmophylla	Occurs throughout Kangaroo Island. Burrows in sandy soils	Small reptiles and mammals, insects and carrion	Egg laying in summer. Hatching in early spring	Moderate mobility. Will probably survive low and moderate intensity fires in burrows	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in spring	Aust
<i>Zoothera lunulata</i>	Bassian Thrush		R	Remota Baxteri Cladocalyx	Damp, forested river margins, taller coastal mallee and around lagoons	Invertebrates and fruits	Jul-Dec	Moderate mobility. High potential for significant impact on populations from extensive fires	Avoid burning more than 50% of individual habitat patches in a single fire event. Avoid 2 or more successive fires in late winter-summer	KI Aust

Appendix 3 – Wilderness Code of Management

Section 3.6 'Fire'

- (i) Fire management will be based on continuing research into the fire history of the area, the relationships between fire and the natural communities occurring within the area, and on the maintenance of wilderness quality.
- (ii) Deliberately lit fires will be used only in emergency situations, and in essential management operations as listed in 3.10 and subject to (i) above.
- (iii) Other human caused fires should, where practicable, be extinguished consistent with maintenance of wilderness quality.
- (iv) Naturally caused fires will be extinguished when, in view of the direction, intensity and extent of the fire and the fire suppression techniques available, they pose a threat to human life and property, and to habitats requiring protection.
- (v) Where fire suppression action is required, the methods utilised will be, wherever possible, those which will have the least long-term impact on wilderness quality.
- (vi) The use of heavy machinery for fire suppression within a wilderness area will be prohibited except:
 - where it is considered to be the only way of preventing greater long-term loss of wilderness quality
 - where specific machinery use techniques, that do not result in significant disturbance to the landscape or create a new access network, are considered the only feasible method of preventing long-term loss of wilderness quality
 - to mitigate hazard to human life, where alternative measures which do not impact on the wilderness quality of the area are unavailable.
- (vii) Wherever possible, fire management practices designed to protect land adjacent to or within a wilderness area will be conducted outside the wilderness area.

Section 3.10 'Emergency and Essential Management Operations'

- (i) All emergency and essential management operations will be carried out with the least possible impact on wilderness quality.
- (ii) Actions that cause short-term degradation of wilderness quality but are necessary for emergency and/or essential management operations will be permitted. The only specific situations acknowledged in this Code as possibly requiring such actions are:
 - control or eradication of non-indigenous species
 - conservation of threatened species, communities and habitats
 - protection of fire-sensitive species and communities
 - management of visitor use
 - management action or use of devices to mitigate hazard to human life
 - restoration of natural processes, communities and habitats
 - research

Where degradation has occurred as a result of these activities, rehabilitation will be undertaken as soon as practicable.

Source: DEH (2004) *South Australian Code of Management for Wilderness Protection Areas and Zones*. Department for Environment and Heritage, Government of South Australia, Adelaide.

The plan will also comply with the *DEH Fire Policy and Procedure for Wilderness Fire Management*.

Summary of Codes Used In Appendices

FIRE RESPONSE SOURCE	
KI	Regional or local data
SA	South Australian data
Aust	Interstate data
^	Data/observations derived from published or unpublished literature
E	Expert opinion
I	Inferred from similar species (Senior Fire Ecologist, Fire Management Branch, has inferred based on other species genera).

