WELLINGTON NATIONAL PARK, WESTRALIA CONSERVATION PARK AND WELLINGTON DISCOVERY FOREST

Management Plan

2008

Department of Environment and Conservation

Conservation Commission of Western Australia

VISION

Over the life of the plan, a balance will exist between the conservation of the planning areas' natural values and the public demand for recreation and water supply. The area will make an important contribution to reservation of the Jarrah Forest, where natural values, such as granite outcrops, mature growth forest, ecosystems of the Collie River, and our knowledge of them, will be maintained and enhanced for future generations. Visitors to the area will enjoy a range of sustainable recreation opportunities in a variety of forest settings, and provide a benefit to the regional economy.

The community will regard the area as a natural asset and will have a greater understanding of its values, and support for their management, through the Wellington Discovery Forest and other education and interpretive facilities. The ancient landscape of the Collie River valley will be recognised as a forest environment of great visual aesthetic appeal, and for its rich Aboriginal heritage, which will be kept alive through the active and ongoing involvement of local Aboriginal people.

PREFACE

The Department of Environment and Conservation (the Department) manages reserves vested in the Conservation Commission of Western Australia (Conservation Commission) and prepares management plans on their behalf. The Conservation Commission issues draft management plans for public comment and provides proposed (final) management plans for approval by the Minister for the Environment.

The *Conservation and Land Management Act 1984* (the 'CALM Act') specifies that management plans must contain:

a) a statement of policies and guidelines proposed to be followed; and
b) a summary of operations proposed to be undertaken.

In accordance with section 55 of the CALM Act, the term of the final management plan will be 10 years, or until the plan is superseded by a new management plan.

ACKNOWLEDGMENTS

This management plan was prepared by the planning team for Wellington National Park, Westralia Conservation Park, proposed Westralia Forest Conservation Area and the Wellington Discovery Forest: Denam Bennetts (Planner and management plan co-ordinator), Drew Griffiths and Peter Henderson. Comment and advice during the preparation of the plan was provided by:

- Departmental staff—in particular Roger Armstrong, Robert Chandler, Peter Hanly, Paul McCluskey, Dave Hampton, Daryl Moncrieff, Kim Williams and Wellington District Staff;
- specialist branches within the Department;
- the Department's Corporate Executive;
- the Department of Water (DoW) and Water Corporation (WC), and
- members of the Conservation Commission.

Many people, individuals and agency representatives made valuable contributions to the development of this document. The assistance of the Wellington National Park Community Advisory Committee is especially acknowledged: Rosanne Pimm (Chairperson), Gemma Basely, Mark Chester, John Gardiner, Margaret Graham, Tony Jenour, Peter Murphy, Joeseph Northover, Ian Pigott, Ken Waterhouse, Bruce Roberts, Wayne Tingey, Ian Menzies and Rodney Smith. Allan Cross (South West Development Commission) also provided input. Maps were prepared by Melissa Robinson and Aaron Rivers.

Images have been provided by DEC staff including Leon Price (Honeymoon Pool image).

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority.

The 'Minister' refers to the Minister for the Environment administering the *Conservation and Land Management Act 1984* (CALM Act).

The 'Department' or 'DEC' refers to the Department of Environment and Conservation.

The term 'Director General' refers to the Director General of the Department of Environment and Conservation. Under the CALM Act, the term Chief Executive Officer can include the term Director General.

The 'Conservation Commission' refers to the Conservation Commission of Western Australia.

The 'planning area' refers to the Wellington National Park, Westralia Conservation Park, proposed Westralia Forest Conservation Area and the Wellington Discovery Forest. The Wellington Reservoir is referred to as the 'Reservoir'.

When 'region' is used in this plan, it refers to the 'South West' planning region used by the Western Australian Planning Commission (WAPC). The 'region' follows the boundaries of the Shires of Augusta-Margaret River, Boyup Brook, Bridgetown-Greenbushes, Busselton, Capel, Collie, Dardanup, Donnybrook-Balingup, Harvey, Manjimup and Nannup. The Department's regional boundaries for this area are referred to as the 'South West Region'.

The 'south-west' refers to the south west corner of Western Australia between Geraldton and Esperance.

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PART A. INTRODUCTION

1. BRIEF OVERVIEW

The planning area lies on the western edge of the Darling Plateau, about 195 km south of Perth and 7 km west of the Collie townsite in the Shires of Collie and Dardanup (see Map 1 and Section 3 *Management Plan Area*). It comprises 20 089 ha of reserves that include Wellington National Park, Westralia Conservation Park, Wellington Discovery Forest and the proposed Westralia Forest Conservation Area.

The most significant natural features of the planning area are the ecosystems and landscapes of the lower Collie River valley. The deeply incised valley is of high scenic quality and supports relatively unspoiled vegetation, indicative of the valley's cool, damp, microclimate. Ecologically mature forest and riparian zones within the area provide valuable habitat for a number of specially protected fauna species. Interspersed throughout the valley are also numerous granite outcrops of high conservation significance. When combined with management for conservation in adjacent State forest, the planning area provides a sizeable, relatively un-fragmented area of forest that extends along the Darling Plateau from the Avon River valley near Perth to the Blackwood Plateau around Nannup.

A major factor influencing management of the planning area is the future use of the Wellington Reservoir (the Reservoir). The Reservoir is surrounded by Wellington National Park and has been identified as a future public drinking water supply, although elevated salinity levels prevent its use for drinking water at the time of writing. Recreational use of the Reservoir spans back through generations of local residents to when the Reservoir was first constructed in the 1930s. The area is now a popular recreation destination and intrinsically linked to the lifestyle of local people, who have a strong connection to the area. The Reservoir is also a popular attraction for visitors, due to its close proximity to the Perth metropolitan area, population centres within region, the Ferguson and Preston river valleys and main travel routes in the south-west. The most popular activities around the Reservoir are swimming, camping, fishing and marroning.

The Department recognises the importance of recreation around the Reservoir to local people and proposes to maintain, but rationalise, recreational use of, and access to, the Reservoir. However, the Department will manage visitor use in the context that decisions regarding the future use of the Reservoir are yet to be determined. If the Reservoir is to be used as a public drinking water supply, it could have significant implications for access to the waterbody and the type and level of recreational use that may be permitted both in and around the Reservoir. This in turn will effect management elsewhere within the planning area. As a result, the development of recreation facilities and services around the Reservoir will be phased in over time, allowing for flexibility to adapt to this possible change. Appendix 2 outlines the process by which the management of access and recreational use can be changed should the Reservoir be required for public drinking water purposes in the future.

Visitors to the planning area are also attracted to the lower Collie River valley for a range of activities including bushwalking, swimming, camping, four-wheel driving and mountain bike riding. Most visitors to the area come during the summer period from October to April, particularly around public/school holidays, the marron season and when the Reservoir overflows, which it does every few years. Visitation is increasing and during peak periods recreation sites are often filled to capacity. This is expected to continue into the future, placing the area under further pressure from visitor use and potentially leading to conflicts between different user groups.

The Wellington Discovery Forest, to the south-west of the planning area, provides visitors with a unique opportunity to learn first hand about the complexities of managing the jarrah forest. It will be operated as an open air classroom or meeting ground, where trials and demonstrations can be accommodated, documented and interpreted. The Wellington Discovery Forest will comprise three zones – an Ecology Zone, a Research Zone and a Management Zone, which will include silvicultural treatments that involve the removal/harvesting of some trees over small areas to demonstrate the effects of forest disturbance.

Aboriginal people have a growing interest in re-establishing cultural ties to the land, and in the future management of the planning area. Their involvement in management will be considered in light of the Government determining a policy position.

This management plan provides effective and relevant guidelines to protect the values of the planning area. The implementation of this management plan will be undertaken by the Department, through the South West Regional office at Bunbury and the District work centre at Collie.

2. REGIONAL CONTEXT

The planning area is located in the WAPC's South West Region (the region). The region covers an area of approximately 2.4 million hectares across 12 local government areas. A characteristic of the region is the complexity and intensity of land use, which can be attributed to its abundance of natural resources and its proximity to Perth and regional population centres.

Population

In 2004, there were 136 000 people living in the south-west (mostly in coastal areas), making it the largest resident population outside of the Perth metropolitan area. Projections of future population growth estimate that the population in the south-west will increase to 165 400 by 2016 and reach 189 800 by 2031 (WAPC 2005). In 2004, the Shire of Collie had a population of 9000, which is expected to decline to 8700 by 2021. The Shire of Dardanup is one of the fastest growing local governments within the region, although this is primarily due to rapid development along the coast. In 2004, the Shire of Dardanup had a population of 9700, and is expected to reach 17 000 by 2021 (WAPC 2005). In recent times, there has also been rapid population growth around the Greater Bunbury area.

Tourism

The region contains many attractions including national parks, forests, beaches, wineries and eco-tourism sites. Its mild climate and diverse natural interests draw about 3.4 million visitors to the south-west each year, making it the most popular tourist destination in the State outside of Perth. Most visitors to the region travel to coastal and wine growing destinations and generally visit forested areas as a stopover. However, forested areas and inland waterways are becoming increasingly popular for recreation and are experiencing greater visitor pressure.

Land Use and Natural Resources

The region has the most diversified economy of the State's nine WAPC regions. It has abundant mineral deposits, hardwood forests and good agricultural soils, as well as substantial manufacturing, commercial, retail, construction, fishing and tourism industries. The gross regional product is estimated at over $6.8 billion and in 2004/05, the largest contributors to the region's economy were manufacturing ($2.8 billion based on the timber, mining, agriculture and export industries), retail ($1.2 billion), tourism ($591 million) and agriculture ($557 million) (DLGRD and SWDC 2006).

Land use near to the planning area is dominated by mining, agriculture, forestry, water supply, rural residential subdivision and the transmission of electricity. Land generally not conducive to agriculture, such as the shallow, gravely soils on steep slopes of the Darling Scarp, is typically utilised as State forest, plantations and catchments for water supply. Conversely, the flat alluvial deposits that occur to the west, on the Swan Coastal Plain, have been largely cleared and support an array of uses including dairy and beef cattle, sheep grazing, horticulture, viticulture, orchards and softwood plantation forestry. East of the forested area, large areas of land have also been cleared for agriculture, causing elevated salinity levels in watercourses, including those that feed the Reservoir. In summer, areas of the coastal plain are often irrigated, using water from the Reservoir, to provide green feed.

A network of reservoirs exists along the western edge of the Darling Plateau, providing important supplies of water for irrigation, industry and domestic purposes. WC supplies bulk water to Harvey Water (formerly South West Irrigation Cooperative) from reservoirs in the Darling Scarp, including Waroona, Samson, Logue Brook, Stirling, Harvey and Wellington. The Glen Mervyn Dam near Donnybrook supplies the Preston Valley Irrigation Cooperative. The Harris Dam, 12 km north of Collie, supplies water to Collie, several towns connected to the Great Southern Towns Water Supply Scheme (GSTWSS), and to the State's Integrated Water Supply System (IWSS) via the Stirling Dam. Few rivers along the Darling Scarp have not been dammed.

The known mineral resources close to the planning area comprise mainly of bauxite, coal, heavy mineral sands and minor occurrences of gold and base metals. All of Western Australia's coal production, which in 2004/05 was valued at $270 million, comes from the Premier, Muja and Ewington mine sites just east of the planning area. Over 50% of the coal is used to supply the State's power grid. The remainder is used by industry in the production of alumina, mineral sands, cement and nickel. Griffin Energy has recently commenced construction of two additional coal-fired power stations with a capacity of 208 megawatts of electricity at the Coolangatta Industrial Estate, 10 km north-east of Collie. The Worsley Alumina Refinery, situated near Collie, processes bauxite mined in the Shire of Boddington. In 2004/05, the Refinery produced 3.3 million tonnes of alumina valued at $972 million.

In 2001, the State Government announced its *Protecting our old-growth forests* policy and the intention to cease timber harvesting in old-growth forests and a reduction in the production of hardwood log timbers. The policy also committed to the creation of 30 new national parks. A greater emphasis is now placed on promoting value adding and downstream manufacturing. The timber industry produces sawn hardwood and softwood, woodchips and fine woodcraft and furniture. In 2004/05, 1 056 000 tonnes of timber were logged at a value of $61.3 million.

Service industries such as construction, transport, entertainment, retail and wholesale are also well developed. Separating conflicting land uses to ensure that they do not detract from the safe and sustainable use and enjoyment of surrounding lands is a key issue for the region.

3. MANAGEMENT PLAN AREA

This management plan covers the following areas (see Map 1):

- Wellington National Park;
- Westralia Conservation Park (unofficially named);
- proposed Westralia Forest Conservation Area (unofficially named); and
- reserve 48049, referred to in this management plan as the Wellington Discovery Forest (unofficially named).

Collectively these areas are referred to as the 'planning area' and occupy a total area of 20 089 ha.

4. KEY VALUES

The key values associated with the planning area include:

Natural

- extensive areas of intact fauna habitat and populations of specially protected (including threatened) and priority fauna species.
- a rich mosaic of vegetation communities, some of which are poorly represented within the conservation estate.
- networks of rock outcrops, wetlands and forested valley ecosystems.
- distinct and interesting floral communities, including mature growth vegetation along the lower Collie River.

Cultural

- an important area for use by local Aboriginal people for the continuation of cultural activities (and ceremonies).
- Aboriginal sites and landscapes of mythological, ceremonial, cultural and spiritual significance, particularly the Collie River.
- an important site for non-Indigenous cultural heritage, with evidence of former forestry workers settlements, old cottages, spot mills, formations and built structures such as Reservoir wall and hydro-electric power station.
- significant site to consider changing perspectives on forests, forestry and protected areas.

Recreation

- an important and popular recreation area, with a diverse array of nature-based recreational opportunities.
- a reservoir that is intrinsically linked to the lifestyle of local people and a tourist attraction to visitors.
- historical links to the Reservoir and Collie River for activities such as fishing, marroning, canoeing, swimming, camping, picnicking, and bushwalking, with links to the Reservoir spanning generations of local residents to when the Reservoir was first constructed in the 1930s.
- a sense of seclusion whilst in close proximity to major population centres and travel routes to the south-west of the State.
- long distance walking and cycling opportunities on the Bibbulmun Track and Munda Biddi Bike Trail.
- a varied landscape with areas of high visual quality, including well defined and steeply sloping valleys, granite outcrops, mature forest, rivers and a reservoir.

Community

- opportunities for community involvement in activities and experiences in nature conservation and visitor services.
- opportunities for involvement of individuals in various committees associated with the management of parks and reserves.

Educational

- a research and educational opportunity within the Wellington Discovery Forest, which enables visitors to learn about the natural environment and management of the jarrah forest.
- a diverse array of natural environments providing research opportunities into the natural, recreation and cultural values of the planning area.

Economic

- the largest reservoir in the south-west of the State, with a high social value and an economic value for water use.
- considerable mineral potential within the Westralia Conservation Park and the proposed Westralia Forest Conservation Area.
- commercial nature-based tourism opportunities.

5. PUBLIC PARTICIPATION

This management plan has been developed in consultation with local communities, users of the planning area and other interested parties in the following ways:

- the draft management plan was released for a two-month public comment period;
- public submissions were invited through State and local newspapers and the Department's Naturebase website;
- the Wellington National Park Community Advisory Committee was established to discuss management issues and provide advice to the Department during development of the plan;
- community consultation meetings were conducted;
- meetings were held with stakeholder groups, including Indigenous groups and interested individuals;
- specific meetings were held with the native title claimants, including local representatives;
- 'Have Your Say' brochures were distributed to encourage individuals and organisations to register their interest in the planning process and identify issues to be considered during the development of the plan;
- an 'Issues Paper' was prepared to stimulate discussion, and inform and assist the public in participating in the management planning process;
- public exhibitions/displays were conducted and information collected from the public;
- regular updates were provided to keep interested parties informed of developments in the planning process (i.e. *The Planning Diary* newsletter);
- Government agencies were consulted, including the Department of Indigenous Affairs, DoW (formally the Department of Environment), WC, Department of Industry and Resources (DoIR) and the Department of Fisheries.

The assistance of the Wellington National Park Community Advisory Committee in facilitating public input to the management plan is especially acknowledged

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PART B. MANAGEMENT DIRECTIONS AND IMPLEMENTATION

6. VISION

The vision for the planning area is….

Over the life of the plan, a balance will exist between the conservation of the planning areas' natural values and the public demand for recreation and water supply. The area will make an important contribution to reservation of the Jarrah Forest, where natural values, such as granite outcrops, mature growth forest, ecosystems of the Collie River, and our knowledge of them, will be maintained and enhanced for future generations. Visitors to the area will enjoy a range of sustainable recreation opportunities in a variety of forest settings, and provide a benefit to the regional economy.

The community will regard the area as a natural asset and will have a greater understanding of its values, and support for their management, through the Wellington Discovery Forest and other education and interpretive facilities. The ancient landscape of the Collie River valley will be recognised as a forest environment of great visual aesthetic appeal, and for its rich Aboriginal heritage, which will be kept alive through the active and ongoing involvement of local Aboriginal people.

This vision for the planning area is derived from community input. The vision also reflects the key values of the planning area and the importance of sustainably managing those values.

7. LEGISLATIVE FRAMEWORK

Planning for conservation reserves occurs at a number of levels, with management plans part of a broad suite of planning undertaken by the relevant managing agencies. Figure 1 illustrates the planning levels typically undertaken for conservation reserves. This shows that management plans are guided by legislation and policy and in turn provide guidance for subsidiary management documents (e.g. fire response plans, weed and feral animal control plans and recreation site development plans).

Legislation

The CALM Act was proclaimed in 1985, establishing the Department and two controlling bodies in which lands and waters managed by the Department were vested. In 2000, amendments to the CALM Act replaced these controlling bodies with the Conservation Commission.

The CALM Act governs the declaration and management of protected areas and in the process imposes certain obligations relating to management planning for these areas. Sections 54-56 of the Act specifies:

- that the Conservation Commission is responsible for the preparation of management plans, through the agency of the Department, for all land vested in it;

- that a management plan must contain a statement of policies or guidelines to be followed in the management of the area, and a summary of the operations proposed to be taken over the life of the plan; and
- the management objectives for various categories of land (see Section 9 *Land Tenure and Classification* for the categories of land with the planning area)

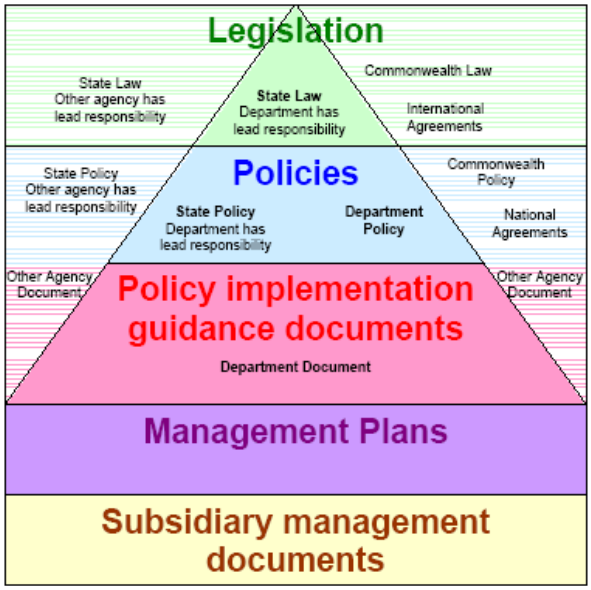

Figure 1. Management Planning Hierarchy

In relation to management plans for the lands vested in it, the functions of the Conservation Commission under section 19(1)(g) of the CALM Act are:

- to develop guidelines for monitoring and assessing the implementation of the management plans by the Department;
- to set performance criteria for assessing the performance of the Department in carrying out and complying with management plan(s); and
- to assess and audit the performance of the Department in carrying out and complying with management plan(s).

The procedure to make an amendment to a gazetted management plan is governed by section 61 of the CALM Act and involves a public consultation process.

The Department is also responsible for administration of the *Wildlife Conservation Act 1950* and associated regulations for the conservation and protection of Indigenous flora and fauna on all lands and waters within the State. It is probable that during the life of this management plan the Government will replace the Wildlife Conservation Act with new legislation to protect biodiversity. To this end, a consultation paper, outlining the intent of the proposed Biodiversity Conservation Act, was released in December 2002. The proposed legislation will seek to:

- strengthen special protection for identified threatened species, and extend this protection to threatened ecological communities;
- adopt common categorisation for threatened species and ecological communities consistent with World Conservation Union (IUCN) standards; and
- list key threatening processes and enable regulations to be made to control threatening processes where they are impacting on biodiversity conservation.

There are a number of other Acts affecting the Department's activities or conferring specific powers on the Department. These and other statutory provisions of relevance to the planning area are referred to throughout this plan where relevant. Of most importance to this plan are:

- *Aboriginal Heritage Act 1972*. Under this Act the Department is required to report Aboriginal heritage sites and ensure that sites are protected.
- *Bush Fires Act 1954*. This management plan is required to conform to this Act and satisfy the Fire and Emergency Services Authority (FESA) that adequate fire protection will be provided. Under section 34(1a)(a) of the Act, management plans require approval from FESA. Under section 45 of the Bush Fires Act, the Department may take responsibility for the suppression of fires threatening the conservation estate.
- *Country Areas Water Supply Act 1947* (CAWS Act). The Reservoir and contributing catchment was originally proclaimed under the CAWS Act in 1952. The catchment area was subsequently amended in 1957 and again in 2000 when the catchment boundaries were amended to accurately reflect the topographical catchment. The Reservoir and catchment are still proclaimed under the Act and is therefore still subject to the by-laws and regulations of the Act. This management plan may be amended to make it consistent with legislation governing the regulation of water (see Appendix 2).
- *Environment Protection Act 1986*. This Act provides for protection of the environment across the State. The Act provides for the development of Environmental Protection Policies and the assessment of development proposals and planning schemes for potential environmental impacts. Significant development proposals may be referred to the Environmental Protection Authority (EPA) under the auspices of this Act.
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This contains provisions relating to the protection of nationally-listed threatened species and ecological communities, listing of key threatening processes and heritage protection.
- *Fish Resources Management Act 1994.* This Act provides for fisheries management throughout Western Australia. The Department of Fisheries has the statutory responsibility for implementation of the Act.
- *Heritage of Western Australia Act 1990*. This Act provides for the registration and protection of places of historic interest on land as 'heritage places'.
- *Native Title Act 1993*. This Act requires native title claimants and representative bodies to be advised when a management plan is being prepared or major public works undertaken.

The CALM Act does not derogate any of the powers of the *Mining Act* 1978, the *Petroleum Act 1967* or any other Act relating to minerals or petroleum, or any Government agreement within the meaning of the *Government Agreements Act 1979* (e.g. *Alumina Refinery (Wagerup) Agreement and Acts Amendment Act 1978* and the *Collie Coal (Western Collieries) Agreement Act 1979*).

Management of lands managed by the Department is also addressed at a broader level through the *Forest Management Plan 2004-2013* (FMP) and the *Regional Forest Agreement for the South-West Forest Region of Western Australia* (RFA). These documents currently provide the planning and management framework for lands in the south-west vested in the Conservation Commission. The FMP will complement this management plan. Where there is conflict between the FMP and this plan, this management plan takes precedence. This will ensure a more comprehensive approach to managing the area.

This management plan also provides a mechanism by which changes to the management of recreational use can be made if the Reservoir is brought online as a public drinking water supply (see Appendix 2).

In addition to legislative specifications, this management plan also conforms to other statutory policies and policies of the Department.

Policy

Government and Departmental policies specifically mentioned in this management plan relate to the management of Department-managed lands for matters such as weeds, fire, disease, rehabilitation, recreation and tourism, community involvement, flora, fauna, visual landscape and visitors. These policies are referred to in the appropriate sections of this plan.

Biodiversity Conservation Strategy

In December 2006, the State Government released a draft *100-year Biodiversity Conservation Strategy for Western Australia*, which provides a framework to guide action for biodiversity conservation in Western Australia over the next 100 years (DEC 2006a). Phase one of the strategy will be to provide a framework for conserving biodiversity over the next 25 years. Strategies in this management plan will contribute towards achieving the objectives of the Biodiversity Conservation Strategy.

Good Neighbour Policy

Whilst the Department's management is limited to the public conservation estate, there may be significant biodiversity values in adjoining lands, which may be significant in their own right and/or complementary to the Department's management of the conservation estate. The Department manages land surrounded by many neighbouring properties, making common cross-boundary management important in dealing with a range of mutual issues of interest. To this end, the Department has released its *Good neighbour policy*, which is aimed at building and maintaining mutually beneficial relationships with neighbours to deal with a range of cross-boundary management issues.

Protecting Our Old Growth Forests Policy

The Government's *Protecting our old-growth forests* policy promoted the cessation of timber harvesting in 100% of all old growth forests and the protection of these areas in a Comprehensive, Adequate and Representative (CAR) conservation reserve system. This involved the creation of new national parks within the south-west and recommended the expansion of Wellington National Park.

Obligations and Agreements

Australia is a participant or signatory to a number of important conservation agreements, many of which affect the public conservation estate managed by the Department. For the planning area this includes the following:

The Convention of Biological Diversity (the Rio Convention)

Australia signed the 'Convention on Biological Diversity' at the United Nations Conference on Environment and Development (also known as the 'Rio Earth Summit') in 1992. The *National Strategy for the Conservation of Australia's Biological Diversity* was adopted in 1996 as the principal means for co-ordinated implementation of the convention in Australia. Its main goal is to protect biological diversity and maintain ecological processes and systems. To address this goal, there have been a number of significant changes to policy and legislation for biodiversity conservation in Australia, resulting in stronger regulatory and institutional mechanisms. This includes the EPBC Act and the Natural Heritage Trust programs.

Regional Forest Agreement for the South-West Forest Region of Western Australia (RFA)

The RFA was made on 4 May 1999 between the Commonwealth of Australia and the State of Western Australia, and will remain in force for a minimum of 20 years. The Agreement establishes a framework for the management of forests within the RFA boundaries, committing

parties to ensuring effective conservation, forest management and forest-based industry outcomes.

The agreement:

1. identifies a CAR conservation reserve system and provides for the conservation of those areas;
2. provides for the sustainable management and use of forests within the RFA boundary;
3. has the purpose of providing long-term stability of forests and forest-based industries; and
4. has regard to studies and projects carried out in relation to all of the following matters within the RFA boundary:

    - environmental values, including mature growth, wilderness, endangered species, national estate values and world heritage values;
    - Indigenous heritage values;
    - economic values of forested areas and forest-based industries, including mineral exploration and production;
    - social values (including community needs); and
    - principles of ecologically sustainable management.

The planning area is located entirely within the RFA boundary.

The Burra Charter

In 1979 the Australia International Council on Monuments and Sites (ICOMOS) adopted a charter for the conservation of places of cultural significance, now known as the *Australia ICOMOS Burra Charter, 1999* (Burra Charter). The charter has been widely been adopted as the standard for heritage conservation practice in Australia and applies to all types of places of cultural significance including natural, Indigenous and historic places with cultural values.

Memorandum of Understandings

It is possible for the Department to enter into a memorandum of understanding or other partnerships with Government agencies, local Government authorities, industry groups or resource users to manage lands (e.g. for fire suppression, feral animal and weed control, acquisition and management of former pastoral leases). Such agreements are identified throughout this management plan where relevant.

7. Legislative Framework

Key Points:

- The CALM Act defines the functions of the Department and the categories of lands and waters to which these apply. Under the CALM Act, the Department is responsible for administering the Wildlife Conservation Act, which provides for the conservation and protection of Indigenous flora and fauna on all lands and waters within the State.
- The RFA obliges the State Government to establish a framework for the management of forests, committing parties to ensuring effective conservation, forest management and forest-based industry outcomes.
- Off-reserve conservation and cross-boundary management are important to achieving the objectives of this management plan.

The objective is to adhere to legislation and policy and ensure obligations to national and international treaties, conventions and agreements are met.

This will be achieved by:

1. managing the planning area in accordance with the CALM Act, the Wildlife Conservation

Act and other relevant legislation; and
2. implementing the State's and Department's obligations under the RFA, FMP, *Protecting our old-growth forests* policy and other agreements.
3. encouraging and facilitating off-reserve conservation and cross boundary management (e.g. conservation of road reserves, land for wildlife programs and NRM), particularly where it contributes to the CAR conservation reserve system and management of the planning area.

8. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

There is a strong interest by Noongar people to be involved in the management of the conservation estate within the south-west, and to strengthen cultural ties to the land. Working together with Aboriginal people to care for the land will be beneficial to the preservation of natural and cultural heritage as well as for cross-cultural awareness.

The State Government has indicated support to explore joint management arrangements with Aboriginal people by developing a consultation paper outlining options for ownership, administration and joint management of conservation lands in Western Australia (Government of Western Australia 2003). The consultation paper outlines a range of possibilities, from consultative management through to joint management of land that may be held by an approved Aboriginal Body Corporate as an inalienable freehold.

It is therefore possible that management arrangements with Aboriginal people may change over the life of this management plan. This may have implications for the day-to-day management of the planning area and the management of specific activities and use, especially with respect to access, camping, fishing and marroning, commercial use, park interpretation, traditional customary activities and the use of Aboriginal names. It may also involve special provisions for Aboriginal people that are additional to opportunities available to the general public. An operational plan, subsidiary to this management plan, may need to be prepared to facilitate the co-ordination of activities and guide ongoing development and management of such activities/use. Such a plan would be prepared in close consultation with Aboriginal people and would be consistent with Department policy and the prescriptions contained within this management plan. Where the operational plan is inconsistent with Department policy and this management plan, an amendment to the management plan may be required.

A memorandum of understanding is already in place between the Department and the South West Aboriginal Land and Sea Council Aboriginal Corporation, which, under the Native Title Act is the representative Aboriginal body for the south-west of the State. This memorandum of understanding sets out both principles and guidelines under which access and co-operative management agreements between the Department and Aboriginal people may be established within the existing provisions of the CALM Act. During the preparation of this management plan, the native title representative Aboriginal body, as well as the native title claimants, were contacted and notified of the management planning process. In addition, local Aboriginal people were consulted extensively over management proposals in the draft management plan, and in particular, management of recreational use and access along Lennard Track.

There is currently one registered native title claim in the planning area (i.e. WAG6274_98 Gnaala Karla Booja).

9. LAND TENURE AND CLASSIFICATION

Land tenure is used to describe the form of right or title to land and is usually designated private (freehold) land or Crown land. In Western Australia, the security of tenure of Crown reserves created under the *Land Administration Act 1997* varies, depending upon whether the reserve is 'class A' or 'other than class A' (unclassified). This system therefore determines the degree of

difficulty involved in changing the tenure of Crown land. Under the *Land Act 1933*, reserves were classified A, B or C. Changes to a class A reserve (e.g. a change in class or an excision or reduction in the area of a reserve) require the agreement of both Houses of Parliament. Changes to an unclassified reserve require approval at Ministerial level.

Management of land by the Department is carried out according to Government policies and as specified in management plans submitted by the controlling bodies and approved by the Minister for the Environment.

Land Categories

Section 5(1) of the CALM Act lists ten categories of land to which the Act applies. Three categories relevant to the planning area include national park, conservation park, State forest (proposed forest conservation area) and CALM Act section 5(1)(h) reserves. Table 1 provides a description of the reserve category, purpose, class and management objective for these categories.

Table 1. Land Category, Purpose, Class and Management Objective

Land Category	Purpose	Class	Management Objective
National park	National park*	Mostly class A	To fulfil so much of the demand for recreation as is consistent with the proper maintenance and restoration of the natural environment, the protection of Indigenous flora and fauna, and the preservation of any features of archaeological, historic or scientific interest
Conservation park	Conservation park*	Either class A or other than class A (unclassified)	Conservation parks are managed identically to national parks.
State forest	Various, including conservation, recreation, water catchment protection and timber production on a sustained yield basis, as well as other purposes prescribed by the regulations, which may include beekeeping #	** Similar to class A, requiring Parliamentary approval to excise or cancel	To achieve the optimum yield in production consistent with the satisfaction of long-term social and economic needs #
CALM Act section 5(1)(h) reserve	Various (eg. Wellington Discovery Forest)	**	To achieve the purpose for which the land was placed under the care, control and management of the controlling body

* Created under the Land Act, Land Administration Act or any other Act for the purpose specified.
** Created under the CALM Act, which has no classification.
# The proposed Westralia Forest Conservation Area is part of State forest and proposed to be reserved under the Land Administration Act as class A conservation park, vested in the Conservation Commission for management by the Department (see Section below on *Land Classification*). In the interim, the purpose of this area of State forest is for conservation, recreation and water catchment protection as well as other purposes prescribed by the regulations. State forest adjoining the planning area has the additional purpose of timber production on a sustainable yield basis.

Categories of land within the planning area are vested in the Conservation Commission and managed by the Department.

Land Classification

A strategy for the conservation of natural and cultural values and the facilitation of sustainable resource use, is the implementation of a classification scheme over lands to which the CALM Act applies to designate appropriate levels of access and types of activities that can occur. Section 62 (1) of the CALM Act provides for the classification of lands into various categories, one of which is forest conservation areas. This is the only land classification that applies to the planning area.

The primary objective for managing forest conservation areas is for biodiversity conservation. Therefore, they will not be available for timber production, but other productive activities that do not involve timber harvesting, such as beekeeping and flora harvesting, may be allowed. The proposed Westralia Forest Conservation Area is the only land classification in the planning area (see Section 10 *Existing and Proposed Reserves*).

10. EXISTING AND PROPOSED RESERVES

The FMP recommended several changes to land tenure, purpose and vesting to give effect to the commitments to new reserves set out in the Government's *Protecting our old-growth forests* policy, further additions proposed following an assessment of high conservation value forests and proposals carried forward from the RFA and *Forest Management Plan 1994-2003*. Legislation enacted in 2004 implemented many these changes, including changes to land tenure and purpose within the planning area. These are described below, along with a summary of the proposed additions to the planning area (see also Map 2). Table 1 provides a description of the reserve category and purpose.

Existing CALM Act Reserves

Wellington National Park

Wellington National Park, formerly owned by the Worsley Timber Company, was gazetted in 2000 as a class A reserve (No. 46213), vested in the Conservation Commission and set-aside for the purpose of 'national park'. On 8 December 2004, 13 745 ha of State forest No. 25 was added to the Park under the *Reserves (National Parks, Conservation Parks and Nature Reserves and Other Reserves) Act 2004*, increasing the total area to 16 790 ha. Subsequent additions increased the total area of the reserve to 17 420 ha. The *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Act 2004* also set aside 684 ha of State forest No. 25 known as the Wellington Discovery Forest and reserved it as a new class A reserve for the purpose of 'Scientific Research and Education' (see Wellington Discovery Forest below).

Wellington National Park is located approximately 8 km from Collie, 16 km from Dardanup and 4 km from Allanson, the nearest small towns. It surrounds the Wellington Reservoir, the largest waterbody in the south-west and a potential future drinking water supply for the GSTWSS and the IWSS. The boundary of the Park extends to a surveyed line below the Reservoir full storage level (the level of water in the Reservoir when it is overflowing). In some years of very low rainfall, the water may retreat below this surveyed line. In these instances, land between the watermark (waters edge) and the surveyed line has no tenure. The waterbody itself also has no tenure and is managed by the WC. A key issue in the management of the Park is the management of recreational use in and around the Reservoir (see Section 1 *Brief Overview* and Appendix 2).

The 2004 additions to the Park were originally part of State forest No. 25, and consequently have a history of timber harvesting. However, inaccessible areas along the lower Collie River valley were not harvested and contain mature growth vegetation. This area also contains

natural, cultural and visual landscape values and is an important area for recreational activities. The management of these activities is important in protecting the key values of the Park. Adjoining the Park is the Mungalup, Bussell and Wellington pine plantations, private property (mostly to the west and north) and State forest to the east and south (Map 2). The Wellington Discovery Forest also abuts the Park to the south. Private property adjoining the Park contains some areas of remnant bushland that buffer the area from external influences, particularly in areas such as the lower Collie River valley. However, most land uses on adjoining private property support horticulture and agriculture and to a lesser extent, broad leaf and pine plantations and rural residence. Applications for subdivisions adjoining the Park are increasing, particularly near Pile Road and throughout the Ferguson River valley. Thirteen private freehold locations also exist as enclaves within the Park. The external influences of these land uses have the potential to impact upon the values of the Park. These impacts are exacerbated for small, isolated fragments of land, such as the 147 ha portion that abuts the Wellington pine plantation.

Westralia Conservation Park

Westralia Conservation Park is a Class A reserve (No. 45961) of 855 ha that was gazetted in 2004 for the purpose of a 'conservation park'. The Park was created under the *Reserves (National Park and Conservation Parks) Act 2004*, which resulted in the Park being limited to a depth of 30 m from the natural surface of the land in recognition of the occurrence of known coal deposits. This allows for potential underground mining, by accessing the coal deposits from outside the park, or for coal-seam methane extraction (see Section 38 *Mineral and Petroleum Exploration and Development*).

The status of this land as a conservation park shall be reviewed during the life of this plan and converting it to a national park shall be considered. As a class A conservation park in the SouthWest Land Division, mining activities require the concurrence of the Minister for the Environment, the same as for a national park.

The Park was originally part of State forest No. 4 and has a history of timber harvesting. It is bounded to the north by a 3.1 km section of the Coalfields Road and abuts the Collie townsite as well as private property and numerous reserves vested within the Shire of Collie. An enclave of 106 ha exists within this Park for the purposes of a rifle range.

Proposed Westralia Forest Conservation Area

The proposed Westralia Forest Conservation Area comprises 1130 ha of State forest (No. 4 and 26) in the Mungalup forest block, originally gazetted in 1920.

Under the FMP, it is proposed that a portion of State forest (No. 4 and 26) be classified as an interim 'Forest Conservation Area' (Proposed Westralia Forest Conservation Area on Map 2). This area was previously identified for reservation in the *Central Forest Region Management Plan 1987* and in the RFA. The interim land classification is a protective measure that will remain in place until existing impediments are lifted and the area is reserved as conservation park under the Land Administration Act. In the interim, the purpose of this area of State forest is for conservation, recreation and water catchment protection as well as other purposes prescribed by the regulations (e.g. apiculture).

In accordance with section 60 (3)(a) of the CALM Act, notice of the management purposes of State forest proposed to become Westralia Conservation Park, will be published in the Government Gazette. With respect only to the proposed Westralia Forest Conservation Area, this notice will replace the purposes of State forest identified in the FMP and the 22 March 1994 Gazettal notice issued for the *Forest Management Plan 1994-2003*. Where possible, management of the area will be consistent with the impending tenure change and the purpose for conservation parks as stated in Table 1.

The boundaries for the proposed Westralia Forest Conservation Area are indicative and may be subject to fine-scale modification, as indicated in the FMP.

Wellington Discovery Forest

The Wellington Discovery Forest (reserve 48049) occupies an area of 684 ha to the south-west of the Wellington National Park. The area was originally part of State forest No. 25 but was later identified in the FMP in the proposal to expand Wellington National Park. In November 2004, the Wellington Discovery Forest was included in the *Reserves (National Parks, Conservation Parks and Nature Reserves) Bill 2004* as part of the expansion to Wellington National Park. The Bill was subsequently amended in Parliament to exclude an area of 684 ha that comprised the Wellington Discovery Forest from the proposed national park expansion, and instead proposed to reserve it as a new class A reserve for the purpose of 'Scientific Research and Education'. The amendment was accepted resulting in the creation of the expanded Wellington National Park and other important national parks, conservation parks and nature reserves. Legislation to create the Wellington Discovery Forest reserve was passed on 8 December 2004. Because of its purpose, this reserve comes under section 5(1)(h) of the CALM Act.

This management plan will provide management direction for the new reserve, giving due consideration to its purpose, current management and the intent of Parliament.

Proposed Reserves

Proposed additions to the planning area would benefit the management of existing reserves and assist in protecting key values. Proposed additions are listed in Table 2.

Table 2. Proposed Tenure Changes

Tenure	Purpose	Vesting	Class	Area (ha)	Proposed Changes
State forest No. 25	Various, including conservation, recreation, water catchment protection and timber production on a sustained yield basis, as well as other purposes prescribed by the regulations	Conservation Commission	** Afforded protection equivalent of class A	26	Incorporate State forest No. 25 into Wellington National Park (including portions adjoining location 2847, portions adjoining the Reservoir near Potters Gorge and two portions south of the Reservoir)
Former mining tenement M70/271 in State Forest No. 25#	As per State forest No. 25 above	Conservation Commission	** Afforded protection equivalent of class A	5	Incorporate into Wellington National Park once rehabilitation is complete
Reserve No. 25973	Foreshore management and public recreation	Waterways Commission	C*	39	Incorporate into Wellington National Park
Reserve No. 6563	Public utility	Unvested	C*	57	As Above

* Crown reserve created under the Land Act and treated as unclassified under the Land Administration Act.
** Created under the CALM Act, which has no classification.
# Former mining tenement M70/271 has been shut down and no further mining will occur.

Numerous freehold locations occur as enclaves of private property within the planning area. There are also Crown reserves vested in or under the control of the Shire of Collie. A surveyed and made road (No. 2429) exists between Pile and Arcadia roads.

Areas of private property and reserves adjoining or contained within the planning area may add to its ease of management, conservation value and reserve design if consolidated into the planning area. Subject to an assessment of the values of these areas, and their availability, consideration should be given to their acquisition and addition to existing reserves. In the event that any of the proposed additions are added to existing reserves of the planning area, these areas will be managed in accordance with this management plan. Other additions will be managed to be consistent with this management plan, or if necessary the plan will be amended to apply to them.

10. Existing and Proposed Reserves

Key Points:

- The planning area comprises various existing reserves (See Section 3 *Management Plan Area*) with purposes that include national park, conservation park and State forest. The Wellington Discovery Forest has a purpose of 'Scientific Research and Education'. These lands are reserved under the Land Administration Act and vested with the Conservation Commission for management by the Department in accordance with the CALM Act and regulations, and the policies of the Department (see Map 2).
- The proposed Westralia Forest Conservation Area is currently part of State forest. Under the FMP, it is proposed to be reserved as conservation park once existing impediments to its reservation as a formal reserve category have been lifted.

The objective is to protect reserves of the planning area with the maximum security of tenure, class and their gazetted purpose.

This will be achieved by:

1. the Department and Conservation Commission initiating all actions for which they are responsible to implement the proposed tenure changes in Table 2, incorporate surveyed but unmade roads into existing reserves and to reserve the proposed Westralia Forest Conservation Area as conservation park on lifting of existing impediments to an immediate change to a formal reserve land category;
2. acquisition of private property if it becomes available, and subject to an assessment of its values;
3. where proposed additions identified in this management plan are incorporated into existing reserves, managing these areas in accordance with this management plan. Other additions will be managed to be consistent with this management plan, or if necessary the plan will be amended to apply to them; and
4. continuing to identify and assess the values of other areas that might be worthy of reservation and where appropriate, recommending tenure acquisitions.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
10.1 Changes in land tenure and purpose	10.1 To formally change the land tenure and purpose of the proposed Westralia Forest Conservation Area to conservation park (Class A) , within 2 years of impediments to its reservation being lifted	After 2 years of impediments to reservation being lifted

11. MANAGEMENT PLANNING PROCESS

The Department initiates the preparation of management plans according to State-wide priorities and on behalf of the Conservation Commission. The process of producing a management plan is shown in Figure 2:

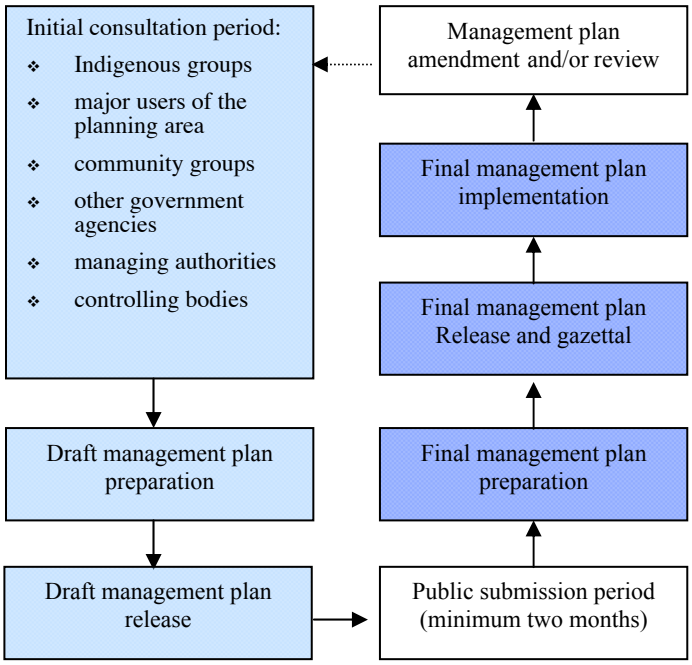

Figure 2. Management Planning Process

12. PERFORMANCE ASSESSMENT AND MONITORING

The Conservation Commission will measure the success of this plan in accordance with section 19(1)(g)(iii) of the CALM Act by using key performance indicators (KPIs), and other mechanisms as appropriate. It is not efficient to measure all aspects of management given resource and technical impediments—consequently, indicators will target key components of the plan. Kanowski *et al.* (2001) defined key performance indicators, when considering the conservation of biodiversity, as:

> "*the minimum set, which if properly monitored, provides rigorous data describing the major trends in, and impacts on, Australian biodiversity.*"

This includes evaluation of a measure and target, reporting requirements and a management response to any target shortfall (Appendix 1). These components provide a basis for adaptive management, whereby management is altered if necessary to meet a desired outcome.

The Department is responsible for providing information to the Conservation Commission to allow it to assess the success of the Department's management and meeting targets specified in the KPIs. The frequency of these reports will depend upon the requirements of each KPI. Where a report identifies a target shortfall, a response to the Conservation Commission is required. The response may identify factors that have led to the target shortfall, and propose alternative management actions where appropriate. The Conservation Commission will consider the Department's response on the target shortfall and evaluate the need for action. The

Conservation Commission will make the results of performance assessments available to the public.