NPW ACT STATUS		EPBC ACT STATUS	
E	Endangered	EX	Extinct
V	Vulnerable	CE	Critically Endangered
R	Rare	EN	Endangered
		VU	Vulnerable

13 GLOSSARY OF ACRONYMS AND FIRE MANAGEMENT TERMINOLOGY

Term	Definition
14 fire appliance	A 4WD firefighting appliance, with a capacity of up to 1000 litres of water, fitted with a pump and hose
AFAC	Australasian Fire Authorities Council
A-frame	Implement (two steel girders welded at the apex) towed behind a tractor used for creating mineral earth breaks
Backburn(ing)	A fire started intentionally along the inner edge of a control line to consume the fuel in the path of a bushfire
Bushfire	An unplanned fire. A generic term that includes grass fires, forest fires and scrub fires
CFS	The South Australian Country Fire Service
Coarse fuels	Dead woody material, greater than 25mm in diameter, in contact with the soil surface (fallen trees and branches).
Control line	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.
Cross-ribbed roller	Adjustable roller towed behind a bulldozer, used for fire break construction and bushfire response.
DEH	The South Australian Department for Environment and Heritage.
Direct attack	A method of bushfire attack where wet or dry firefighting techniques are used. It involves suppression action right on the fire edge, which becomes the control line.
Discontinuous fuels	Significant gaps between clumps or patches of fuel
EAT	DEH Environmental Assessment Table. Completed for all prescribed burns (as part of the Prescribed Burn Plan) and other fire management works where native vegetation is being cleared and is not exempt under the Native Vegetation Act 1991
EPBC Act	The commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
Extreme fire behaviour	A level of bushfire behaviour characteristics that ordinarily precludes methods of direct suppression action. One or more of the following is usually involved: high rates of spread; prolific crowning and/or spotting; presence of fire whirls and/or a strong convective column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously
Extreme fire danger	The highest fire danger classification
Fine fuels	Grass, leaves, bark and twigs less than 6mm in diameter
Fire access track	A track constructed and maintained expressly for fire management purposes
Fire behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography
Fire break	An area or strip of land where vegetation has been removed or modified to reduce the risk of fires starting and reduce the intensity and rate of spread of fires that may occur

Term	Definition
Fire danger	The combination of all factors, which determine whether fires start, spread and do damage, and whether and to what extent they can be controlled
Fire effects	The physical, biological and ecological impact of fire on the environment
Fire hazard	Any fuel which if ignited, may be difficult to extinguish
Fire management	All activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives
Fire regime	The history of fire in a particular vegetation type or area including the fire frequency, interval, intensity, extent and seasonality of burning.
Fire scar	A destructive mark left on a landscape by fire
Fire season	The period(s) of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised fire control
Fire suppression	The activities connected with restricting the spread of bushfire following its detection and making it safe
Fuel	Any material such as grass, leaf litter and live vegetation, which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare
Fuel arrangement	A general term referring to the spacing and arrangement of fuel in a given area
Fuel hazard	The Overall Fuel Hazard is defined as the sum of the influences of bark fuel, elevated fuel and surface fine fuel
Fuel management	Modification of fuels by prescribed burning, or other means
Fuel reduction burning	The planned application of fire to reduce hazardous fuel quantities, undertaken in prescribed environmental conditions within defined boundaries
Fuel type	An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause predictable rate of spread or difficulty of control under specified weather conditions
GAFLC	South Australian Government Agencies Fire Liaison Committee
Hydro-axe	The mechanical mulching of all vegetative matter from ground level without soil disturbance
IBRA	Interim Biogeographical Regionalisation for Australia
Incident Controller (IC)	The individual responsible for the management of all incident operations and IMT
IMT	Incident Management Team. The group of incident management personnel comprising the Incident Controller and the people he/she appoints to be responsible for the functions of Operations, Planning and Logistics
Indirect attack	The use of backburning as a method of suppression to confine the fire within a defined area bounded by existing or prepared control lines. Control lines may be a considerable distance ahead of the fire
Key Fire Response Species	In this fire management plan, these are the species most susceptible to decline due to inappropriate fire regimes: either too frequent or too infrequent fire, low or very high intensity fire, or fire in a particular season
KI DBPC	Kangaroo Island District Bushfire Prevention Committee
KI NRM Board	Kangaroo Island Natural Resources Management Board
Lifestyle block	Small non-viable holdings