The Department will measure KPIs identified in this management plan through monitoring. Monitoring will also be required to increase knowledge of the planning area and the Department's response to issues, thereby assisting future management.

The Department will invite public comment on any proposed amendments to management of the planning area, where they are contrary to this management plan.

13. ADMINISTRATION

For administrative purposes, the Department is structured into nine Regional centres that are further sub-divided into Districts. The planning area is part of the Wellington District of the South West Region. The day-to-day implementation of the management plan is the responsibility of the District Manager, Wellington District, who coordinates the operational management of reserves in the planning area.

14. TERM OF THE MANAGEMENT PLAN

The management plan for Wellington National Park and Westralia Conservation Park will guide management of the planning area for a period of 10 years from the date the final management plan is gazetted. During this time, amendments to the management plan are allowed under section 61 of the CALM Act. If an amendment is necessary, the proposed changes will be released for public comment.

At the end of the 10-year period, the management plan may be reviewed and a new management plan prepared. The new management planning process requires full public consultation and approval from the Minister for the Environment. In the event that the plan is not reviewed and replaced by the end of the 10-year period, this plan will remain in force unless revoked by the Minister for the Environment.

PART C. MANAGING THE NATURAL ENVIRONMENT

The planning area is part of an international biodiversity hotspot and is important in protecting the natural values of the jarrah forest. There are several large-scale threatening processes that may impact on its values, such as *Phytophthora cinnamomi* (dieback), feral animals, inappropriate fire regimes and climate change. Informal recreation, widening of utility corridors, adjoining land use and development pressures from nearby townsites are also issues of concern. This chapter will describe the biodiversity values, the major threats to these values, and actions proposed by the Department to mitigate the threats. The main focus is on:

- gaining a better knowledge and understanding of the natural values, threatening processes and their impacts within the planning area and adapting management accordingly;
- continuing to control exotic species (environmental weeds and introduced and problem animals), particularly in areas that may impact on threatened species and communities;
- identifying protectable areas that are not infested by *P. cinnamomi*;
- managing fire to promote biodiversity and to protect life and community assets;
- rehabilitating superfluous tracks and disturbed areas;
- encouraging and facilitating off-reserve conservation and cross-boundary management;
- monitoring and maintaining the health of riparian vegetation and ecosystems; and
- ensuring knowledge is stored and updated by, and available to, staff managing the natural environment of the planning area.

15. BIOGEOGRAPHY

The Interim Biogeographic Regionalisation for Australia (IBRA) provides a planning framework for selecting a comprehensive, adequate and representative (CAR) reserve system of protected areas to conserve Australia's biodiversity (Thackway and Cresswell 1995). The benchmark reservation level for a CAR terrestrial reserve system is for 15% of each bioregion, and any subregions within it, to be managed as part of the conservation estate (CALM 2003).

In addition to using scientifically-based CAR criteria, areas that serve as buffers to reserves, protect threatened species or otherwise assist with conservation management are also commonly included in parks and reserves. Natural areas with spectacular landforms and scenery subject to high public use may also be included.

Bioregions

The IBRA divides Western Australia into 26 biogeographic regions, based on dominant landscape characteristics of climate, lithology, geology, landforms and vegetation. The planning area lies within the Jarrah Forest bioregion (Figure 3), which is divided into two subregions: the Northern and Southern Jarrah Forest.

At the time of publication, 14% of the Jarrah Forest bioregion is within a conservation reserve[1] (631 890 ha). On a subregional scale, this comprises 10% (190 801 ha) of the Northern Jarrah Forest and 17% (441 089 ha) of the Southern Jarrah Forest. This makes the Jarrah Forest bioregion one of the most highly reserved bioregions within the State.

[1] Conservation reserves include nature reserves, national parks, conservation parks and 5(1)(g) and (h) reserves which have a purpose of conservation.

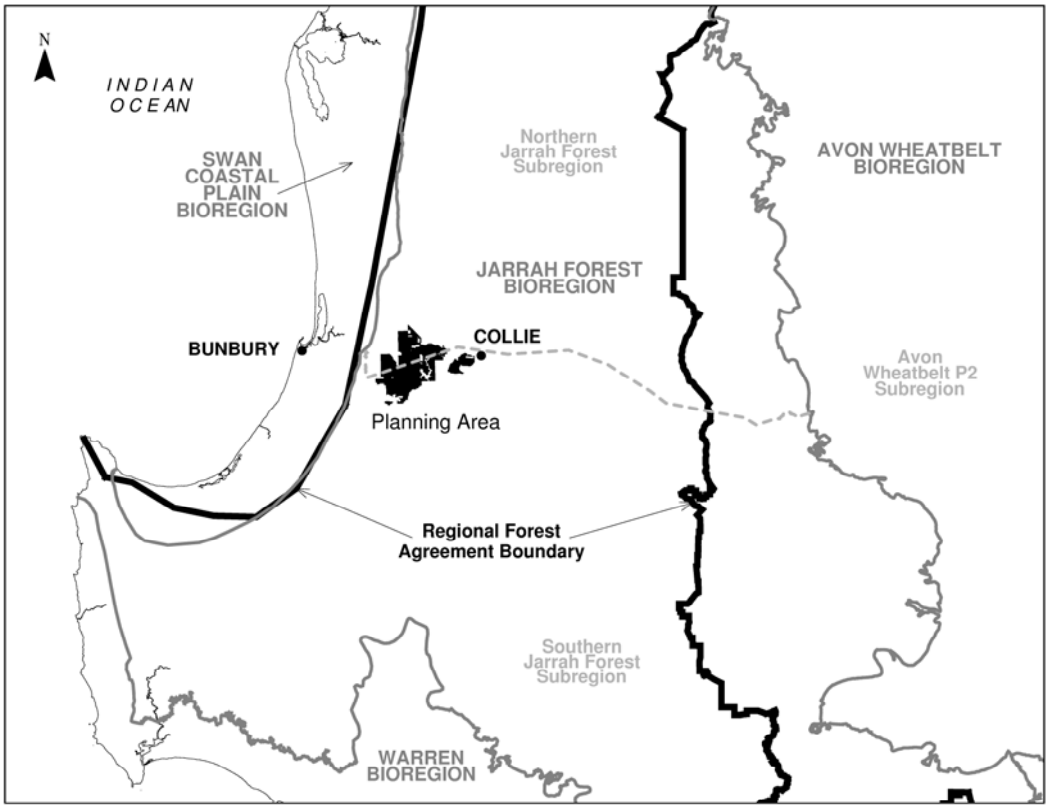

Figure 3. Bioregions in the South-West

Forest Ecosystems

In the south-west of the State, the RFA was initiated to provide a specific framework for managing the area's forests, recognising the need for a more in-depth analysis of environmental, social, economic and Indigenous heritage values. As such, 26 forest ecosystems were defined and used to assist in the establishment of a CAR conservation reserve system to protect the biodiversity of the south-west forest area. The forest ecosystem definition process is consistent with the criteria used for determining bioregional boundaries but is at a finer scale.

The reservation target for forest ecosystems was set at 15% of their pre-1750 distribution, except for some rare ecosystems where 100 % of the extant distribution was the target. This ensures that viable examples of each ecosystem are included in the protected reserve system. To assist in decisions on areas for reservation, information provided at a finer scale was also considered, including vegetation complexes, species richness, relictual and disjunct species and the presence or absence of mature growth vegetation.

The FMP added to the conservation reserve system proposed in the RFA by incorporating the policy commitments in the Government's *Protecting our old-growth forests* policy. The addition of the reserve proposals in the *Protecting our old-growth forests* policy significantly increased the representation levels of many forest ecosystems. The informal reserve system within State forests is also managed to increase the protection of less well reserved forest ecosystems.

Seven forest ecosystems occur in the planning area, six of which (jarrah north west, jarrah sandy, jarrah woodlands, rocky outcrops, sand dunes and shrub herb and sedgelands) meet the agreed target for the CAR conservation reserve system (Conservation Commission 2004). The

forest ecosystem that does not meet the CAR target for conservation reserves is the Darling Scarp. Protection of this ecosystem is required on private land to meet the CAR target.

15. Biogeography

Key Points:

- The IBRA provides a planning framework for selecting a CAR reserve system of protected areas to conserve Australia's biodiversity.
- The planning area lies within the Jarrah Forest bioregion and straddles its two subregions (Figure 3).
- Reservation in the Jarrah Forest bioregion falls just below the CAR target for the terrestrial conservation reserve system. However, it is still one of the most highly reserved bioregions within the State.
- Seven forest ecosystems occur in the planning area, six of which meet the agreed target for the CAR conservation reserve system.

The objective is to contribute to a comprehensive, adequate and representative conservation reserve system to conserve biodiversity.

This will be achieved by:

1. acquiring lands to deliver a reserve system that meets CAR criteria;
2. negotiating with the relevant State agencies and local governments to add important conservation and recreation reserves under their control to the planning area; and
3. taking into account any refinements to the IBRA over the life of this management plan.

16. CLIMATE CHANGE

The planning area experiences a Mediterranean-type climate, characterised by cool, wet winters and hot, dry summers. The climate is influenced by anticyclonic activity, which results in regular cold fronts in winter and occasional heavy summer storms. The area experiences high winter rainfall (1000–1200 mm) in a strong west-east gradient.

Observed and Projected Climate Change

Human induced global climate change, or the greenhouse effect, is the result of changes to atmospheric concentrations of greenhouse gases. In the south-west of Western Australia, changes in greenhouse gas concentrations, combined with natural variability, have already contributed to an observed decline in rainfall (IOCI 2006), especially early winter rainfall (May, June and July). This has also resulted in a decline in streamflows for the same period.

Future climate change projections for the south-west of Western Australia are for continued warming (increased mean annual temperature) and reduced rainfall (IPCC 2007). The IOCI (2006) projects a rise in temperatures in all seasons in the south-west by 2030 as well as further declines in winter rainfall. Catchments can also expect further reductions in runoff. There are also indications that weather events may be more extreme, with more frequent and prolonged droughts. Changes in ground moisture, temperature and vegetation may also lead to more vigorous fire behaviour in traditionally cooler months and more restricted burning seasons, which is likely to have implications for fire management. It is also likely that there will be more days of very high and extreme fire danger (Williams *et al*. 2001) and consequently more frequent bushfires.

Impacts of Climate Change

The potential impacts of climate change on biodiversity are uncertain and poorly understood, although the south-west of Western Australia is considered to be at considerable risk of significant biodiversity loss (IPCC 2007). Potential direct impacts on biodiversity include changes in animal and plant physiology, changes in life-cycle timing and changes in species distribution and abundance. Indirect impacts may arise from changes in species competition and predation or through alterations to the nature and intensity of existing biodiversity pressures (e.g. disease, salinisation, density and distribution of weeds, erosion, habitat fragmentation and loss of wetlands). The combination of direct and indirect impacts resulting from climate change could place considerable stress on ecological systems and result in:

- local species extinctions;
- changes to ecosystem composition and processes;
- changes in fire behaviour;
- a contraction or fragmentation in the range of native species; and
- the dispersal or migration of species from their current locations to locations having more appropriate conditions.

Species most likely to be affected are those:

- with narrow temperature ranges or low temperature requirements;
- narrow geographic ranges that are closely associated with local environmental conditions;
- those dependent on relatively high rainfall habitats; and
- those which are unable to evolve in situ.

In the planning area, some wetlands and ephemerally moist riparian zones could contract or dry out, reducing this vegetation type and predisposing these areas to fire. This in turn may affect the structure of some waterways as well as the aquatic ecology and fringing vegetation.

Reduced streamflow and groundwater recharge has also impacted on the availability of water resources for public consumption. As a consequence, water source developments have been accelerated, placing greater pressure on areas such as the Reservoir to become available for new public drinking water supplies (see Section 44 *Water Resources*).

Responses to Climate Change

Climate change continues to be the subject of intense international, national and State focus. On a national level, 'loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' has been identified as a key threatening process under the EPBC Act. At the State level, the *Western Australian Greenhouse Strategy* (WA Greenhouse Taskforce 2004) facilitates fulfilment of the State's responsibilities regarding national and international agreements on climate change. As part of the State strategy, the Department has commenced work on actions requiring it to undertake biodiversity response modelling to investigate the potential vulnerability of Western Australia's plants and animals to climate change and develop a climate-biodiversity strategy.

The issue of projecting and responding to climate change is complicated by significant knowledge deficits and uncertainty. Although the effects of climate change may not be apparent over the life of this plan, it is important that effective monitoring programs be established to support the long-term regional-scale planning necessary to limit the potential impacts as much as possible. In view of these uncertainties, climate change management strategies need to:

- use adaptive management principles and testing that generates better understanding of the interaction between taxa and community resilience and climate factors;

- be flexible to allow use of better knowledge as it is generated;
- promote the resilience of taxa and communities to climate change by limiting or reducing those pressures over which we have some management control;
- manage for uncertainty (e.g. by extending the conservation reserve system as appropriate and providing buffers, species dispersal corridors and climate refugia);
- identify key locations which contain biodiversity values important on a regional, state or national scale;
- monitor changes to taxa and community structure and representation over time;
- reducing knowledge deficits about climate variability and change; and
- develop response strategies for significant climate-change related threats that can be currently understood, such as drought.

At the individual reserve level, implementing strategies that create reserves, control introduced animals and weeds, manage fire and re-introduce or translocate threatened native plants and animals, will help improve the resilience of species and ecosystems and hence decrease their vulnerability to climate change. A system of monitoring sites should also be established to ensure any changes to ecosystem composition and structure is quickly detected, enabling remedial strategies to be developed and implemented in a timely manner.

16. Climate Change

Key Points:

- Climate in the south-west of Western Australia is changing as a result of human-induced global warming. Decreases in rainfall and river flows, as well as increased temperatures, are already apparent. Future climate change projections indicate that this drying trend will continue.
- The south-west of Western Australia is considered to be at considerable risk of significant biodiversity loss as a result of climate change.
- Reserve creation and protection of wildlife corridors, introduced predator and weed control, fire management and re-introduction programs could help improve the resilience of species and ecosystems, and decrease their vulnerability to climate change.
- Reduced river flows across the south-west may place increasing pressure on the Reservoir to become available for public drinking water supply.

The objective is to protect key values from the potential effects of climate change.

This will be achieved by:

1. identifying management priorities and the limit of conservation options for species and communities by investigating their potential vulnerability to climate change. In particular, focus on species and communities that are of conservation significance or are likely to be highly vulnerable to climate change;
2. continually reviewing and adapting management in response to new knowledge and understanding of climate change and its impact on biodiversity;
3. identifying and protecting climatic refugia;
4. protecting adequate and appropriate space within the reserve system and supporting reserve additions to provide buffers, species dispersal corridors and climate refugia;
5. limiting non-climate stresses for species and communities vulnerable to climate change;
6. incorporating the potential for climate change impacts into species recovery plans for threatened species and communities; and
7. encouraging research into the sustainability of water dependant ecosystems.

17. GEOLOGY, LANDFORM AND SOILS

Geology

The planning area is situated on the western edge of the Yilgarn Craton geological province, which extends northward into the Murchison and eastward to include the Goldfields (Figure 4).

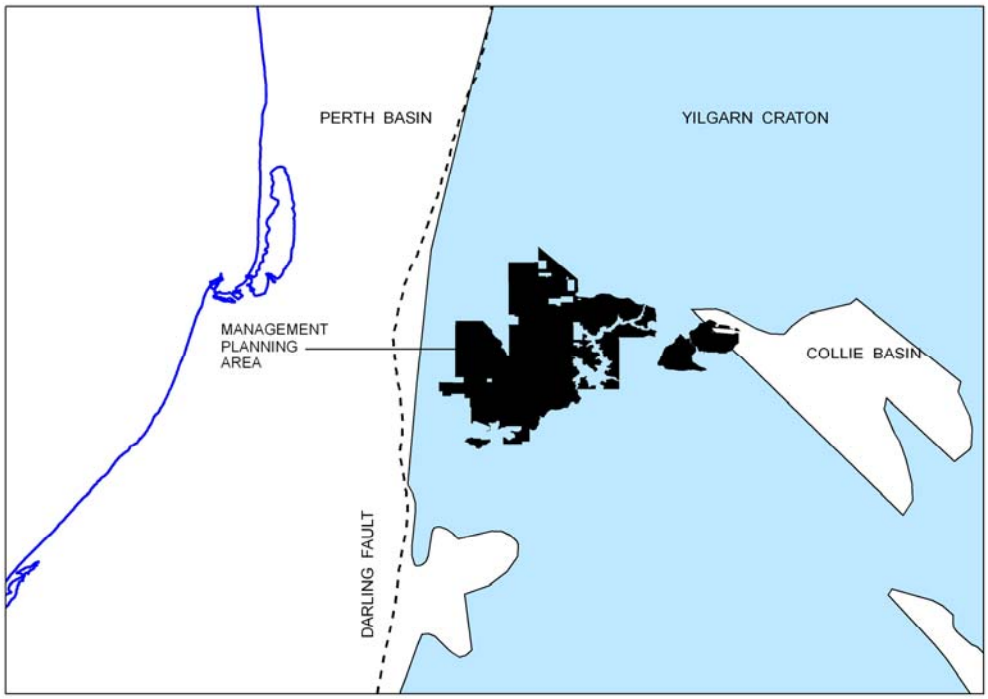

Figure 4. Geology of the Planning Area

The Yilgarn Craton is a stable shield, consisting of linear belts of metamorphosed sedimentary and volcanic rocks, which have been invaded by large areas of granite, about 2600 million years ago (Archaean period). The Craton is characterised by linear belts of greenstone rocks that are highly mineralised and have given rise to numerous gold and nickel mines. The Boddington gold mine, close to Collie, is in one of these belts. The Balingup Complex which underlies the western side of the planning area is over 300 million years old and consists of metamorphosed sedimentary and granitoid rocks.

Some 290–320 million years ago, when Australia was part of the ancient supercontinent of Gondwana and close to the south pole, much of today's Western Australia was covered by a massive ice sheet. As the Australian continent broke off and drifted away, northward, the sheet glacier melted, leaving thick beds of tillite. Subsequently, a warmer and wetter era (Permian) supported luxuriant vegetation in swamps and extensive forests, which eventually developed as coal measures.

Except in a few places, most of the signs of ancient glaciation and the evolving forests have been eroded away back to the basement rock of the Yilgarn Craton. However, in the Collie region, discrete crustal deformations occurred, producing the Collie, Wilga and Boyup basins, in which remnants of coal formation have been preserved. The Collie Basin covers an area of 223 km^2 and is partially located within the Westralia Conservation Park. It comprises Permian sedimentary rocks, approximately 280 million years old, including coal measures composed of conglomerate, sandstone, siltstone, shale and seams of sub-bituminous coal. Permian sediments

of the Collie Basin do not outcrop except for rare exposures of the coal measures in the bed of the Collie River.

Up to this time, Australia and 'Greater India' were still linked, but the two land masses subsequently parted. The southern part of the Yilgarn Craton's western edge is marked by a major rock-deforming feature, the Donnybrook-Nannup Shear Zone. It passes through the western part of the planning area, and here much of the original granite has been transformed (metamorphosed) into gneiss. The deforming processes and exposure to weathering have created some mineral enrichment, as with tin and tantalite at Greenbushes. Subsequent weathering of the granites and gneisses also developed a veneer of laterite over the surface, which in places is enriched with bauxite, which is mined further north of the planning area.

The western edge of the Yilgarn Craton is marked by the Darling Fault, visually expressed in the Perth to Bunbury area by its erosion feature, the prominent Darling Scarp. The adjoining Swan Coastal Plain overlies a deep sedimentary basin (Perth Basin) west of the escarpment. Over time, the Yilgarn Craton has been uplifted relative to the Perth Basin, resulting in rejuvenated drainage that is largely controlled by joints and fractures and the erosion of more easily weathered rocks. As a consequence of these actions, the Collie River and valley was formed. Granitic monadnocks or outcrops, resulting from this erosion, are sometimes exposed as emergent features throughout the planning area. Many of these outcrops are small, isolated, and are likely to provide important refugia for flora species beyond their current main range.

Known Minerals

The planning area is considered to have potential for copper and platinum group elements as well as for bauxite, tin-tantalum-lithium, nickel and gold mineralisation (RFA 1998). The latter has been reported from the upper reaches of the Ferguson River at Wellington Mill. Total resources of the Collie Coal Measures are approximately 2000 million tonnes, of which about 600 million tonnes are estimated to be ultimately extractable using current technology.

Landform and Soils

The planning area comprises the Darling Plateau physiographic unit. It is an undulating surface with an average elevation of 250–300 m above sea level, which extends along the Darling Fault from the Perth hills south, to the Whicher Range. Overlying the Darling Plateau are topographical features of the earths surface or landforms, such as plains, plateaus, valleys and ridges. These are strongly influenced by the uplift of the Yilgarn Craton and the underlying geological nature of the substrate or basement rock, as well as features such as faults. Three major landform units occur within the planning area: Lateritic Uplands, Minor Valleys, and Major Valleys.

Lateritic Uplands

The lateritic uplands can be found on hillcrests and ridges between river and creek systems, where they are characterised by gently undulating surfaces and open jarrah forest. They occupy the highest areas of the landscape, set some 50–100 m above the swampy valleys, and have little variation in a general elevation of about 280 m. Projecting even further above these areas, are prominent hills, such as Mt Lennard (320 m). A characteristic of the uplands in the planning area is the presence of large rock outcrops of granite that occur sporadically along the valley. To the east, in the Collie Basin, the lateritic uplands are broad and flat, and comparable to those on the surrounding Archaean rocks. In these areas, the uplands reach a general elevation ranging from 200–250 m.

Soils of the lateritic uplands differ between those of the Collie Basin and those of the surrounding Archaean rocks, despite the similarities in landform. Massive ironstone duricrust pavements, loamy gravels, sandy gravels and numerous lateritic outcrops dominate soils on the Archaean rocks, which originate from granites and gneisses. Soils of the Collie Basin however,

originate from sedimentary rocks such as sandstone, which gives rise to infertile, yellow brown sandy gravels, unique to the region. The difference in soil type becomes apparent in the vegetation, where the poorer, sandier soils of the Collie Basin support a more open forest environment.

Minor Valleys

Minor valleys of the planning area generally connect to major valleys, and comprise of small tributaries and creek systems such as the Gervasse River. They are common on the western half of the Darling Plateau and dissect the lateritic uplands, forming narrow valleys with gentle side slopes and flat swampy floors. The tributaries and creek systems that characterise these valleys exhibit a clear north-west to south-east lineation, which is related to dominant structural elements of the basement rock, such as faults. Soils comprise of loamy gravels, sandy gravels with some loamy earths and deep sands.

In the Collie Basin, the minor valleys are shallow, with low slopes that are dominated by sandy gravels and deep sands. The poor moisture and nutrient retention capabilities of these soils support different vegetation to the surrounding forest.