Term	Definition
MVS	Major Vegetation Sub-group
NHT	National Heritage Trust. Established by the Australian Government in 1997 to help restore and conserve Australia's environment and natural resources.
NPW Act	The South Australian <i>National Parks and Wildlife Act 1972</i> .
NVC	Native Vegetation Council. Established under the provisions of the <i>Native Vegetation Act 1991</i> , responsible for making decisions on a wide range of matters concerning native vegetation in South Australia.
'Of conservation significance'	In this plan, used to describe important or <u>rated</u> populations or species of flora and fauna as well as vegetation communities. These may be: Nationally rated, that is, listed as Threatened (with a rating of Extinct, Critically Endangered, Endangered, Vulnerable or Conservation Dependent) under the federal Environment Protection and Biodiversity Conservation (EPBC) Act 1999; South Australian rated, listed as Threatened (with a rating of Endangered, Vulnerable or Rare) under the National Parks and Wildlife Act 1972, Revised Schedules 7, 8 and 9. Provisionally listed as Threatened (with a rating of Endangered or Vulnerable) in South Australia, that is, included on the unpublished DEH Provisional List of Threatened Ecosystems of South Australia.
Parallel attack	A method of suppression in which the fire line is constructed approximately parallel to and just far enough from the fire edge to enable firefighters and equipment to work effectively. The line may be shortened by cutting across unburnt fingers. The intervening strip of unburnt fuel is normally burnt out as the control line proceeds, but may be allowed to burn out unassisted where this occurs without undue delay or threat to the line.
Prescribed burn plan	The plan, which is approved for the conduct of prescribed burning. It contains a map identifying the area to be burnt and incorporates the specifications and conditions under which the operation is to be conducted.
Prescribed burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives. It is undertaken in specified environmental conditions.
Response plan	A plan detailing the response for a risk or an area including the type and number of resources.
Retardant	A chemical generally mixed with water, designed to retard combustion by chemical or physical action. It is usually applied by aircraft but may be applied from tankers at the fire edge.
Risk assessment	Used in DEH fire planning to assist in evaluating the threat to life, property and environmental assets posed by bushfire and to aid in developing strategies and implementing actions and works for risk mitigation. Considers <i>Likelihood</i> and <i>Consequence</i> to determine an overall risk rating using a matrix as <i>Low</i> , <i>Moderate</i> , <i>High</i> , <i>Very High</i> or <i>Extreme</i> .
Spotting/Spot Over	Isolated fires started ahead of the main fire by sparks, embers or other ignited material, sometimes to a distance of several kilometres.
Total Fire Ban	A ban on lighting and maintaining of a fire in the open, which can be invoked at any time during the year. When invoked, the Total fire Ban is imposed for a period of 24 hours, from midnight to midnight, but may also be imposed for part of a day or days.
TPC	The <i>Threshold of Potential Concern</i> (TPC) for a vegetation type or community is the level of fire regime element (i.e. fire interval, frequency, intensity or season) where <i>Key Fire Response Species</i> are likely to significantly decline if exceeded. Fire regimes beyond that level are likely to lead to local extinction of significant

Term	Definition
	<p>biodiversity.</p> <p>TPC1 demonstrates the recommended lower limit for fire interval for a particular MVS. That is, vegetation within this MVS will be represented predominantly by early successional species if the inter-fire interval is less than the time specified, and those species that require longer to flower and set seed can disappear from a community.</p> <p>TPC2 demonstrates the recommended upper limit for fire interval for a particular MVS. That is, populations of some species (e.g. obligate seeders) are likely to reduce within this MVS if fire is absent for more than the time specified.</p>
Weeds CRC	The Cooperative Research Centre for Australian Weed Management.
'Weed of national significance'	20 priority weeds that pose future threats to primary industries, land management, human or animal welfare, biodiversity and conservation values at a national level. These weeds were identified and ranked through the assessment of invasiveness, impacts, potential for spread and socioeconomic and environmental aspects.