Major Valleys

The deeply incised landform of the lower Collie River valley is a spectacular example of the major river valleys found along the western edge of the Darling Plateau. It dominates the planning area, providing striking scenic attributes and numerous recreation opportunities, as well as supporting valuable habitats for conservation. This type of landform is associated with major river systems such as the Collie River, which has carved deep into the valley along joints and fractures in the basement rock. The deepest of these entrenchments is along the lower Collie River, below the Reservoir, where slopes may be greater than 25 degrees and have a relief of 120–200 m. The narrowest point of the Collie River valley defines the location of the Reservoir wall. Between the Mungalup pine plantation and the Reservoir wall, landforms are characterised by broader, more moderately incised valleys, lesser relief and slopes that are predominantly 15–25 degrees. These valley landforms are also common to other reservoir areas such as the Stirling Dam, and to a lesser extent, Harris Dam.

The patterning of soils in major valleys is complex, depending on relief and steepness of valley systems, rockiness of the slopes, and the nature of the valley floor. This is particularly evident in the lower Collie River, where stony soils occur around granite outcrops, red and brown loamy earths on the upper slopes and brown loams in the lower slopes and floors. Above the Reservoir, soils in the major valleys are predominantly red and yellow loamy earths and in the upper reaches of valleys systems, loamy earths and gravels.

The Lateritic Soil Profile

All landscapes of the planning area consist of a weathered mantle at the surface, which has formed as a result of weathering of granite, gneiss, migmatite and dolerite rock types. The upper part of this mantle consists of ferruginous and aluminous horizons, which together make up the laterite soil profile. This profile is characterised by the presence of jarrah-marri forest ecosystems and consists of topsoil containing a gravely sandy loam up to a depth of five metres and deeper kaolinitic clay 30 m above the bedrock.

Erosion

The process of soil erosion can be accelerated when the soil surface is disturbed or vegetation removed, resulting in changes in landform, soil structure, nutrient availability and sediment transport to streams and waterways. The construction and use of roads and facilities for public and management purposes can increase soil erosion. Four-wheel driving, the use of bicycle and walk tracks, picnic areas and campsites can exacerbate soil disturbance resulting in erosion,

compaction and degradation. Rehabilitation is used as a short-term corrective measure (see Section 39 *Rehabilitation*).

Most of the planning area is undisturbed and of low risk of erosion. However, some areas of concern are:

- the lower Collie River valley, where there is a combination of shallow soils, deeply incised valleys and predominantly high relief. Once disturbed, these soils are highly susceptible to erosion and are at risk of minor landslips;
- disturbed areas surrounding the Reservoir and areas where riverside camping is prominent;
- banks of the Reservoir;
- disused gravel pits;
- roads, tracks and walk paths located on steep slopes and in areas of shallow soils, such as Lennard Track, Sneaker Road, Goat Road and Sika Circuit; and
- points of concentrated public recreation such as Honeymoon Pool, Potters Gorge and the banks of the lower Collie River.

Whilst the inherent erodibility of soils cannot be changed, the erosion associated with human activities can be contained or prevented by appropriate management. The rotation of campsites to allow for rehabilitation, the hardening of recreation sites and the temporary or permanent closure of tracks are some measures that can reduce the impact of erosion. The careful placement of facilities can also direct visitors away from environmentally sensitive areas. This, combined with education of visitors about the effects of erosion and the use of appropriate codes of practice, guidelines and on-site investigations prior to any changes in land use, can minimise erosive activity.

17. Geology, Landform and Soils

Key Points:

- The planning area is located on the Darling Plateau, which forms the western edge of the Yilgarn Craton, an ancient area of Archaean granitic and gneissic rocks.
- The Collie Basin forms an unusual geological feature of the Yilgarn Craton, different to the surrounding granitic and gneissic rocks. It contains Permian sedimentary rocks that comprise what is known as the Collie Coal Measures.
- The Collie River valley is a spectacular example of the incised river valleys found along the length of the Darling escarpment. The valley dominates the landscape, providing striking scenic attributes and numerous recreation opportunities.
- Erosion hazards are greatest in disturbed areas of the Collie River, particularly along the lower Collie River valley, where shallow soils and steep sloping landscapes occur.

The objective is to protect and conserve the geology, landforms and soils.

This will be achieved by:

1. identifying geological features and soil types vulnerable to environmental damage and potentially threatened by human use (e.g. granite outcrops and riverbanks), and protecting these areas (see also Part E. *Managing Visitor Use*);
2. further identifying areas of erosion and taking appropriate remedial action;
3. minimising soil disturbing activities in, and public access to, areas of steep and moderate slopes, particularly in the lower Collie River valley;
4. appropriately managing human activities, including the sensitive siting of access routes and facilities, to minimise the exposure of soil to mechanisms of erosion;
5. rehabilitating superfluous tracks and disturbed areas as necessary;
6. providing interpretive information on geology within the planning area, its relationship with landforms, soils and vegetation and their vulnerability to damage.

18. HYDROLOGY AND CATCHMENT PROTECTION

Surface Water Hydrology

Surface water hydrology of the south-west is characterised by short coastal rivers with greatly fluctuating flow rates and water levels, and a large number of permanent or ephemeral water bodies, including lakes and flats (Commonwealth and Western Australian Regional Forest Agreement Steering Committee 1998). Drainage systems exhibit a distinct westerly to south-westerly trend directed towards the Indian Ocean.

The main drainage system of the planning area is the Collie River, which has been significantly altered by damming for water supply. It feeds into the Reservoir before traversing the forested Darling Scarp and passing across the Swan Coastal Plain to discharge into Leschenault Estuary (see Map 3). It is a large river system characterised by small waterfalls, rapids and intermittent pools, varying in size.

The Collie River catchment encompasses an area of 2823 km^2 and extends nearly 100 km inland towards Darkan. Approximately 677 km^2 of the catchment (24%) was cleared before clearing control legislation was introduced (Mauger *et al*. 2001). The catchment is one of the few major river systems that penetrate inland to the central wheatbelt. It experiences streamflow mostly between July and November. A number of major tributaries branch from the Collie River including the Wellesley, Brunswick, Harris and Bingham rivers. The headwaters of the Wellesley and Brunswick rivers emanate from the high rainfall areas on the western edge of the Darling Plateau, whereas the Harris and Bingham rivers have their headwaters in comparatively flat landscapes where annual rainfall is about 600 mm and marri-wandoo woodlands dominate the vegetation. The eastern-most reaches of Collie River drain saline land with varied land uses, including agriculture, mining and fragmented native forest. Largely forested catchments such as the Harris and Bingham rivers continue to have lower stream salinities of less than 300 mg/L and feed reservoirs such as the Harris Dam with high quality water.

Wellington Reservoir

The Reservoir has a water supply capacity of 186 GL used for irrigation but potentially important for industry and as a drinking water supply (see Section 44 *Water Resources*). Water from the Reservoir is mainly allocated for irrigation for fodder crops, pasture for dairy cattle, fruit and vegetables within the Collie Irrigation District.

Historically, the Reservoir was used as a supply of potable water for the GSTWSS and is still proclaimed under the CAWS Act, which gives the Reservoir and catchment a level of protection (see Appendix 2). At present, it is not used as a drinking water supply because of the existing poor quality water. The major influence on water quality within the Reservoir is high salinity levels associated with dryland salinity, caused by extensive land clearing in the upper catchment (see *Salinity* below). Although the Reservoir contains water with salinity levels higher than normally acceptable for drinking water purposes, it could still be used if mixed with a better quality source or if salinity levels are significantly reduced.

In light of the poor quality water that developed in the Reservoir, during the 1980s alternative sources of potable water were sought and a 72 GL replacement dam on the Harris River was constructed. This supply, as well as the 7 GL supply at Mungalup Dam, provides alternative sources of drinking water to the Collie townsite and the GSTWSS. A water source protection plan for the Harris Catchment was finalised in June 2007 and a plan for Mungalup Dam is due in 2008. Should the Wellington Reservoir be required as a drinking water source in the future, the strategies contained within this plan may need to be modified, particularly with respect to recreational activities and use. Appendix 2 outlines how such changes may take place.

Water Allocation

Water allocations are determined by DoW. Once the water in the Reservoir becomes potable, there may be trading between irrigation water allocations and drinking water allocations. In allocating water, its social value is recognised as well as the needs of the environment. Management of water quality and drinking water sources is part of water source protection planning, also carried out by DoW.

Environmental Water Requirements

Water allocation can take into account the requirements of the environment, based on the premise that the environment is a user of water and has a right to adequate water supply for water-dependant ecosystems and to sustain key ecological functions. The amount of water required to maintain ecological processes is known as the environmental water requirement and is determined through scientific investigation and community consultation.

For the lower Collie River between the Reservoir and the western edge of the planning area, water is required to sustain the health of riparian vegetation, including fringing sheath twigrush sedgelands and species on granite and sand islands. Sheath twigrush sedgelands are particularly important as they are the only species that provide stabilisation to the lower embankments. Loss of this vegetation could lead to undercutting of embankments and an increase in sediment loading in the channel bed. Sheath twigrush fringing sedgelands are also an important fauna habitat, providing breeding areas and protection from predators. Long-term impacts of reduced water flow would include the loss of understorey species (herb strata) that are out competed by invasive weed species. This, combined with an increase in recreational use, may allow disturbance opportunists such as kikuyu (*Pennisetum clandestinum*), which is already present in small amounts, to invade.

Water flow, velocity and quality are particularly important in sustaining native fish species such as the western minnow and nightfish. These species undergo a reproductive migration and as such, barriers to movement can impact on the completion of their life history. Hardcastle *et al.* (2003) reported that flood pulses of 3–5 days in duration were required during the period of August to October to provide sufficient fish passage and allow species to traverse obstacles, necessary for successful spawning migrations. This regime would mimic unregulated river systems in the south-west of the State. A major requirement for the maintenance of fish populations in the Collie River is also the presence of permanent water during all months of the year.

The environmental water provision is the amount of water that can be allocated from a resource to meet an environmental water requirement. Environmental water provisions must be maintained before any allocation is made to consumptive use. The guiding principles of how water is allocated are illustrated in DoW's *Environmental Water Provisions Policy for Western Australia*, which is based on the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ/ANZECC 1996).

Groundwater Hydrology

Substantial groundwater resources estimated to contain 7000 GL of potable water occur in the Collie Basin. This is the most significant fresh groundwater resource east of the Darling fault (Rutherford 2000), although it can be acidic and high in iron (Tille 1996).

Groundwater abstraction is currently managed under a strategy developed by the Collie Water Advisory Group. The strategy considers the interaction between water resources, the management of coal mining, power generation, future industry, the environment and the social impacts of water availability. It calls for groundwater abstraction to be minimised while recognising the importance of mining and power generation.

Despite the management of groundwater abstraction in the Collie Basin, groundwater resources are being progressively depleted on a local scale by mining activities, pumping from borefields and from open cut and underground coal mines (Rutherford 2000) and used for industrial purposes associated with coal mining and power generation. Dewatering from the mines and the disposal of water has resulted in water leaking from the Collie River into underground mines causing pool levels to be lowered, and the creation of perennial pools where the river was once at a seasonally low level (Rutherford 2000, Collie Water Advisory Group 1999). Consequently, careful management is required to contain adverse environmental impacts to current levels (CBWSOSC 2007). A number of pools will continue to be supplied with supplementary water to sustain them.

Salinity

Salinity of our streams and waterways poses the greatest threat to water quality in the south-west of Western Australia. The south-west has the largest area of dryland salinity in Australia and the highest risk of increased salinity in the next 50 years. The Collie River receives saline water from cleared agricultural areas within its catchment, particularly in the eastern-most areas around Darkan and West Arthur. This has impacted significantly on the water resource of the Reservoir and its use for productive and high value activities (Figure 5).

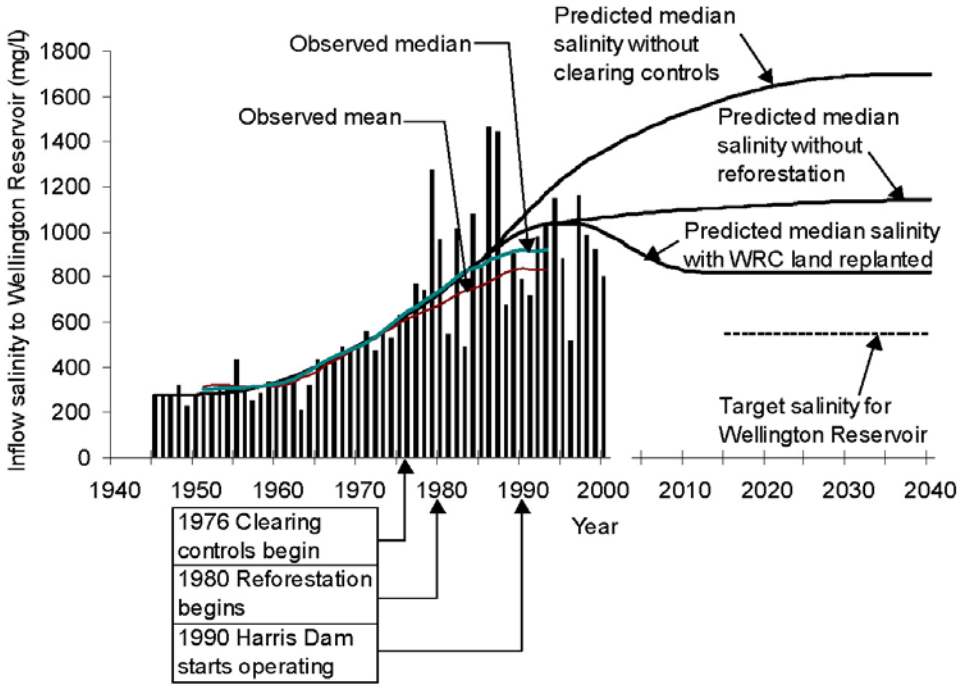

Figure 5. Salinity Trends of the Reservoir

In an attempt to restore the Reservoir to a potable level, the State Government banned land clearing in the Collie River catchment in 1976 and also initiated a buy-back and re-afforestation program in 1980. Since that time, 6700 ha have been planted to trees. An additional 13 000 ha of private plantations will reduce the total cleared area of the catchment to less than 25%. As a result, the average flow weighted salinity of the Reservoir has declined to 950 mg/L at the time of writing (CBWSOSC 2007). This is far higher than the 500 mg/L recommended in the World Health Organisation *Guidelines for Drinking Water Quality* and the 280 mg/L that was recorded when the Reservoir was constructed in 1933. Further, small reductions in salinity can be expected as trees reach maturity.

In view of the poor quality water within the Reservoir and declining rainfall trend, the Collie Basin has also been designated by the State Salinity Strategy (State Salinity Council 2000) as a

recovery catchment. The State Salinity Strategy and the State Salinity Action Plan both set out options for the management of salinity and a target of 500 mg/L to be achieved by 2015. Options for meeting this water quality target include a mixture of upland and lowland revegetation activities in plantations or alleys, groundwater pumping and drainage, planting specialist deep-rooted perennial crops or pastures, the diversion of saline river flows and the protection of remnant vegetation. The diversion of saline river flows has the greatest potential to generate significant reductions in salinity levels and could reduce salinity in the Reservoir to potable levels within several years of commencement (CBWSOSC 2007). The recovery of the Collie River catchment is also outlined in the Collie Salinity Situation Statement (Mauger *et al.* 2001).

Salinity research is undertaken to the south of Wellington National Park in two paired catchments, the forested control which is located in the planning area.

Water Quality

The *State Water Quality Management Strategy No.1* (Government of Western Australia 2001), as its response to the National Water Quality Management Strategy (ARMCANZ and ANZECC 1994), gives guidance for the management of water quality in creek and river systems of the planning area. The administration of water quality protection, and the conservation and management of Western Australia's water resources, is the responsibility of DoW. Under section 33(1)(dc) of the CALM Act, the Department also has responsibility for water protection and promotes the conservation of water, both in terms of quality and quantity, on land it manages.

The quality of water entering the Reservoir is fresh to brackish, with moderate levels of salinity and less than optimum levels of oxygen. Elevated salinity levels are a result of large-scale land clearing for agriculture and horticulture in the upper catchment, east of the Reservoir. High intensity activities, such as mining, also create point sources in the upper catchment, where discharges and dewatering have the potential to degrade both water quality and quantity. Urbanisation in the upper catchment could also impact on water quality, especially since the Allanson townsite, which adjoins the planning area, is currently un-sewered. Numerous pine plantations as well as native State forest surround the planning area, the latter supplying fresh water to the Reservoir and Collie River.

18. Hydrology and Catchment Protection

Key Points:

- Hydrology and water quality of the planning area is vital for the creation and maintenance of the biological systems, the provision of significant recreational opportunities, and the potential for development of a public drinking water supply.
- The main drainage system is the Collie River, which feeds the Reservoir before traversing the forested Darling Scarp and passing across the Swan Coastal Plain to discharge into Leschenault Inlet.
- The Reservoir is used primarily for irrigation but is important for industry and as a potential drinking water supply. Historically, the Reservoir was used as a supply of potable water, but is currently not suitable for use without mixing because the existing water is too saline. It is expected that salinity will reduce to a potable level by 2015 with the implementation of further catchment recovery techniques. The catchment is still proclaimed under the CAWS Act.

The objective is to protect and conserve the quality and quantity of water.

This will be achieved by:

1. assessing the potential effects of Department operations or developments on water

quality/quantity and identifying and implementing strategies to prevent or mitigate adverse effects;
2. liaising with DoW to maintain environmental water requirements and provisions to the lower Collie River below the Reservoir wall;
3. effecting those Departmental responsibilities relevant to the Collie River catchment and identified by the Collie River Salinity Situation Statement;
4. ensuring that stream buffers are maintained in adjacent State forest and disturbed areas revegetated;
5. reviewing the adequacy of water monitoring for natural values within the planning area;
6. supporting DoW to continue monitoring of water quality and quantity along the lower Collie River and meet to review these finings annually;
7. engaging with relevant authorities (e.g. DoW) and adjacent landholders regarding water quality/quantity and providing advice and direction as necessary to ensure values of the planning area are protected;
8. undertaking or encouraging others to undertake research into the hydrology and environmental water requirements of the planning area and adapt management accordingly; and
9. adapting management as per Appendix 2 should the Reservoir be required as a drinking water source in the future.

19. NATIVE PLANTS AND VEGETATION COMMUNITIES

At a State level, the Department has the statutory responsibility under the Wildlife Conservation Act for flora conservation, and all flora native to Western Australia is protected under this Act. Threatened flora is also protected under this Act (see *Declared Rare and Priority Flora* below).

The Commonwealth's EPBC Act provides a listing of nationally threatened flora species. While threatened species legislation is broadly similar across jurisdictions, there are differing approaches to species listing, and therefore inconsistencies exist between the State and National threatened species lists. The Australian Government and the Department are currently in partnership to align threatened species listed under EPBC Act with flora listed under the Wildlife Conservation Act.

Native Plants

The planning area is located in the South West Botanical Province of Western Australia, which is internationally recognised as one of the world's 34 biodiversity hotspots, for its exceptionally rich plant diversity and very high endemism, and the degree to which it is under threat. It is located on the boundary of the northern and southern jarrah forests, a continuum defined by slight variations in rainfall and the transition from the drier open forests in the north to the tall forests of the south.

There are 331 native plant taxa[2], representing 72 families recorded in the planning area, although botanical collections and surveys have been limited. The largest number of species belong to the family Papilionaceae (peas), followed by Myrtaceae (eucalypts and paperbarks), Proteacea (banksias and grevilleas), Mimosacea (wattles), Asteracea (daisies) and Cladoniaceae (fungi).

Vegetation is representative of that of the jarrah forest, displaying a remarkable structural homogeneity in overstorey species, dominated by jarrah (*Eucalyptus marginata* subsp. *marginata*), marri (*Corymbia calophylla*) and, on deeper valley soils, Swan River blackbutt (*Eucalyptus patens*). The diversity in floristic composition, adaptive characteristics displayed by plants, patterns of groupings and the structural features of vegetation communities coincides

[2] Records obtained from the Western Australian Herbarium 2008.

with changes in environmental conditions across the jarrah forest, principally variations in climate, topography and soil type.

The rapid intensification of land use demands on the jarrah forest, which has occurred since the 1960s, has placed greater conservation significance on those remaining species and communities in conservation reserves (McKenzie *et al.* 1996). The variety of vegetation types, wide range of habitats, presence of major river systems, landscape values and continuity with adjoining State forest make plants and vegetation communities of the planning area significant for conservation and a valuable contribution to the CAR conservation reserve system.

Declared Rare and Priority Flora

The Department has the statutory responsibility for flora conservation and particular responsibility for threatened flora, which are declared as 'rare flora' under the Wildlife Conservation Act. In addition to declared rare flora, the Department also refers to priority flora. These are taxa that may be may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status. Although priority flora are not gazetted and do not have the same level of legislative protection as declared rare flora, the priority flora list is maintained as a mechanism to highlight flora of special conservation interest and to encourage appropriate management. Taxa are grouped from Priority 1 to Priority 4 (see *Glossary* for explanation, no flora are currently listed as Priority 5) according to the perceived urgency for further survey. Management direction for priority flora is provided by advice from the Department's Species and Communities Branch, and specialised staff in the Region.

Within the planning area, there is one Priority 1 species (*Hemigenia rigida*), three Priority 3 species (*Acacia oncinophylla* subsp. *oncinophylla*, *Tetratheca parvifolia* and *Meeboldina thysanantha*) and two Priority 4 species (*Grevillea ripicola* and *Senecio leucoglossus*).

Vegetation Communities

Vegetation of the planning area is a mosaic of forest, wetland and woodland vegetation types. It ranges from tall open forest along the lower Collie River valley to open forests and open woodlands of the Collie Basin. Woodlands and forests typically occur on lateritic soil types, especially in the uplands, and are dominated by an overstorey of jarrah and marri. Common understorey species include bull banksia, sheoak (*Allocasuarina fraseriana*), waterbush (*Bossiaea aquifolium*) and snottygobble (*Persoonia longifolia*), as well as grass tree (*Xanthorroea preissii*) on hilltops.

A number of distinct and interesting floral communities exist. Of particular note is the unusual mixture of marri and Swan River blackbutt forest that dominates the deeper, and more fertile, red and yellow loamy earths of the lower Collie River valley. This area contains riverside vegetation including flooded gum (*Eucalyptus rudis*), swamp paperbark (*Melaleuca rhaphiophylla*), peppermint (*Agonis flexuosa*) and river banksia (*Banksia seminuda*). Understorey species such as karri hazel (*Trymalium spatulatum*) and *Chorilaena quercifolia*, which are typical of karri forest, also occur. The presence of these species is indicative of the cool, damp, microclimate of the lower Collie River valley and is different to vegetation elsewhere in the planning area and in similar landform types of the northern jarrah forest. The vegetation has remained largely unaffected from human disturbance, an uncommon feature within the bioregion, and a primary reason for the occurrence of ecologically mature forest in this area. Elsewhere, this type of vegetation has been eliminated or reduced due to the damming of rivers, agricultural land clearing and the establishment of pine plantations. Conservation of this area is paramount, especially given the increase in visitors and vulnerability of the landform to erosion. Where possible, compatible off-reserve conservation of adjoining lands is also encouraged.

Westralia Conservation Park, within the Collie Basin, contains plants that have a distinct structure and floristic composition, different to the surrounding vegetation. Geomorphologically, this area is an island within the Yilgarn Craton, and consequently may contain endemic plants. A distinguishing characteristic of this landscape is the broad, flat depressions, which support woodlands of sheoak and open woodlands of moonah, swamp banksia and holly-leaved banksia. Shrub species such as horned leaf hakea (*Hakea ceratophylla*), swamp peppermint (*Agonis linearifolia*), white myrtle (*Hypocalymma angustifolium*) and swamp teatree (*Pericalymma ellipticum*) are prominent, particularly in water-gaining sites and areas of humus rich podsol soils.

Granite Outcrops

Small, isolated and disjunct granite outcrop communities are interspersed throughout the planning area, particularly along the lower Collie River valley. These outcrop communities provide a contrast to the surrounding forest in terms of species composition and vegetation structure, and also because they are likely to have a higher proportion of obligate seeders (Hopper *et al.* 1997). Species composition varies dependant on soil depth and ranges from lichen encrusting bare rock, through moss swards and herbfields to shrublands and heathlands on deeper soils (Smith and Sage 2002). These outcrops are significant to the region as they are geographically separated from similar outcrops, the nearest of which occurs in Lane Poole Reserve, Shannon National Park and the Monadnocks Conservation Park.

The evolution of a distinct suite of plant species associated with rock outcrops is probably due to a number of factors, including the diversity of microhabitats (alternatively extremely dry and wet), high light levels and a relatively longer interval between fire than the surrounding vegetation. The diversity of microhabitats and soil moisture regimes is likely to have facilitated the evolution of several endemic species in the south-west, and the persistence of refugial species beyond their main range (Hopper *et al.* 1997). Many of these endemics are not found in surrounding habitats, although they may be found in granite outcrops over a wide geographical range. The refugial characteristics of granite outcrops are demonstrated by *Daviesia hakeoides* subsp. *hakeoides*, which has persisted within the planning area as a disjunct outlier from the main population. Its presence shows a significant extension in the range of this species.

Granite outcrops throughout the south-west also contain some of the most diverse plant life in the South West Botanical Province (Hopper *et al.* 1997). Surveys of the planning area in 2002 indicate that the number of species is comparable to other outcrops within this region (Smith and Sage 2002). A high proportion of rare flora is also likely. Hopper *et al*. (1990) found that 12% of plants listed in 1989 as rare flora under the Wildlife Conservation Act were found in granite outcrops. Within the planning area, outcrops support the Priority 3 species *Acacia oncinophylla* subsp. *oncinophylla*.

Granite outcrop communities are fragile habitats, susceptible to weed invasion, grazing by feral animals, too frequent fire, loss of shrub layer, salinity and the disease caused by *Phytophthora cinnamomi*. In the planning area, eleven weed species, mostly small, annual plants, were found to comprise 12% of the species composition (Smith and Sage 2002). Disturbance by trampling can also lead to loss of vegetative cover, erosion and increases in weed invasion if not controlled. This is already apparent along Lennard Drive.

Further surveys are necessary to ascertain the significance of granite outcrops for refugial species and their response to fire. Existing research plots have been established to assess species composition, weed invasion and vegetation condition in selected outcrops. This will continue over time.

Wetlands and Riparian Habitats

Important wetland habitats exist as seasonally or permanently inundated features along creek systems of the planning area. They are typically small, often less than 5 ha, and occur sporadically throughout the jarrah forest. Most of the wetlands contain fresh water originating from forested catchments and contain emergent vegetation that is waterlogged for most of the growing season. The main riparian habitat of the planning area occurs along the lower Collie River, which, despite modified flow regimes caused by damming of the river and increased salinity levels, provides a valuable habitat and acts as a wildlife corridor. However, vegetation communities containing sheath twigrush (*Baumea vaginalis*) and *Meeboldina decipiens* would be at particular risk if stream flows were reduced, predisposing the area to erosion, weed invasion and the loss of fish habitat.

Wetland and riparian areas provide significant habitat for fauna species, especially small macropods such as the quokka and quenda, as they find a reliable food supply and protection from predators. They can be impacted upon by introduced animals such as pigs and foxes, exotic plants, salinisation, climate change and unmanaged human access. Fire regimes appropriate to the maintenance of biodiversity and ecosystem function will be applied to protect wetland systems.

Ecologically Mature Forest

Small areas of ecologically mature forest exist along riparian zones of the lower Collie River, where the effects of disturbances such as timber harvesting, roading and clearing are considered negligible. The only noticeable degradation is the increasing erosion of tracks and riverbanks, caused by recreational activities.

The presence of ecologically mature forest is necessary to protect the full range of biodiversity values and sustain viable populations of fauna, especially species such as common brush-tail possum and cockatoos, which require large tree hollows. A reduction in suitable tree hollows caused by land clearing outside the planning area, and competition for hollows from introduced species such as the honeybee (*Apis mellifera*) and laughing kookaburra (*Dacelo novaeguineae*), highlights the habitat value of mature growth forest. Disturbance in these areas has the potential to limit the availability of tree hollows. Therefore, any disturbance activity within the planning area (e.g. recreational site development and fire) will be assessed for its impact on tree hollows.

Ecotones

Ecotones are transition zones between adjacent but different environments. They generate evolutionary diversity and serve as repositories of genetic diversity to be used for rehabilitation of adjacent environments if and when these areas loose species (Volis *et al*. 1998, Kark *et al.* 1999). Ecotones are often narrow areas of land that have a high number and variety of species, making them vitally important for biodiversity conservation. An example of ecotones within the planning area might be the transition zone between a wetland or granite outcrop habitat and the surrounding jarrah forest. The ecotone between the geology, landform and vegetation of the Yilgarn Craton and Collie Basin within the Westralia Conservation Park is also an important transitional zone. Where possible, recreation development should avoid ecotones.

Significant Vegetation Complexes

During the RFA, vegetation for the forested area within the south-west was considered at forest ecosystem, ecological vegetation system and vegetation complex levels (Mattiske and Havel 1998). Vegetation complexes were the finest scale unit of classification.

Within the planning area there are nine identified vegetation complexes: Collie, Dwellingup 1, Helena 1, Hester, Lowden, Murray 1, Yarragil 1, Darling Scarp 2 and Muja. Map 4 shows their distribution. Of these, Darling Scarp 2, Lowden, Collie and Muja are identified as un-common

and under-represented across the South-west, with less than 15% representation in conservation reserves. The establishment of Wellington National Park and the Westralia Conservation Park has added considerably to the representation of Lowden and Helena 1 vegetation complexes within formal conservation reserves. The Darling Scarp 2, Collie and Muja vegetation complexes whilst un-common, are not well represented within the planning area.

Other vegetation mapping of the planning area has been undertaken by Heddle *et al.* (1980) in the Darling System (System 6) and by Beard (1981).

Threatening processes

Plant species and communities of the planning area face a number of threatening processes viz:

- spread of disease, such as that caused by *Phytophthora cinnamomi*;
- inappropriate fire regimes;
- development pressures from nearby townsites and adjoining land use;
- informal recreation;
- widening of utility corridors;
- dumping of rubbish, firewood collection and weed invasion;
- salinisation to the east of the planning area; and
- climatic change.

These are addressed in the relevant sections of this management plan.

19. Native Plants and Vegetation Communities

Key Points:

- Vegetation is representative of that of the jarrah forest, displaying a remarkable structural homogeneity in overstorey species, principally dominated by jarrah, marri and to a lesser degree, Swan River blackbutt. Floristic differences in understorey composition are strongly correlated to changes in the underlying soils, as well as landform and climate.
- A feature of the area is the vegetation along the lower Collie River valley. This area contains ecologically mature forest, granite outcrop communities, riparian vegetation and plant species typical of the karri forest.
- Westralia Conservation Park contains vegetation that has a distinct structure and floristic composition, different to the surrounding vegetation.
- The Darling Scarp 2 and to a lesser extent the Lowden, Collie and Muja vegetation complexes are un-comon and under-represented within formal conservation reserves.

The objective is to identify, protect and conserve native plants and vegetation communities.

This will be achieved by:

1. listing rare flora under the Wildlife Conservation Act and/or EPBC Act;
2. managing native plants and vegetation communities according to Department Policy;
3. developing and implementing recovery plans for declared rare flora;
4. ensuring this management plan gives effect to recovery plans and that new recovery plans are consistent with this management plan;
5. assessing proposed operations and developments for the potential impacts on vegetation communities and declared rare, priority and other flora;
6. identifying native plants and vegetation communities that may require special protection (e.g. granite outcrops, wetland and riparian habitats of the lower Collie River valley), and implement appropriate strategies to minimise the impacts from threatening processes;

7. protecting inadequately represented vegetation complexes from disturbances that may be detrimental to natural values;
8. managing fire to conserve flora biodiversity (see Section 25 *Fire*);
9. encouraging regeneration of degraded areas where disturbance is severe and natural regeneration is less likely to occur;
10. liaising with neighbouring landholders and local government authorities to promote compatible management on adjoining lands;
11. providing opportunities for visitors to improve their awareness, understanding and appreciation about the importance of native plants and vegetation communities and the impacts of threatening processes;
12. supporting research and monitoring of native plants and vegetation communities (such as susceptibility to disease, response to fire) and adapting management accordingly; and
13. making use of existing research plots to monitor the long-term change in species composition and structure of granite outcrops. Additional plots will be established if required and subject to the availability of resources.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
19.1 Changes in species composition and structure within granite outcrops of the lower Collie River valley	19.1 Subject to natural variations, maintaining species composition and structure within granite outcrops of the lower Collie River valley	Every 5 years, or as per recovery plans if applicable
19.2 The persistence and condition of populations of declared rare flora	19.2 No loss or decline as a result of management actions	

20. NATIVE ANIMALS AND HABITATS

The planning area is important for fauna species of the jarrah forest, primarily due to its good condition, size and continuity with adjoining State forest. It supports an assemblage of fauna species and associated habitats that are broadly representative of the jarrah forest. Within these habitats, there are several distinctive microhabitats such as granite outcrops, wetlands and riparian zones along watercourses, adding to the diversity of species able to coexist in the area (Nichols and Muir 1989). Some habitats are particularly notable, such as the ecologically mature forest along the lower Collie River, which provides tree hollows, thickets and vegetative corridors for movement of species downstream.

Species diversity of mammals and other large vertebrates, such as land birds, is low in the jarrah forest compared to other areas such as the semi-arid zone (Abbott 1988). However, species diversity of invertebrates and small vertebrates is high (McKenzie *et al.* 1996). Most species do not appear to be restricted to the planning area.

Native Animals of Conservation Significance

Threatened and Other Specially Protected Fauna

The Commonwealth's EPBC Act provides a listing of nationally threatened fauna species. Threatened fauna are also listed at an international level in the *IUCN (World Conservation Union) Red List of Threatened Animals* (1994).

At a State level, the Department has the statutory responsibility under the Wildlife Conservation Act for fauna conservation, and all native fauna in Western Australia is protected under this Act.

The Act provides for the Minister to declare fauna species as 'rare or likely to become extinct' (commonly referred to as threatened) or 'other specially protected fauna'.
Within the planning area there are ten species of specially protected fauna. Eight of these are threatened species (Table 3) and two, the peregrine falcon (*Falco peregrinus*) and carpet python (*Morelia spilota imbricata*), are listed as specially protected fauna because, whilst not currently threatened, they may be poached because of their high commercial value or because they are uncommon. The peregrine falcon is also listed under an international agreement.

Table 3. Threatened Fauna

Common Name	Scientific Name
Chuditch*	*Dasyurus geoffroii*
Western ringtail possum*	*Pseudocheirus occidentalis*
Quokka*	*Setonix brachyurus*
Brush-tailed phascogale	*Leipoa ocellata*
Woylie	*Bettongia penicillata ogilbyi*
Forest red-tailed black cockatoo	*Calyptorhynchus banksii naso*
Baudin's cockatoo*	*Calyptorhynchus baudinii*
Carnaby's cockatoo*#	*Calyptorhynchus latirostris*

\# Likely to occur, but not recorded within the planning area
* Nationally threatened fauna species listed under the Commonwealth's EPBC Act.

Priority Fauna

In addition to threatened and other specially protected fauna, the Department also maintains a 'reserve list' of priority taxa (see *Glossar*y for explanation). At the time of publication there are nine priority species within the planning area (see Appendix 3).

The Department's draft Policy Statement No. 9 *Conserving threatened species and ecological communities* (subject to final consultation) provides management direction for both threatened and other specially protected fauna and priority fauna.

Recovery and Action Plans

The Department, often in collaboration with other State and Commonwealth agencies, prepares State recovery plans for the most threatened species. Species within the planning area that have recovery plans at the time of writing include the chuditch, woylie and Carnaby's cockatoo. The Western ringtail possum has an interim recovery plans and recovery plans are being prepared for Baudin's cockatoo and the forest red-tailed black cockatoo.

Mammals

Since European settlement, few mammal fauna of the Jarrah Forest bioregion have become extinct, although some species have contracted in range and become more fragmented. The diversity of mammals is low compared to that in eastern Australian forests, and can be attributed to a wide distribution of species, the apparent structural homogeneity of the landscape and the fact that the tree component is dominated by only a few species. Many mammals inhabit streamside vegetation and utilise tree hollows for shelter and breeding. The conservation of these areas will therefore be an important component of this management plan.

The planning area, together with the Tone-Perup Nature Reserve and Dryandra Woodland, is one of the few refuge areas for the chuditch, which is increasing in numbers. However, some species, such as the quokka, western ringtail possum and woylie (*Bettongia penicillata*) occur only in low population levels. These species are of a size (0.35 g – 5 kg or critical weight range) that renders them susceptible to predation by introduced carnivores, in particularly the fox *(Vulpes vulpes*). As such, many have declined in range and abundance, and persist in refugial habitats that may not be the most favourable to them, but least favourable to their agent or means of decline (Caughley 1994). Typically, these refugial habitats include densely

vegetated thickets in river, stream and wetland systems, many which also provide corridors for migration. Land clearing (particularly riparian vegetation), habitat alteration, grazing, changes in burning patterns and the introduction of other feral species outside of the planning area may also have contributed to the decline of critical weight range mammals. As such, integrated management, which includes fox control, is required to conserve these species.

At the time of printing, there are nine known quokka populations in the planning area. One population, north of the Collie River, is considered to be the largest in the northern jarrah forest, although numbers appear to be declining. Many other quokka populations of the northern jarrah forest are small and also appear to be declining and contracting in range. Elsewhere in forested areas of the south-west, quokkas are widespread, particularly along the south coast where their status appears to be stable.

The decline of quokkas in the northern jarrah forest has given rise to small, isolated populations that, whilst highly mobile, are at threat. It is thought that their decline is primarily due to predation by the introduced fox. However, whilst the fox is targeted under 1080 baiting programs, quokka numbers are not responding. The status of quokka populations in the northern jarrah forest warrants strategic and adaptive management to manage their habitats in perpetuity and obtain more knowledge on the species and its threats. Research needs to focus on a variety of management practices including use of fire, fox baiting and pig control.

The western ringtail possum, once widespread across the south-west of the State but at low density, now appears to be confined predominantly to the coastal plain (west and south coast) and dense riparian vegetation of the Darling Plateau. An isolated population exists within the planning area near Honeymoon Pool, although suitable habitat for the species exists elsewhere along lower Collie River valley. This population comprises the second most northerly known extant population for the species. However, the population is declining, a trend that is expected to continue elsewhere in the south-west where there are increasing pressures on suitable habitat. Predation by the fox and land clearing has been implicated as a cause of decline of the species. Monitoring within the planning area is necessary to determine the distribution of western ringtail possums as well as the impact of recreation. Fire also appears to be an issue in managing their habitat (see Section 25 *Fire*).

Some species, such as the woylie, have been re-introduced to the planning area following predator control. Successful translocations of woylies from Batalling State forest occurred in June and July 2000. Their numbers are steadily increasing and spreading throughout suitable habitats of the planning area.

Birds

Approximately 66 native birds have been recorded within the planning area, almost half the number known to occur across the entire jarrah forest (Nichols and Muir 1989). The most abundant species appear to be insectivorous birds. Distribution of species is generally attributed to structural differences rather than variations in floristics. A study by Wykes (1983) found that the greatest abundance of birds in the jarrah forest generally occurs along watercourses and adjacent vegetation, where food, shelter and water are available. Such habitats of the planning area include the ecologically mature forest along the lower Collie River and adjoining creek systems.

Most birds appear not to be specialised to, or dependent on the forest environment (Nichols and Muir 1989, Wykes 1983). However, several bird species, or groups of species, rely heavily on particular habitats of the planning area. Cockatoos, parrots, owls, ducks and tree-martins for example, use tree hollows for nesting (Abbott and Whitford 2002). Smaller bush birds, such as wrens, robins and some honeyeaters, require and thrive in the dense thickets of hakea and grevillea found around granite outcrops. Creek and streamline vegetation also provide

important habitat for smaller bush birds. The Collie River and the Reservoir also support a number of waterbirds.
Three specially protected cockatoo's are found within the planning area. Competition from feral honeybees for nest hollows appears to be a significant threat to these species (see Section 23 *Introduced and Other Problem Animals*).

Reptiles and Amphibians

Reptiles of the south-west of Western Australia are poorly represented, possibly due to the regions prolonged winter, consistently low temperatures and high rainfall. Species are distinct from the arid zone and temperate south-east Australia (How *et al*.1987), although many reptiles with wide distributions in arid Australia extend well into the south-west. Chapman and Dell (1985) noted that there was a hiatus line between Perth and Albany, where only 35 of the 109 species found to the north of this line extended further into the south-west. Agamids and geckos are particularly poorly represented south of this line. The geographic separation of the south-west corner of the State could account for speciation in both reptiles and frogs.

There have been few studies on reptiles that are specific to the planning area. Elsewhere in the jarrah forest most reptiles appear to be predators, varying from large, active foraging elapids such as the dugite (*Pseudonoaja affins affins*) to the smaller, mostly insectivorous skinks and geckos. Species such as the bobtail (*Tiliqua rugosa)*, king's skink (*Egernia kingii)*, red-legged skink *(Ctenotus labillardieri)* and Gould's monitor (*Varanus gouldii*) appear to be common. The carpet python (*Morelia spilota imbricata*), a specially protected species, was once common in the jarrah forest and wheatbelt but has declined in geographic distribution (Nichols and Muir 1989). Dell's skink *(Ctenotus delli)*, a Priority 4 species likely to occur in the planning area, is endemic to the south-west of the State. Reptiles are likely to take advantage of shelter from logs, rocks, tree hollows and leaf litter. Granite outcrops of the planning area provide specialised habitat for reptiles.

The frog fauna of Western Australia is rich, containing 14 of the 26 genera of native Australian frogs and (in terms of species) more than one third of the total frog fauna of the continent (Tyler *et al*. 1984). There is also a high degree of endemism with no less than 39 species confined to Western Australia. Whilst no frogs have been recorded in the planning area, it is likely that they exist.

Fish

The lower Collie River contains deep, clear, well-flushed pools that provide ideal habitat for the six species of fish (four native and two introduced) recorded in the planning area. All of the native fish species, nightfish (*Bostockia porosa*), western minnow (*Galaxias occidentalis*), western pygmy perch (*Edelia vittata*) and freshwater cobbler (*Tandanus bostocki*) are endemic to the south-west. Preferred habitat for these species is under ledges, rocks and logs and amongst root mats and inundated vegetation. All species have distinct migratory requirements, with all except the cobbler leaving the main river system in winter and spring to spawn in small tributaries, especially seasonal streams (Pen and Potter 1990, 1991a, 1991b, 1992). Native fish species of the planning area are widely distributed and abundant in rivers, streams, lakes and pools throughout forest and agricultural areas of much of the south-west (Morgan *et al.* 1998).

Western Australian Museum records indicate that adult pouched lamprey (*Geotria australis*) were also recorded in portions of the lower Collie River adjoining the planning area but this species has not been recorded in recent times (Morgan *et al.* 1998).

Invertebrates

Majer and Abbott (1989) considered soil and litter invertebrates of the Dale Botanical Subdistrict as one of the best-studied in Australia, many seasonal in their abundance or activity.

Later surveys on arthropod fauna by Abbott *et al.* (1992) found 396 species in foliage of the jarrah forest, mostly leaf chewers, sapsuckers and predators. Abbott (1992) suggested that the total number of insect species alone in the south-west forests may be in the order of 15 000 to 20 000.

Aquatic Invertebrates

In the planning area, 47 families of aquatic macroinvertebrates have been recorded through the AusRivAS program and surveys of the lower Collie River, all which are representative of species found in the south-west and none that are confined to the Collie River (Halse *et al.* 2001). The richest diversity for macroinvertebrates was found in portions of the upper and lower Collie River, whilst the Reservoir had the poorest diversity. The most important habitat for aquatic macroinvertebrates is fringing and submerged aquatic plants, particularly rushes and sedges (WRC 2001). The AusRivAS program assessed the Collie River to have similar macroinvertebrate values to other catchments on the Darling Plateau. However, higher conservation value catchments were found further south on the Shannon, Donnelly and Warren rivers.

Alterations to water quality, such as the increase in stream salinity in the Collie River, may have affected macroinvertebrate communities. However, it is possible that the small, fresh water tributaries connecting to this system provide refugia for species once representative of the area. The importance of granite outcrops is recognised in providing surface pools and wetlands at their bases as habitat for a poorly understood but potentially important group of macroinvertebrates.

Decapod species found along the lower Collie River include the koonac (*Cherax* sp.), gilgie (*Cherax quinquecarinatus*) and marron (*Cherax canei*). Freshwater prawns and gilgies appear to be present in low numbers compared to other rivers flowing off the Darling Plateau (Wetland Research and Management 2003), possibly reflecting poor water quality or predation by introduced fish species. Populations of marron downstream of the Reservoir wall appear to be stable and in good numbers, although the number of large marron has declined. To sustain marron populations, the Department of Fisheries regulates size and bag limits, gear controls, closed seasons and licensing. However, illegal marroning out of season still occurs. A management strategy to review the state of the fishery and ensure its long-term sustainability was prepared by the Department of Fisheries and a subcommittee of the Recreational Fishing Advisory Committee in 2006 (DoF 2006).

20. Native Animals and Habitats

Key Points:

- The planning area supports an assemblage of native fauna species and associated habitats that are representative of the jarrah forest.
- Greatest faunal diversity is likely to occur along riparian vegetation bordering river systems, surrounding granite outcrops and in seasonal pools formed within granitic monadnocks.
- There are 10 species of specially protected fauna known to occur in the planning area, seven that are threatened. A further nine species are listed on the Department's priority list.
- The greatest threat to native animals of the planning area is competition from and predation by the introduced species such as the fox and cat.

The objective is to protect and conserve native animals and their habitats.

This will be achieved by:

1. protecting native animals and habitats from threatening processes, giving priority to

threatened species;
2. providing statutory protection for species by listing them under the Wildlife Conservation Act and/or EPBC Act, subject to the satisfaction of criteria for listing;
3. managing native animals and habitats according to Department policies;
4. considering the reintroduction of native fauna to areas where they are known to have formerly occurred once threatening processes have been identified and controlled;
5. supporting the preparation and implementation of recovery and translocation plans for fauna species that are identified in, or reintroduced into, the planning area;
6. ensuring this management plan gives effect to recovery plans and that new recovery plans are consistent with this management plan;
7. assessing proposed operations and developments for the potential impacts on native fauna;
8. continuing to control feral species (particularly foxes) through appropriate control regimes, if/as required. Western Shield will continue to be the primary framework to control foxes;
9. considering the requirements of fauna species and, where possible, apply fire to maintain or promote biodiversity (see Section 25 *Fire*);
10. prohibit domestic animals;
11. discourage feeding of native fauna around campsites;
12. providing opportunities for visitors to improve their awareness, understanding and appreciation about the importance of native fauna and the impacts of threatening processes;
13. supporting and/or participating in the research and monitoring of native fauna and adapting management accordingly. In particular, focus on:
    - surveying and monitoring the presence, distribution, population size, status of known populations, abundance, habitat requirements and ecology of both translocated and specially protected species, with a current emphasis on the quokka and western ringtail possum;
    - identifying breeding sites of threatened Cockatoo species with a view to ensuring their protection; and
14. supporting DoW to continue monitoring of water quality, water quantity and the presence and abundance of macroinvertebrates along the lower Collie River

Key Performance Indicators (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
20.1 Range and population size of critical weight range mammals	20.1 Subject to natural variation, recovery and maintenance of populations of critical weight range mammals	As per recovery plans for individual species or in their absence, annually
20.2 Evidence of second generation progeny from translocated species	20.2 The successful establishment of translocated species	

21. THREATENED ECOLOGICAL COMMUNITIES

The Commonwealth EPBC Act provides for the legislative protection of threatened ecological communities (TECs) listed under this Act. Under current State legislation, TECs are not afforded special protection (unlike individual flora and fauna), although this is proposed to change if and when the proposed Biodiversity Conservation Act is enacted.

Possible TECs that do not meet the survey criteria for the assessment of TECs are added to the Department's priority ecological community list (as Priorities 1, 2 and 3). These three categories are ranked in order of priority for survey and/or definition of the community, and

evaluation of conservation status, so that consideration can be given to their declaration as TECs.

At the time of writing, there are no threatened or priority ecological communities in the planning area.

22. ENVIRONMENTAL WEEDS

Environmental weeds are species that establish themselves in natural ecosystems, proceed to modify natural processes and eventually lead to the decline of the communities they invade. Environmental weeds displace native plants, particularly on disturbed sites, by competing with them for space, light, nutrients and soil moisture. They can also have a significant impact on other natural values by altering animal habitats, harboring pests and diseases and altering fire regimes.

Environmental Weed Management

An integrated approach to environmental weed management was developed in the *Environmental Weed Strategy for Western Australia* (EWS) (CALM 1999). The EWS is consistent with the State Weed Plan (DoA 2001), which has been developed to help achieve coordinated and effective weed management throughout Western Australia. The EWS rates environmental weeds in terms of their environmental impact on biodiversity using the following criteria to rate each weed:

- *invasiveness* – ability to invade bushland in good to excellent condition or ability to invade waterways;
- *distribution* – wide current or potential distribution including consideration of known history of wide spread elsewhere in the world;
- *environmental impacts* – ability to change the structure, composition and function of ecosystems and in particular an ability to form a monoculture in a vegetation community.

The Department's Policy Statement No. 14 *Weeds on CALM lands* and proposed Policy Statement *Environmental weed management* (subject to final consultation) are used in conjunction with the EWS and local knowledge to guide the approach and priority setting for the control of environmental weeds on lands and waters managed by the Department. Priorities for action are to first control any weed that impacts on threatened or priority flora, fauna or ecological communities, or that occurs in areas of high conservation value, and then address weeds rated under the EWS as high, moderate, mild and low in decreasing priority as resources allow. The impacts of weeds and potential spread in local environmental conditions must also be considered.

Options for environmental weed management include prevention, eradication, control, containment, or do nothing. The preferred option is to prevent the introduction of environmental weeds through appropriate management, as eradication is rarely feasible. Effective control programs encourage the growth of native species and the suppression of weeds with the overall aim of boosting the areas resilience to further weed invasion. However, it is imperative that these control measures be used in conjunction with a revegetation plan to prevent reinfestation from occurring. Consideration to the spread of weeds needs to be considered across Department operations, especially with respect to beekeeping, prescribed fire and planning for visitor access and site development.

The local community can play an invaluable role in the early detection, monitoring and control of weeds, and hence strategies to increase community awareness of and support for weed management are identified where relevant throughout this plan. Volunteers should be used to assist with weed control where possible.

The Department also has a legal responsibility for controlling plants declared under section 37 of the *Agriculture and Related Resources Protection Act 1976* (ARRP Act), although the Act does preserve the Department's right to decide priorities and the level of control according to resources.

Problem Weeds

Forty-three species of environmental weeds are recorded within the planning area, including six species declared under the ARRP Act (see Appendix 4) and two weeds of national significance. Many weeds have been introduced via access routes, public utility corridors (e.g. powerlines, pipelines and telephone lines), adjoining agricultural lands, townsites and via waterways such as the Collie River.

The suppression of watsonia (*Watsonia marginata*) (rated as moderate by the EWS) is considered to be of paramount importance and a high priority for management. The weed was introduced as an ornamental in gardens within the Collie townsite and has spread along the Collie River and Reservoir foreshore. Once established, watsonia has the potential to impact heavily on natural values by creating a monoculture in riparian zones. This is already the case along the upper Collie River where the weed is well established and poses a fire risk when it dries off in summer. The spread of watsonia needs to be managed in this area as there is potential for the weed to use the watercourse as a means to invade the lower Collie River.

Another weed of particular importance is bridal creeper (*Asparagus asparagoides*), which is a problem around the Wellington Mill Cottages (also known as Wellington Forest Cottages) and surrounding watercourses as well as the King Jarrah recreation site. This weed is rated as high by the EWS and is listed as one of Australia's 20 weeds of national significance. Although present in few known populations within the planning area, this climbing plant is very competitive and can form a dense canopy, shading out native shrubs, herbs and seedlings. Bridal creeper also forms a tuber mat below the soil surface that limits the availability of moisture and nutrients to other plants, making seedling establishment difficult. As a result, bridal creeper can reduce the number and density of native plant species and in turn affect the animals that depend on them. At the time of publication, there are various sites where the bridal creeper rust has been released and is effectively reducing the size of infestations.

Victorian tea-tree (*Leptospermum laevigatum*) and arum lily (*Zantedeschia aethiopica*) are also rated as high by the EWS. The former carries a large seed load and spreads rapidly into disturbed areas following fire. Arum lily is only present in a small population around the Reservoir and is part of an ongoing control program that has seen the population decline.

Other weeds of particular concern are blackberry (*Rubus fruticosus*), silver wattle (*Acacia dealbata*), wild lavender (*Lavandula dentata*), blue periwinkle (*vinca major*) and a small population of Monterey pine (*Pinus radiata*), which has originated from the Wellington plantation and is showing signs of invasion into the surrounding bushland. The treatment of weeds, such as blackberry, could become an issue close to the Reservoir as there is a risk of contamination.

Introduced Trees

Several introduced tree species occur at the quarry near the Reservoir wall, including lombardy poplar (*Populus nigra*), European ash (*Fraxinus excelsior*), liquid amber (*Liquid amber styraciflua*) and Chinese elm (*Ulmus parvifolia*). These species do not pose a significant risk to the natural values of the planning area but do provide visitors with shelter and visual appeal whilst picnicking in the quarry. Where a species poses no threat of spreading, they should be retained in their current state.

Several tree species trial plots are located within the Wellington National Park and should be revegetated once research has been completed.

22. Environmental Weeds

Key Points:

- Environmental weeds displace native plants and vegetation communities and alter ecosystems, particularly on disturbed sites.
- Forty-three species of environmental weeds are recorded within the planning area, most significantly watsonia, bridal creeper and monetary pine. Of these, six species are declared under the ARRP Act and two listed as weeds of national significance.
- Most weed species are introduced as a by-product of adjoining agricultural practices or for ornamental purposes within the Collie townsite.
- The local community can play an invaluable role in early detection, monitoring and control of environmental weeds.

The objective is to minimise the impacts of environmental weeds on key values.

This will be achieved by:

1. managing environmental weeds according to Department policy and relevant legislation;
2. preparing and implementing a prioritised weed control plan targeting specific species and areas based on ratings in the EWS and local knowledge;
3. monitoring and reviewing the weed control plan;
4. ensuring that weed species that pose a threat to significant native flora, fauna and communities are given high priority for control;
5. continuing to maintain information on weeds including a register of weeds, details of distribution, relevant biological information and history of control;
6. undertaking weed surveying and mapping;
7. targeting new infestations and areas of recent disturbance for weed control to prevent weeds from permanently establishing themselves. Rehabilitation following control may be required to prevent re-invasion;
8. retaining introduced trees deemed to have heritage value providing they pose no threat of spreading or affecting natural values;
9. limiting the opportunity for weeds to be introduced and established by applying appropriate hygiene practices and minimising soil disturbance;
10. requiring industry (e.g. utility service providers) and other agencies/organisations to apply appropriate hygiene practices when operating within the planning area;
11. liaising with relevant agencies and neighbouring land managers to facilitate effective, coordinated weed management in the planning area and surrounding areas; and
12. undertaking and/or supporting research into environmental weeds and adapt management accordingly.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
22.1 Number and cover of environmental weed species rated as 'High' in the EWS or considered as a local priority	22.1 Decrease in the number and cover of species rated as 'High' in the EWS or considered as a local priority	Every 5 years

23. INTRODUCED AND OTHER PROBLEM ANIMALS

Introduced and other problem animals may be either introduced feral species that have become established as wild or naturalised populations, or native species, which for some reason, have altered their natural distribution and population to the detriment of other native species. They have the potential to seriously impact on natural systems through direct effects such as predation, habitat destruction, pollution of streams, competition for food and territory, introduction and spread of disease and through environmental degradation.

A primary objective of the Department is to achieve the systematic and safe control of introduced and other problem animals on lands and waters that it manages. The Department's proposed Policy Statement *Management of pest animals on CALM managed lands* (subject to final consultation) provides guidance for this by identifying State-wide priorities and strategic approaches to management.

The Department also has responsibilities for control of declared animals on the lands it manages under sections 39–41 of the ARRP Act, viz "a Government Department shall control declared plants and declared animals on or in relation to public land under its control."

Introduced and other problem animals of the planning area are identified in Table 4.

Table 4. Introduced and Other Problem Animals Recorded in the Planning Area

Common Name	Species	Management Priority
Mammals		
Feral pig*#	*Sus scrofa*	High
Fox*#	*Vulpes vulpes*	High
Feral cat#	*Felis catus*	Medium
Rabbit*#	*Oryctolagus cuniculus*	Low
House mouse	*Mus musculus*	Low
Black rat	*Rattus rattus*	Low
Red deer*	*Cervus elaphus*	Low
Fallow deer*	*Dama dama*	Low
Rusa Deer*	*Cervus timorensis*	Low
Feral dog*	*Canis familiaris familiaris*	Low
Fish		
Redfin perch	*Perca fluviatilis*	Low
Rainbow trout	*Oncorhynchus mykiss*	Low
Brown trout	*Salmo gairdneri*	Low
Mosquitofish	*Gambusia holbrooki*	Low
Carp	*Cyprinus carpio*	Low
Birds		
Laughing kookaburra Δ	*Dacelo novaeguineae*	Low
Invertebrates		
Feral honeybees	*Apis mellifera*	Low
Yabby	*Cherax albidus*	
Jarrah leafminer	*Perthida glyphopa*	Low

* Declared species under the ARRP Act (as of January 2008)

Δ Acclimatised species or 'fauna living in a wild state as a result of being released or escaping from confinement or because it is the immediate or remoter offspring of fauna that has been released or has escaped from confinement'. These species are considered native to Western Australia and are protected under the Wildlife Conservation Act.

\# These animals are recognised as nation-wide problems and are the subject of threat abatement plans developed through the Commonwealth Department of the Environment and Water Resources.

Foxes and Cats

Foxes are common in the planning area and have been implicated in the decline of many native mammals in the critical weight range (35 g to 5.5 kg). The feral cat is thought to be responsible for the extinction of small to medium sized ground dwelling mammals and ground-nesting birds on islands and in the arid areas of the State (Burbidge and McKenzie 1989), although documented evidence of their effect on native fauna in the south-west is scarce (Environment Australia 1999, Dickman 1996). Predation by foxes and cats is listed as key threatening processes under the EPBC Act. Five-year threat abatement plans have been prepared for both threatening processes to provide national coordination, with the emphasis on local control programs to ensure recovery of endangered species. In the planning area, foxes are a major threat to recovery programs of significant fauna species such as the chuditch, quokka and woylie.

Baiting programs in Western Australia have shown that removal of the fox, or substantial reduction in fox numbers, can result in significant increases in the number of viable native fauna populations. In 1996, the Department initiated the Western Shield program to strategically control predators such as the fox and feral cat. The program involves aerial baiting of selected lands managed by the Department using 1080 poison (sodium fluoroacetate) baits to enable native wildlife populations to recover and to allow for the reintroduction of native animals to former habitats once foxes and cats have been controlled. Unfortunately, the Department's baiting program works more effectively against foxes than cats, as cats prefer live bait. However, work will continue to develop a bait more attractive to cats.

Baiting is undertaken four times per year and has seen an increase in the abundance of some ground-dwelling mammal species in the critical weight range, particularly the chuditch. The chuditch regularly occurs in the planning area and its numbers are increasing, a trend that is consistent throughout the jarrah forest. The survival of other, once widespread, critical weight-range mammal species such as the quenda (*Isoodon obesulus fusciventer*) and common brush-tail possum (*Trichosurus vulpecula*) has also been enhanced through baiting programs. However, it should be noted that baiting does not benefit all native fauna species and integrated management is required for fauna conservation.

The fauna populations of the planning area could also be maintained by sympathetic management of adjoining private property, particularly if they were to control fox populations and minimise the presence of domestic animals.

Feral Pigs

Feral pigs have become a problem in many areas of the planning area, and move frequently into/from neighbouring properties. They have the potential to be very destructive to vegetation, particularly in riparian zones and can reach high population densities. Their habit of wallowing, digging and rooting around the margins of watercourses and swamps can destroy vegetation and fauna habitat, cause erosion, encourage weed invasion and remove food and nesting sites of native animals. In the planning area, feral pigs may have the ability to displace native mammals of conservation significance, such as the quokka, quenda, water rat and woylie (Freegard 2005), and therefore hamper recovery and translocation efforts. Pigs also have the potential to spread *P. cinnamomi*.

Feral pigs are illegally transported and released into new areas (or restocked into existing areas) by recreational hunters, a fact that is proven through genetic studies (Hampton 2003). In the planning area, illegal pig hunting compounds the impacts of pigs and can compromise key values. For example, the introduction of hunting dogs and the use of firearms can threaten visitor safety. Illegal pig hunters may also spread the disease caused by *P. cinnamomi* by travelling through disease risk areas.

Water quality may be significantly affected by the activities of feral pigs as they can increase the turbidity of the water and cause siltation effects downstream. In addition, they may also pose a risk to water quality in public drinking water catchments by excreting water-borne pathogens into water supplies (Freegard 2005). *Giardia* and *Cryptospiridium* have already been identified in pig faeces from water catchments in the Perth metropolitan area.

Feral pigs require daily access to water, which limits their distribution to watercourses, swamps and dense vegetation often associated with these environments. Feral pigs rarely move between catchments and hence control can be considered on a catchment basis. Guidance for management is provided by the draft *Feral Pig Management Strategy* (Freegard 2005), which outlines the approach and priority setting for control of feral pigs according to the protection of specific values. In addition, a threat abatement plan is being developed at a national level following the listing of feral pigs as a threatening process under the EPBC Act. The Department currently conducts annual trapping programs as part of its ongoing management and this will continue over the life of this plan. Baiting may also be trialled. Feral pig monitoring indicating the increasing presence of new feral pig populations will trigger further control efforts.

Rabbits

Rabbits are not widespread throughout the planning area but their grazing pressure and destabilisation of the soil can have significant localised impacts. Rabbits only appear to reach significant numbers in forest areas where native vegetation has been cleared and annual grasses are prevalent. Rabbit numbers are seen to correspond to the periodic impact of myxomatosis and, more recently, calicivirus.

Feral Honeybees

Self-sustaining, wild populations of feral honeybees (*Apis mellifera*) are established throughout most of the south-west. Managed beekeeping sites for the production of honey also occur (see Section 42 *Beekeeping*).

Feral honeybees may impact on the natural values of the planning area in the following ways:

- by competing for tree hollows. Many birds and tree-dwelling mammals use tree hollows for breeding sites and shelter, which is already a limited resource. Feral honeybees have been recognised as a major factor affecting the breeding potential of all three species of black cockatoos (CALM and WC 2005);
- by competing with native species for floral resources, such as pollen and nectar. Feral and managed hive honeybees can remove 80% or more of the floral resources;
- by affecting pollination and seed set of native species, due in part to inefficient transfer of pollen or the physical damage to flowers; and
- by increasing seed-set in some weeds.

Visitors to popular recreation sites may also encounter feral honeybees. On these very few occasions, a build up in numbers can increase the risk of people being stung.

Although feral honeybees have existed in the south-west for the last 150 years and consequently most impacts would have already occurred, the removal of feral colonies would still have nature conservation and recreation benefits. However, the feasibility of completely removing feral honeybees is low, as localised eradication would probably be followed by recolonisation from new swarms invading the area (Gross 2001). Until an effective means of control is found for feral honeybees, management should focus on controlling the distribution and density of managed hives in areas of highest conservation value or around recreation sites (see Section 42 *Beekeeping*).

Introduced Fish

Exotic fish that have been introduced into the planning area include redfin perch, trout, mosquito fish and carp. The popularity of ornamental fish, such as goldfish, may also lead to releases and the possibility that they will become well established in the future. Besides trout, which are are stocked, there is no effective control method that can be applied to exotic fish of the planning area. A primary focus in addressing this threat is preventing introductions through increased awareness of this threat and ways to reduce it.

Redfin Perch

Redfin perch were introduced to Albany in the 1890s for recreational fishing and have since been spread throughout water-bodies and river systems of the south-west. They are now targeted as a recreational species, and on occasion, are illegally reintroduced to river systems by recreational fishers.

Redfin perch are voracious predators that can rapidly invade and dominate a river or reservoir to the detriment of local species. They are bottom feeders that consume smaller animals including marron and gilgies. Their diet also includes many of the fish species native to the south-west. Horwitz *et al.* (1997) stated that redfin perch have resulted in the absence of native fish species such as western pygmy perch (*Edelia vittata*) from remnant pools in sections the Collie River, although more recent surveys by Murdoch University have recorded this species upstream of the Reservoir and is likely to also occur downstream of the Reservoir wall. Earlier reports by Pen and Potter (1992) noted that, despite appreciable predation, Indigenous fish species have co-existed with redfin perch in the upper reaches of the Collie River since the early 1900s. They also noted that western pygmy perch had disappeared from nearby river systems now occupied by redfin perch and that under certain extreme conditions, such as a marked depletion in alternative food sources, they could pose a threat to native fish species.

Trout

Brown trout were first introduced into Western Australia as early as the 1870s, and rainbow trout in the early 1900s (DoF 2002). Both species of trout were originally introduced for recreational fishing. The Collie River is stocked occasionally with trout in a program administered by the Department of Fisheries[3], who are also responsible for the management of native fish species. In the years from 2000 to 2007, 8800 brown trout were released (N. Harrison *pers. comm.*).

Trout are opportunistic feeders with a wide-ranging diet from decapod crustaceans (such as marron and gilgies) and native fish species to aquatic insects, amphibians and aquatic snails. Similar to redfin perch, trout predate on and compete with native species, and influence their distribution (DoF 2002). The impact of trout on native fauna via the spread of pathogens (e.g. from hatchery-produced fish) is unknown. The presence of rainbow trout coincides with low native fish species diversity in Western Australia (Arthington and McKenzie 1997) and brown trout have been implicated in the decline in a number of threatened fish species Australia-wide, in particular galaxiids and minnows (Arthington and McKenzie 1997, Cadwallader 1996). However, subtle differences in habitat preferences indicate that trout may be able to co-exist with some native species with minimal impacts (DoF 2002). In the planning area, redfin perch are considered a greater threat to native species than trout (DoF 2002).

In Western Australia, the Minister for Fisheries established a sub-committee of the Recreational Fishing Advisory Committee in 2004 to develop a five-year strategy for the State's south-west recreational freshwater fisheries, including developing future stocking strategies for the

[3] The Department, under the Wildlife Conservation Act, is responsible for the protection of native fauna, including fish. The Department of Fisheries is also responsible for the protection and management of native and recreational fish species under the Fish Resources Management Act.

recreational trout fishery. The Department is represented on this committee. As part of this process, the Department of Fisheries is finalising a management plan for the translocation of trout into and within Western Australia. This will asses the suitability of river systems across the south-west for stocking with trout, based on environmental and social factors, native fish distribution and historical trout stocking events. The Department and the Conservation Commission will also establish guidelines to assist in their assessment of trout stocking proposals on areas within the conservation estate. The guidelines will be applied with a view to providing information and advice on biodiversity conservation to the Department of Fisheries and other key stakeholders.

Other Introduced Animals

The expansion of rural residential development on the Swan Coastal Plain may encroach on land adjoining the planning area. Increasingly it will be important to monitor for the establishment of populations of introduced animals that are commonly associated with this type of development, particularly the laughing turtle-dove (*Streptopelia senegalensis*), spotted turtle-dove (*Streptopelia chinensis*) and the variety of escapee parrots and cockatoos. The kookaburra is considered to cause only negligible decreases in small bird populations (Long 1981).

Yabbies may compete with or prey upon aquatic fauna and their burrowing activities may alter riverine habitats. Yabbies may also threaten marron populations through disease (see Section 24 *Disease*).

Domestic animals may present a threat to native wildlife (see Section 35 *Domestic Animals*).

23. Introduced and Other Problem Animals

Key Points:

- There are a number of introduced and other problem animals in the planning area that can out-compete, prey on, or alter the habitat for native animals. The most significant these species are foxes and feral pigs.

The objective is to minimise the impacts of introduced and other problem animals and their control on key values.

This will be achieved by:

1. controlling introduced and other problem animals according to relevant legislation, Department policy and operational guidelines (e.g. the Department's Training Manual for *Safe and effective use of 1080 for vertebrate pest control*);
2. developing and implementing a priority control plan for introduced and other problem animals;
3. maintaining information on introduced and other problem animals including a register of animals, details of distribution, relevant biological information and history of control;
4. continuing feral predator control as part of the Western Shield program, with a focus on the protection of specially protected species;
5. using appropriate control mechanisms to assist in pig control;
6. eradicating feral colonies of honey-bees from around recreation sites and where feasible, controlling feral bees elsewhere within the planning area;
7. investigating options to control introduced fish species in permanent tributaries of the Collie River;
8. encouraging the Department of Fisheries to undertake research and monitoring on the impacts of trout on native fauna within the planning area;
9. establishing guidelines to assist in their assessment of trout stocking proposals on areas within the conservation estate. The guidelines will be applied with the view to providing information and advice on conservation issues to the Department of Fisheries

and other key stakeholders;
10. monitoring for the establishment of other introduced species;
11. liaising with relevant agencies and neighbouring land managers to facilitate the effective and coordinated control of introduced and other problem animals; and
12. supporting Department research and education programs that are aimed at improving the control of introduced and other problem animals and adapt management accordingly.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
23.1 Populations and area impacted by feral pigs	23.1 A decrease in the number of populations or area impacted by feral pigs from 2008 levels	Every 5 years

24. DISEASE

Plant Disease

Plant pathogens are a serious problem in the south-west of Western Australia causing the destruction of many species susceptible to disease and the subsequent degradation of vegetation communities (Shearer 1994, Wills and Keighery 1994). The most frequently reported disease groups of the south-western native plant taxa include pythiacious root rots (*Phytophthora* species), rusts, *Armillaria* root rots, stem cankers and leaf spots and blights (Shearer 1994). Families most affected by disease are Proteaceae, Myrtaceae, Mimosaceae, Papilionaceae, Haemodoraceae, Goodeniaceae, Epacridaceae, Poaceae and Chenopodiaceae (Shearer 1994). The most significant to the planning area appears to be *P. cinnamomi*.

Disease caused by Phytophthora

The disease known as 'dieback' is caused by the microscopic pathogen *Phytophthora cinnamomi.* There are now known to be eight species of *Phytophthora* occurring within the native vegetation communities of Western Australia, of which *P. cinnamomi* is recognised as the most damaging. Susceptible plants, once infested, are killed and in many cases are eliminated from the site leading to dramatic and permanent changes to native vegetation communities and their dependent fauna.

Dispersal

P. cinnamomi is able to move autonomously over long distances through surface and sub-surface water, travel microscopic distances to infect new roots or travel between roots of mycelial threads. The pathogen can be spread in soil and plant material that can then be transported by vectors such as humans, vehicles and animals. The pattern of *P. cinnamomi* distribution is strongly related to the native vegetation community and other site factors such as the presence of watercourses, tracks and roads, with infestation being most common where human activities have taken place in the absence of a hygiene regime.

Effects

The effect of *P. cinnamomi* upon the health of vegetation communities and individual species varies greatly. In many places, lethal root-disease destroys the structure of many native vegetation communities, reduces their floristic diversity, decimates their primary productivity and destroys habitat for much dependant native fauna. The greatest incidence of the disease is in the jarrah forest and banksia woodlands, partially due to the environment and historical factors related to human disturbance. However, in some places the pathogen causes little

damage at all. Unfortunately, in the south-west it is more common to find susceptible communities in vulnerable environments than not.

No simple or single relationship exists between the presence of *P. cinnamomi* and the development of the disease. This is because of the considerable variability that exists within and between native plant species in their responses to the presence of *P. cinnamomi*, and the complex influence of temporal and spatial variation in environmental forces.

However, it is now evident that among the variety of vegetation communities that occur within areas of the south-west receiving more than 800 mm mean annual rainfall, there are four types of distinctive response to the pathogen as follows:

- *no obvious symptoms of disease* - this includes those areas of karri and wandoo forest, which contain no floristic elements of the dry sclerophyll (jarrah) forest type and to vegetation communities on the calcareous soils of the Spearwood and Quindalup Dune Systems and of the Swan Coastal Plain and pedogenically related landscapes;
- *an extremely destructive epidemic of root rot* - this applies within the highly susceptible understorey elements of the dry sclerophyll forest, in banksia woodland and in heathland on podsols, podsolic and lateritic landform;
- *a variable epidemic* - this applies to the dominant jarrah tree component of the forest with all variants in the response of jarrah are coincident with, or preceded by, mass deaths in susceptible elements of the understorey; and
- *an 'endemic' pathogen* - where *P. cinnamomi* has been long established (some 50 years or more) in sites formerly dominated by jarrah/banksia forest and has been very heavily impacted *P. cinnamomi* behaves in a manner characteristic of endemic pathogen. The forest is often replaced by open woodland of marri/parrot bush (*Dryandra sessilis*). Periodic outbreaks of mortality in parrot bush follow, with subsequent regeneration by seed.

Each of these circumstances presents a different problem that requires a separate management response.

The disease caused by *P. cinnamomi* can also have a major impact on faunal habitats[4], viz:

- direct and indirect loss of food sources such as seeds, nectar, pollen, invertebrates and seasonal food;
- loss of food for species that prefer floristically rich vegetation;
- loss of habitat for species dependant on thick ground cover;
- loss of food and habitat for arboreal species;
- decline in litter invertebrates;
- decline in invertebrate food sources for insectivores;
- increased predation risk; and
- changes to microclimate.

Jarrah forests and wetland habitats of the planning area have been affected by *P. cinnamomi* and *P. cinnamomi*-induced death of susceptible plants continues to result in the irreversible decline in the diversity of vegetation communities.

Management

Management guidelines for *P. cinnamomi* are described in the Department's Manual: *Phytophthora cinnamomi and disease caused by it* (CALM 2000), Policy Statement No. 3 *Management of phytophthora and disease caused by it* and the accompanying *Best practice guidelines for the management of Phytopthora cinnamomi*. Dieback caused by *P. cinnamomi* is

[4]Information based on Wilson *et al*. (1994)

a key threatening process under the EPBC Act and a threat abatement plan has been prepared (Environment Australia 2001).

Management of *P. cinnamomi* within the planning area will focus on significant uninfested areas[5] and areas that are already infested areas but with significant residual natural values. Management will aim to:

- contain or retard further autonomous spread at the boundaries of existing infestations. This may include the realignment or hardening of tracks and roads;
- progressively identify significant uninfested (protectable) areas; and
- reduce the rate of vectored spread and establishment of new infestations within significant uninfested (protectable) areas by:
  - preparing *P. cinnamomi* management plans for new developments (e.g. recreational facilities and upgrades, or realignments of management roads and tracks);
  - restricting operations to dry soil conditions where possible;
  - controlling feral animals, for example pigs;
  - applying phosphite where it has been identified as a priority (see below);
- minimise or prohibit access into these areas;
- restrict vehicle access to areas designated as Disease Risk Areas and only allowing access for management and approved purposes, through the issue of a Disease Risk Area permit;
- educate industry, local people and visitors in relation to the spread and management of the disease; and
- implement programs of interagency research and liaison.

Emphasis of management will be on reduction of vectored spread and the human-assisted establishment of new centres of infestation within protectable areas. Such areas will be managed to ensure their uninfested status and protectability is not compromised.

Broadscale surveys for the occurrence of *P. cinnamomi* were undertaken prior to 1976 using aerial photograph interpretation, indicating expression of the disease in native plants scattered throughout the planning area. More recently, surveys revealed further areas infested with *P. cinnamomi*, however, the current extent of infested areas is unknown as the majority of the planning area has not been surveyed since 1983. Due to the high degree of visitor access to the area, further spread of *P. cinnamomi* is likely to be greater than indicated by previous surveys.

To accurately determine the extent of *P. cinnamomi* within the planning area and to identify protectable areas, on-ground surveys are required. However, due to resource limitations, not all of the planning area can be surveyed. Therefore, the first priority is to interpret aerial photographs and combine this with knowledge of the disease occurrence to map probable disease spread and protectable areas. On-ground surveys should then be prioritised according to the risk to natural values. This may include the following criteria:

- conservation significance on the area;
- susceptibility of native plants and vegetation communities;
- intensity of human activity, either existing or projected;
- current and proposed access;
- soil type and geomorphology; and
- current knowledge and experience.

In the case of areas that will, for the foreseeable future, remain unsurveyed, or are 'unprotectable' and uninfested, standard hygiene practices apply. In some cases, strict adherence to disease hygiene plans may be difficult (e.g. construction of emergency fire access tracks in wildfire situations). Wildfire suppression plans will need to include tactics to minimise this.

[5] Areas likely to remain uninfested by the autonomous spread of the pathogen in the medium term and referred to as 'protectable areas'.

For areas that are already infested but contain significant residual values, ecosystem restoration may be considered where there is serious environmental damage. The chemical 'phosphite' has been shown to reduce the impact of *P. cinnamomi* on many susceptible native plants and a program of repeated applications may be developed to help protect threatened species and communities identified in the planning area. In addition, germplasm from threatened native plants may be collected for cryogenic storage. At present no phosphite is applied within the planning area.

Several sites within the planning area have been designated as Disease Risk Areas under section 82 of the CALM Act (see Map 6). The relevance of Disease Risk Areas, including the possibility of replacing them with 'limited access areas' as prescribed under section 62(1) of the CALM Act, may be reviewed over the life of this management plan.

Other Plant Diseases

Armillaria is a naturally occurring root disease caused by the soil-borne pathogen *A. luteobubalina*. It spreads predominantly by root to root contact between healthy and infected plants. The range of species susceptible to the fungus is very large and poorly defined (at least 50 families and over 200 species), with very little information on the presence of resistant or tolerant species. The highest impact of the disease is in regrowth karri, marri and jarrah forests as a result of the harvesting and thinning operations which provide stumps that *A. luteobubalina* can readily colonise and then infect saplings and residual trees. Many species that resist infection by *P. cinnamomi* are susceptible to *A. luteobubalina*. There is no observation of this disease in the planning area, although surveys have not been conducted and the disease may exist or be introduced in the future. At present, there is no simple method for controlling Armillaria, with prevention through appropriate hygiene practices the best treatment.

Mundulla yellows is a little known and only recently discovered disease, which has the potential to affect native plant species, causing a progressive decline, yellowing and then death of the trees. It affects many eucalypt species (23 known species in Western Australia), including jarrah and Swan River blackbutt, and possibly sheoaks, banksias and wattles. The disease occurs across a scattered distribution in Australia, mostly in coastal areas and areas of high disturbance (Handol *et al*. 2002). It has not been observed in the planning area or in other undisturbed native forest and it is unknown how the disease is spread. Until more is known about mundulla yellows, general disease hygiene practices should be applied to minimise the risk of human spread.

In contrast to Phytopthora, rust pathogens are most likely to be endemic and require living hosts for normal development. Information on the impacts of rusts on native plants is limited.

Botryosphaeria ribis and *Cryptodiaporthe melanocraspeda* appear to be two of the most common aerially-dispersed canker-causing fungi, and infect plant hosts mainly from the Proteaceae and Myrtaceae families (Shearer 1994).

These, mostly endemic pathogens, can have significant localised impact. However, in healthy and robust ecosystems they do not appear to be a serious threat to the long-term maintenance of biodiversity. Unless evidence exists that human intervention has triggered an epidemic that is impacting (or will impact) to a predetermined unacceptable level on the values of the planning area or the precautionary principle otherwise dictates, the management response will be to monitor the occurrence and impacts.

Animal Diseases

Animal diseases within the planning area are not widely reported, however there are a few diseases, which potentially effect animal populations including: toxoplasmosis in mammals (e.g.

western ringtail possums and woylies), 'chytrid' frog fungus and the freshwater crayfish parasite *Thelohania*.

Toxoplasmosis is a parasitic disease mainly found in the host animal, cats. Whilst this disease may be introduced to populations of native mammals through cat faeces, it persists in populations of native mammals through direct transfer from an infected mother to their offspring (vertical transfer) (Dr A. Wayne *pers. comm.* 2007).

The 'chytrid' frog fungus (*Batrachochytrium dendrobatidis*) is a newly identified and potentially harmful disease of amphibians. The fungus can cause sporadic death in some populations or 100% death in others (Environment Australia 2002). Studies have shown that there is a broad zone of infection from just north of Geraldton south to Augusta and east to Esperance, however this does not imply that all frog populations are infected within this zone (Aplin and Kirkpatrick 2001). Whilst it is possible that the disease can infect all frog species, some common species are also known to contain the disease and hence the risk to frog populations in the south-west is low. The fungus occurs most often in waterbodies or in soil and frogs that spend more time in or near the water may be more susceptible to the disease. Adequate quarantine measures will need to be undertaken when works are carried out in or adjacent to known frog sites. The infection of amphibians with this fungus is a key threatening process under the EPBC Act and a threat abatement plan will be prepared.

The freshwater crayfish parasite (*Thelohania*) and porcelain disease (*Microsporidiosus*), is present in some yabbies. Both *Thelohania* and *Microsporidiosus* invade the muscle tissue of freshwater crayfish, possibly causing death. Currently there are no treatments available. Both these diseases may pose a threat to smooth marron.

24. Disease

Key Points:

- *P. cinnamomi* appears to be the most significant pathogen threatening native vegetation and fauna habitat within the planning area.
- *P. cinnamomi* can be spread by humans, vehicles and animals moving infested plant material and soil.
- The spread and management of *P. cinnamomi* is not well understood by industry (e.g. utility service providers), local people and visitors.
- Several sites within the planning area have been designated as Disease Risk Areas including the former Davis and Gervasse blocks as well as the entire proposed Westralia Forest Conservation Area.

The objective is to ameliorate the impact, and minimise the further spread, of *P. cinnamomi* and other diseases.

This will be achieved by:

1. managing disease according to Department policies and operational guidelines (e.g. the Department's manual – *Phytophthora cinnamomi and disease caused by it*);
2. progressively identifying, mapping and assessing uninfested areas and then rationalising and managing access roads and/or tracks into them. Prioritise on-ground surveying for *P. cinnamomi* and management actions according to the risk to natural values and develop management actions in accordance with Department policy;
3. implementing seasonal road closures to minimise disease spread as necessary;
4. developing *P. cinnamomi* hygiene management plans prior to commencing any operation that requires soil or plant material movement such as the construction of any new roads, firebreaks and tracks;
5. identifying, evaluating and where practical and reasonable, implementing measures for the maintenance and restoration of infested areas where they have been given priority

for action. This may involve treatments with phosphite, or other appropriate treatments, or trialling the reconstruction of badly affected ecosystems;
6. reviewing current Disease Risk Areas, including the need to reduce, increase or maintain the numbers and size of these areas, particularly in relation to the identification of uninfested and protectable areas above, and re-classification of remaining Disease Risk Areas to a more appropriate land classification under section 62(1) of the CALM Act, such as a 'limited access area';
7. monitoring plant and animal diseases and using standard hygiene practices where necessary;
8. providing the public and industry (e.g. utility service providers) with information about plant disease, emphasising the need to be clean on entry to uninfested areas and to stay on approved roads and tracks;
9. encouraging research into the effects of *P. cinnamomi* and other plant and animal diseases on key values and adapt management accordingly; and
10. documenting any outbreaks of new diseases within the planning area (plant or animal) and implementing management responses as appropriate.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
24.1 The identification and establishment of protectable areas that are a priority for protection	24.1 Protectable areas that are a priority for protection have been identified and established	After 5 years
24.2 The number of protectable areas that are free of infestation by *P. cinnamomi*	24.2 No decrease in the number of protectable areas that are free of infestation by *P. cinnamomi*	

25. FIRE

Fire is on the one hand an ancient ecosystem process essential to the conservation of biodiversity and on the other, a phenomenon capable of threatening biodiversity, life and community assets. As a result, the management of fire is integral the Department's activities and a core management responsibility. The challenge for managers is to devise practical and affordable fire regimes that conserve biodiversity at agreed spatial scales, and minimise the adverse impact of wildfires on social, economic and environmental values.

The Department's management of fire, including the use of fire, fire suppression and wildfire prevention, is regulated by legislation (e.g. Bush Fires Act, CALM Act and precedents established under Common Law) and guided by the Department's Policy Statement No. 19 *Fire management policy*. Policy Statement No. 19 includes a number of scientific principles to guide fire management (Burrows and Friend 1998, Fire Ecology Working Group 1999).

This management plan also presents an adaptive management approach to fire where management policies and practices are continually improved by learning from the outcomes of operational programs, research (e.g. on fire ecology) and monitoring. This acknowledges a level of uncertainty about what policy and practices are best, but consistent with adaptive management, this plan utilises the best available knowledge to implement programs aimed at meeting specific management objectives. Monitoring, regular review and analysis of management outcomes and ongoing research are critical if fire management in the region is to continuously improve.

History

Pre-European settlement

Fire, climate and vegetation have a long association on the Australian continent, one that pre-dates the arrival of humans by millions of years (Churchill 1968, Singh *et al*. 1981). Evidence of frequent fires has been documented dating to 2.5 million years ago in the south-west of Western Australia, indicating that fire has been a major evolutionary influence since at least that time (Dodson and Lu 2000, Dodson and Ramrath 2001, Hassell and Dodson 2003), and maybe as early as the mid Miocence, approximately 15 million years ago. The former date coincides with a major climatic change from subtropical to Mediterranean, which is thought to have led to an associated increase in fire, as evidenced by charcoal in sedimentary deposits. Rainforest species characteristic of the subtropical climate of the Tertiary period (approximately 65–1.5 million years ago) were replaced by scleromorphic species with lignotubers, and large persistent woody fruits that were pre-adapted to nutrient deficient soils. These adaptations were ideally suited to the drought and fire conditions that were to become more prevalent.

The relatively recent arrival of Aboriginal people (probably within the last 60 000 years) undoubtedly led to dramatic changes in fire patterns and fire environment (Hallam 1975, Hallam, 2000; Pyne 1991, Hassell and Dodson 2003). Intervals between fire appeared to be much shorter in areas fully occupied by Aboriginal people in contrast to areas of the south-west that were historically unoccupied (e.g. offshore islands) (Hassell and Dodson 2003).

These regimes presumably evolved with the economic and ecological needs of the people (Hassell and Dodson 2003), varying from group to group and for different localities and occasions. Aboriginal people probably utilised fire to their advantage, opening up dense vegetation for ease of access, encouraging new plant growth to improve hunting and foraging opportunities, protection of camping spots and areas of high resource value, and for ceremonial purposes (Hallam 2000). A review of Aboriginal usage of fire for the period 1696-1890 by Abbott (2003) also proposed that in forested areas of south-west Western Australia, Aboriginal people lit fires, principally in summer, which could be large and burn up to hundreds of hectares at 3–5 year intervals. This would have varied depending on the flammability of sites (e.g. steep south-facing slopes or riparian vegetation in higher rainfall areas) and prevailing weather.

Post European Settlement

In 1954, widespread prescribed burning under controlled conditions was introduced (Anon 1969, Underwood and Christensen 1981), and adopted more widely after the severe wildfires at Dwellingup in 1961 (Armstrong 2004). This application of fire to reduce fuel loads, and consequently reduce wildfire risk, has continued to the current time. Broad-scale fuel reduction became a reality with the use aircraft for of aerial ignition in 1965 (van Didden 1983) and within a few years the aerial burning program was operational in Western Australia, with over 180 000 ha of land deliberately burnt in the spring of 1967.

Since the 1960s, much of the south-west forest region has been regularly burnt using aerial and ground prescribed burning. Within the planning area, some areas have been burnt several times in order to protect assets whilst others, typically bounded by ‘low fuel’ areas such as the Reservoir, remain long unburnt. There have also been a number of wildfires (Table 5).

The high number of deliberately lit fires is of particular concern. Historically, areas of forest nearby to the Collie townsite have a high incidence of arson when compared to other areas within the Department’s South West Region. The risk of arson ignitions needs to be considered in future management, particularly in fire detection and response times. Education is a key role in combating arson and the Department will co-operate with agencies responsible for public education and law enforcement, such as Fire and Emergency Services and the Western Australian Police Service.

Table 5. Wildfire Causes in the Planning Area 1989–2007

Causes[1]						
Lightning (number and area)	Human-induced				Unknown[4] (number and area)	Cause not listed (number and area)
	Accidental[2] (number and area)	Deliberate (number and area)	Escape from prescribed burns[3] ((number and area)	Escape from other burns (number and area)		
6 5 ha	6 36 ha	33 42 ha	0 N/a	1 30 ha	10 74 ha	1 <1 ha

[1] Causes are taken from what is listed in final fire reports. There may be some overlap between some of the causes, particularly prior to 2000 where different classes were used.
[2] Accidental causes include escapes from burns lit by sources other than the Department.
[3] Prior to 2000 some accidental fires may have been escapes from prescribed burns undertaken by the Department.

Implications from the historical occurrence of fire in the planning area

Irrespective of the anthropogenic burning patterns of Aboriginal people and early European settlers, environmental conditions have been altered to such a degree over the past 100 years that the application of these historic fire regimes may no longer meet biodiversity conservation objectives. Factors such as the location of private property, towns and cities, cleared land, weeds and contemporary conservation values contribute to these changing conditions. Rather, scientific knowledge should be used to contribute to the development of ecologically-based fire regimes considered at a landscape scale. Knowledge of the critical role of fire in biodiversity conservation has developed in recent years, and the Department now applies fire to not only reduce the risk to life and property but also to conserve biodiversity (Burrows 2002).

Fire Ecology

Fire ecology is the study of the interaction of fire, the biota (plant and animals species), and the habitats in which they live. Knowledge of the impacts of this interaction is integral in protecting biodiversity, but also in protecting human life and community assets. Numerous studies report on the changing species assemblages, species diversity, vegetation composition and structure, habitat characteristics in response to time since last fire, fire season, fire interval, and fire intensity, and on the ways in which fire can influence ecosystem processes. However, more can be learnt about local fire ecology and fire management will continue to evolve with this accumulated knowledge and management experience (Burrows 2004).

Adaptation of the Biota to Fire

Some biota survive and persist in fire prone environments by avoiding fire (e.g. they grow in low fuel areas or in very moist sites) or by developing adaptations that allow them to accommodate and utilise the occurrence of fire. These adaptations are often useful in dealing with periodic drought and poor nutrient status of many Australian environments. They also contribute to the 'life history strategies', that biota have employed to adapt to fire. These adaptive attributes, particularly in plants, are sometime referred to as 'vital attributes'. Attributes such as the time it takes to flower after germination, the time to senescence and death, how a plant regenerates (from seed or re-sprouting or both), where the seed is stored (in the canopy or in the soil or both) or how this seed is triggered to germinate provide valuable clues to understanding what might be the most appropriate fire regime for that species in terms of fire frequency, intensity, season and scale. Determining vital attributes of species enables fire regimes to be determined for their conservation.

For many species, reproduction and regeneration are stimulated by fire, and for some vegetation communities, fire is necessary for the maintenance of floristic and structural diversity (Burrows and Wardell-Johnson 2003). However, no single fire regime is optimal for all species and while many species are resilient to a range of fire regimes, some species are vulnerable or sensitive to

fire or have quite specific fire regime requirements (Table 6). These fire sensitive species are referred to in this plan as key fire response species.

Table 6. Vital Attributes of Species Sensitive to Frequent Fire (Key Fire Response Species)

Fauna	Flora
Restricted, specialised habitats	Readily, killed by fire
Have low fecundity	Have relatively short life spans
Exist as discrete dispersed populations	Long juvenile periods
Have low dispersal capacity	Canopy-stored seed
Require mature or late seral stage vegetation (relatively long unburnt)	Regenerate only from seed ('obligate' seeders)
Prone to predation	Require fire for successful regeneration

(from Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Typically, fire sensitive species are generally confined to more mesic or less flammable parts of the landscape such as riparian zones, some wetlands and granite outcrops, where fire is less frequent (see *Managing Fire to Conserve Biodiversity*). Generally vegetation communities in the drier, upland areas of the forest are more drought-adapted and have a history of more regular fire, so display a greater resilience to fire (Burrows 2008). However, even fire sensitive species require fire at some stage for their rejuvenation – an exception perhaps being peat swamps (Burrows and Wardell-Johnson 2003). Extreme regimes, such as sustained, very frequent burning or infrequent but large, intense fires, are more likely to be most damaging to biodiversity than more moderate, intermediate regimes (Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Vital Attributes of the Flora

The flora of the planning area possesses a variety of traits that enable persistence in this fire-prone environment (Burrows and Wardell-Johnson 2003), including:

- soil protection of buried buds;
- bark protection of aerial buds;
- bud survival and sprouting;
- fire stimulated flowering;
- fire triggered opening of fruits and seed release (serotinous); and
- seed stored in the soil and in woody fruits.

Knowledge of the vital attributes of plants has helped to define fire regimes, especially minimum and maximum intervals between fires. The rate at which plant species produce adequate seed for regeneration after fire is an important consideration in determining the minimum inter-fire period. For example, Burrows *et al.* (1995) showed that the majority of understorey plants on upland, high-rainfall jarrah forest sites flower within three years of fire. On less flammable sites such as gullies and broad valley floors, some species may take five to six years to flower after fire but may not set adequate quantities of viable seed for several years after this (Burrows and Wardell-Johnson, 2003). On the basis of current knowledge, doubling the juvenile period[6] of the slowest maturing fire sensitive species at a particular site provides a conservative minimum interval between lethal intensity fires and allows for adequate replenishment of seed banks (Dr N. Burrows *pers. comm.*). Populations will survive more frequent fires provided the intensity of the fire does not kill the entire cohort of parent plants.

The longevity of plant species (particularly fire sensitive obligate seeding species) helps define the maximum safe interval between fires before the seed bank is lost. Data suggests that, for

[6] The juvenile period is defined as the time it takes for at least 50% of the population to reach flowering age.

many south-west ecosystems, fire intervals in excess of 35-40 years may result in the decline and local extinction of some serotinous seeders that only regenerate effectively following fire.

The fire response patterns such as post-fire regeneration, the juvenile period and in some cases, longevity of some 700 species, has been collated into the Department's FIRERESPONSE database. The database indicates that about 97 % of understorey species reach flowering age within three years of fire and all species reach flowering age within five to six years of fire. Few species are regarded as 'fire sensitive' and most of these are located in areas of fire refugia (e.g. the more mesic or less flammable parts of the landscape). Knowledge of the distribution and habitat preferences of species can be used to develop and implement ecologically-based fire regimes using the vital attributes of species. This typically requires consideration of two landscape components: fire prone upland areas and fire sensitive habitats (e.g. wetlands, granite outcrops and valley floors), although this may vary depending on the fire response of flora and fauna species in the area. An example of one possible fire regime based on the vital attributes of species is provided in Figure 8.

Patchiness of the vegetation (e.g. burnt and unburnt areas) is also important as it ensures a variety of post fire seral stages at the local scale. For example, the satellite imagery in Figure 10 (page 162) shows how post-burn patchiness was achieved across a prescribed burn near the intersection of Mowen and Sues roads, approximately 23km east of Margaret River. This enabled the protection of viable quokka habitat in the south of the burn and the regeneration of senescing habitat in the north of the burn.

Vital Attributes of the Fauna

Research indicates that the immediate impact of fire on fauna, and their recovery rate, is directly proportional to the scale, intensity, and patchiness of the fire and the interval between fires (Friend 1995, Burrows and Friend 1998, Friend 1999). This impact will also depend on the presence of predators where displaced species have to travel across open ground to find suitable habitat (Friend 1999).

For mammals, the post-fire response of populations is reasonably predictable and consistent (Figure 6), and could be considered in terms of the their life history characteristics based on shelter, food and breeding requirements, and the scale, intensity and patchiness of the fire (Burrows *et al*. 1999, Friend 1999). Responses are largely dependent on vegetation structure and floristic composition, which simplifies the prediction of fire impacts (Friend 1999).

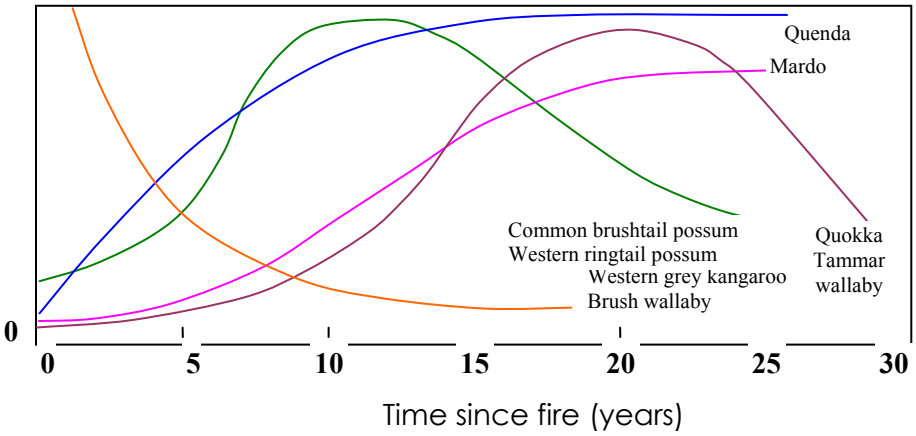

Figure 6. Idealised Relationship Between the Abundance of Various Mammal Species and Time Since Fire

(source: Dr N. Burrows *pers. comm.*).

Two mammal species of the planning area that are identified as having particular fire regime requirements are the quokka and western ringtail possum. Draft fire management guidelines have been developed by the Department for the management of both of these species.

The quokka has specific habitat requirements, occupying riparian zones that are in the mid to late post-fire seral stages. Fire is important for both protecting these habitat patches from wildfires and for regenerating these habitats when they senesce some 25-30 years after fire. A mosaic of mature vegetation (for diurnal cover and refuge) and recently burnt vegetation (for food) appears to provide optimal habitat. Inappropriate fire regimes, including long periods of fire exclusion followed by large intense wildfires, risk the local extinction of subpopulations, the breakdown of metapopulation behaviour and regional extinctions.

Changed fire regimes, particularly the increased frequency of intense fire events, are also thought to be partially responsible for the decline of the Western ringtail possum, which is generally more abundant in forest that has remained unburnt for more than 20 years. The intensity of fire is a key factor in the management of the species, whose main habitat of peppermint is susceptible to canopy scorch. The effects of fire on food availability and shelter resources are also expected to be important determinants in the response of the species to fire. In general, the species survives well where low intensity, patchy burns are employed, as their moist habitats tend to burn less frequently and result in a patchwork of vegetation structure. Occasional moderate to high intensity fire may be required to regenerate habitat and assist in the development of tree hollows. The temporary displacement of other arboreal species, such as the common brushtail possum, into their habitat is an issue following fire. As for quokkas, the strategic and effective control of introduced predators is important post fire.

The effects of fire on bird fauna are difficult to predict as each species responds differently to fire (Burbidge 2003). Generally though, bird communities are relatively resilient to single fire events of a small scale and low to moderate intensity. At the time of writing, a draft fire management guideline has been prepared for the management of Western Australian species of black cockatoos. This suggests that inappropriate fire regimes have the potential to deplete the food supply of black cockatoos and destroy nesting hollows. However, fire may also have an important role in hollow formation in large trees and is necessary for the regeneration of eucalypts, Proteaceous trees and shrubs that cockatoos rely on as a food source.

The effects of fire on amphibians and reptiles are complex and less predictable (Friend 1999, Bamford and Roberts 2003).

Invertebrate fauna appears to be resilient to more regular and frequent fires (van Heurck and Abbott 2003). Invertebrate diversity however, is greatest where there is a wide range of post-fire successional stages in the vegetation (van Heurck and Abbott 2003).

Ecosystem Health

Maintaining a diversity of post-fire fuel ages, seral stages or habitats through space and time, is fundamentally important for ecosystem health. The process of post-fire vegetation change is continuous, and the rate of change will depend on the severity of disturbance events, such as fire, and local soil and climatic conditions. At least three broad post-fire seral stages can be recognised – early, intermediate and late, based on the rate of change of the understorey vegetation structure[7] and floristics. In any one landscape, all of these functional habitat characteristics and seral stages are desired. The relative proportion of each seral stage within the landscape is best determined by the theoretically-derived negative exponential distribution[8] (Weir *et al*. 2000, Tolhurst and Friend 2001) of vegetation/fuel age classes across an ecological

[7] Forest overstorey species of the south-west are very resilient to fire so stand replacement fires, or fires that kill the overstorey, are relatively rare and most change in seral stage occurs in the understorey vegetation.

[8] The negative exponential distribution aims to produce disturbance-induced mosaic patterns across the landscape, which are thought to resemble those produced by natural disturbance events.

unit within the landscape (Figure7). This will guide decisions on where, how much and when to apply fire.

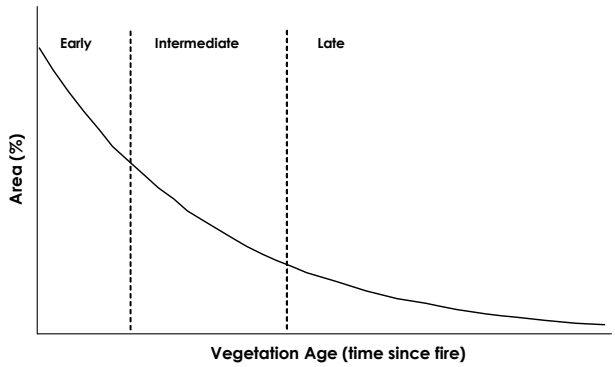

Figure 7. Theoretical Distribution of a Stable Time-since-fire Spatial Mosaic for an Ecological Unit

At the local scale, specific vegetation types and ecosystems (e.g. riparian zones, wetlands and granite outcrops) may have a different theoretical distribution to that of Figure 8. However, at present the knowledge to derive this distribution is limited, and it is not ecologically sound to apply the fire regimes that are appropriate to these geographically limited ecosystems across the broad landscape. Instead, the Department will seek to improve knowledge of the fire regime requirements for specific fire-sensitive ecosystems and use this to develop guidelines for their management. Should this knowledge become available in the future, and it is able to be applied practically, the Department may adapt its fire management accordingly.

Scales of Fire Planning

The issue of the most appropriate scales at which to manage fire in the south-west is a complex one and will always be a trade-off between what is ecologically desirable based on best available knowledge and what is feasible and practical. This management plan recognises two spatial and temporal scales for fire planning – the Landscape (30 000 to 100 000 ha) scale and the Logical Burn Unit (500 to 5000 ha) scale. Landscape scale fire management is based around the 26 Landscape Conservation Units (LCUs) that have been identified in the south-west. These LCUs are derived from amalgamations of the 315 vegetation complexes, according to their burning characteristics (Mattiske and Havel 2004). Objectives derived at the Landscape scale will be used to guide prescribed burning at the more detailed and operational Logical Burn Unit scale.

Although planning at a finer scale is currently not feasible, it is possible that the scales of fire planning may change over the life of this plan.

Fire Management within the Planning Area

This management plan provides the strategic framework that the Department will use to develop ecologically-based fire regimes and regimes for the strategic protection from wildfire. These two outcomes are not mutually exclusive and in most cases fire applied to achieve biodiversity conservation will provide tangible benefits to strategic protection outcomes and vice versa. Ecological regimes will be based primarily on vital attributes and life histories of key flora and fauna species to ensure ecosystem health and the protection of biodiversity as well as life and community assets. The main objectives of fire management within the planning area are to:

- maintain and promote/enhance biodiversity;
- reduce the threat that wildfire presents to life and community assets;

- increase knowledge through fire research, operational experience and monitoring; and
- communicate with neighbours, the community and other stakeholders about fire management.

The Department interprets the guidance contained in its fire policy and this management plan through a dynamic operational planning process known as the Regional Master Burn Plan. This process is used to identify appropriate areas for the application of prescribed fire in the coming three years. Prescribed fire programs are based on regimes identified in this management plan and are updated twice each year on the basis of operational work and new information, such as wildfire occurrence and improving conservation knowledge (e.g. on vital attributes of species). The Regional Master Burn Plan allows sufficient lead-time for planning and preparing annual burn programs and specific burn plans well ahead of the operation, which enables time for surveys for dieback and threatened flora. This program also provides the public an opportunity to view what is planned for implementation and provide their input into program planning.

Managing Fire to Conserve Biodiversity

There is often debate about the most appropriate fire regimes to conserve biodiversity. The scientific complexity of fire behaviour and ecology means there will continue to be uncertainty and risks surrounding ecosystem responses to fire (planned and unplanned) and the outcomes of various planned fire regimes. Fire managers recognise this uncertainty but also understand that it is not a valid reason to avoid taking action to protect biodiversity, life and community assets from inappropriate fire regimes. Actively applying prescribed fire in managed ways can achieve many benefits for biodiversity that outweigh the risk of uncertainty and can also contribute to the better understanding of ecosystems over time.

This management plan adopts an adaptive approach to fire management, which, in the long-term, seeks to devise, implement and monitor a range of fire regimes based on:

- vital attributes of threatened species, significant habitats and ecological communities;
- vital attributes of key fire response species;
- creating and maintaining diverse post-fire (seral) stages, or functional habitat types;
- managing fire to protect ecologically sensitive areas and niches; and
- fuel accumulation rates.

One or a combination of these factors is likely to apply to appropriate parts of the planning area. Knowledge of vital attributes of key fire response plant and animal species and habitats known or likely to occur within any Landscape Conservation Unit will be used to derive appropriate 'ecological' fire regimes for the planning area (see Figure 9). As there are gaps in current knowledge, management for biodiversity conservation will initially focus on the protection of threatened species and significant habitats that require specific atypical fire regimes. As more information on the vital attributes of species becomes available this will be incorporated into the prescribed burning program. Fire regimes have also been developed to protect life and community assets (see *Managing Fire for the Protection of Life and Community Assets*) and will complement ecological fire regimes where possible. Fire regimes for biodiversity conservation may also achieve a protection benefit.

The Department has developed a range of fire management guidelines to protect specific fire sensitive species and ecological communities. Several of these guidelines apply to parts of the planning area and will be used to guide fire management where applicable. These guidelines may be different from the standard ecological fire regime and will inform fire planners and managers of strategies and tactics for a prescribed burn to accommodate the needs of 'fire regime specific' biota. The guidelines have been developed using the best available knowledge but further research, experimentation and subsequent adaptive management may be required to determine the most appropriate fire regimes for the species and habitats present in the planning area.

However, before applying fire management guidelines within the planning area, consistency and compatibility with other conservation, land management and fire management objectives must be checked to ensure the best possible outcome.

Managing Fire Based on the Vital Attributes of Threatened Species and Ecological Communities

There are several threatened species within the planning area that are vulnerable to fire (e.g. quokka and Western ringtail possum). These species tend to occur in geographically restricted niches in the landscape. Fire regimes that are applied across the landscape need to be cognisant of their presence and their special needs in terms of fire management. Strategies and tactics used in applying appropriate fire regimes at a landscape scale need to take these special needs into account.

Threatened flora and fauna and threatened ecological communities are protected by State and Commonwealth legislation, which imposes requirements in relation to how fire management activities are conducted. In many cases, it is appropriate to devise and implement strategies and tactics within a fire regime that are specific to these taxa and communities that to ensure their persistence (where the fire ecology of threatened species is well understood). Threatening fire regimes may include long periods of fire exclusion, sustained frequent burning, large and intense wildfires and post-fire grazing.

Where limited fire ecology information exists for a threatened species or community, carefully monitored experimental burning should be a priority. For other species and communities of conservation significance (e.g. priority, endemic, relictual and disjunct species) where knowledge is limited, adaptive management experimentation should be considered.

Managing Fire Based on the Vital Attributes Key Fire Response Species

Scientific knowledge of vital attributes of selected plants (key fire response species) within ecosystems is being used to derive appropriate fire regimes, especially acceptable intervals between fires, for the planning area. Knowledge of the juvenile period, longevity and regeneration and establishment requirements of key fire response plant species are used to establish minimum and maximum fire intervals and the season and intensity of fire. Knowledge of the habitat requirements (seral stage) and dispersal capacity of key fire response fauna species assists with determining fire interval and spatial scale or patchiness. Having devised appropriate 'ecological' fire regimes based on plant attributes, they can then be cross-checked for their efficacy against co-occurring key fire response fauna species. There are gaps in the knowledge of vital attributes of many species but consistent with an adaptive management approach, knowledge will be gained and fire management improved by on-going research and by monitoring of operational programs.

An example of one possible ecological fire regime based on the vital attributes of species is provided in Figure 8. Within any Landscape Conservation Unit (or Logical Burn Unit), there will be a variety of interlocking ecosystem components or habitats with different fire response patterns. For each Landscape Conservation Unit (or Logical Burn Unit), a standard ecological fire regime based on vital attributes of key fire response species is devised for the most fire-prone (least fire sensitive) components and to protect the least fire-prone (most fire sensitive) components. This typically requires consideration of two landscape components, although this may vary depending on the fire response of flora and fauna species in the area:

- the drier, more flammable fire regime tolerant habitats, which generally contain flora species that are mostly resprouters and have relatively short juvenile periods and fauna that do not require mature or medium to late successional state vegetation; and

- fire regime specific habitats (e.g. granite outcrops and valley floors) will generally contain flora that are fire sensitive with relatively long juvenile periods and fauna that prefer mature, medium to late successional stages of vegetation.

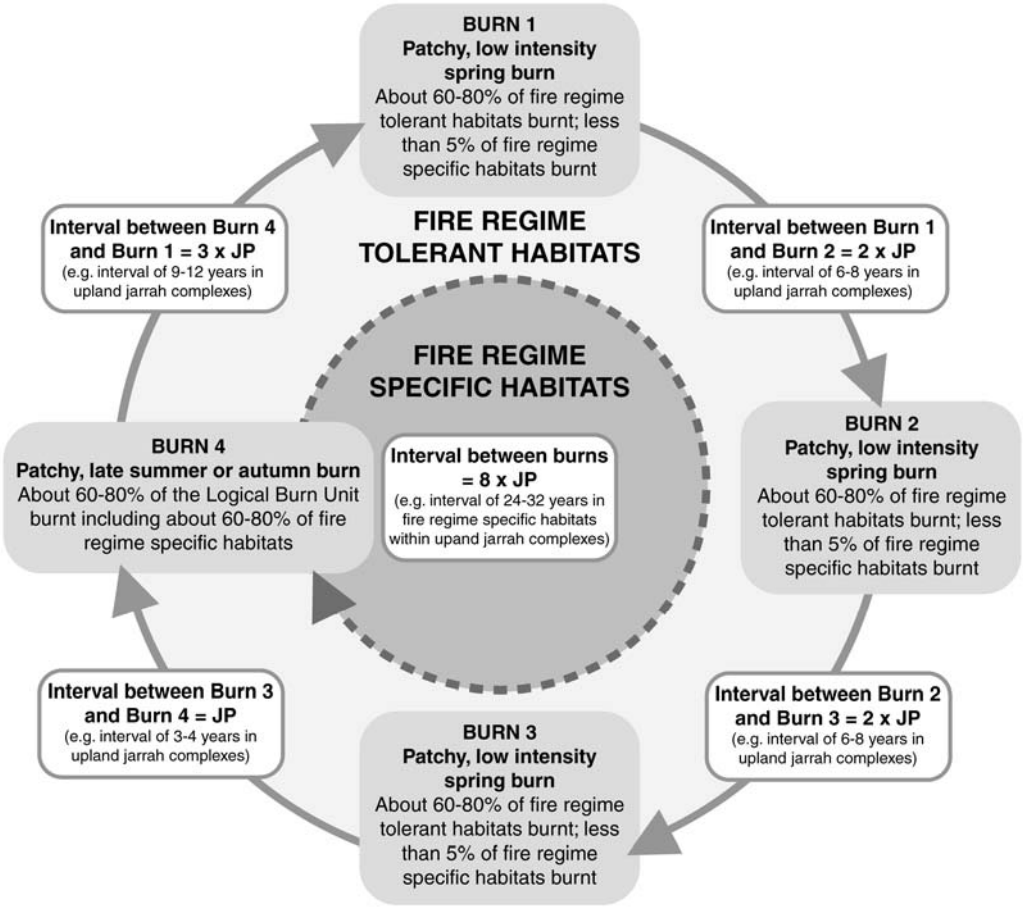

Figure 8. Example of an ecological fire regime for managing ecosystems based on vital attributes

(adapted from the example of a managed jarrah forest fire regime shown in Burrows 2008).
[1] = the juvenile period of the slowest maturing fire sensitive understorey species.

Managing Fire for Diverse Post-fire (Seral) Stages

Maintaining a diversity of post-fire fuel ages, seral stages or habitats through space and time, is fundamentally important for ecosystem health. The Department will aim to approximate the theoretical negative exponential distribution for each LCU to maintain this diversity.

Managing Fire to Protect Ecologically Sensitive Areas and Niches

The Department has prepared specific fire management guidelines for fire sensitive/atypical habitats occurring across the landscape (e.g. wetlands and granite outcrops). These guidelines will inform fire managers of strategies and tactics for a prescribed burn to accommodate the needs of 'fire regime specific' biota.

Managing Fire to Protect Ecologically Sensitive Areas and Niches – Riparian Zones and Wetlands

Small wetland and riparian environments exist in parts of the planning area along the Collie River and its tributaries as well as isolated swamps. Some fire regimes, coupled with the

impacts of climate change, may have detrimental impacts on some riparian zones and wetlands. An observed decline in rainfall since the 1970s has had the effect of a sharp fall in streamflow in the south-west, and resulted in the drying out of some wetlands, peat swamps and riparian zones, predisposing them to fire for a longer period. Consequently, these areas may burn earlier in spring, and remain drier for longer in autumn months. This has important implications for the protection of inland wetlands and riparian ecosystems. High intensity fire may also impact on water quality in wetlands by increasing the amount of dissolvable and erodible residue finding its way into waterways (Horwitz *et al*. 2003).

The extent or patchiness of fire in riparian zones of the planning area is important for fauna that persist in relatively small, linear habitats along these drainage lines. Large-scale fires that burn entire habitats could be detrimental to some species that utilise these corridors, particularly along the lower Collie River and its tributaries. Too infrequent fire may result in some serotinous plant species completing their life cycle and dying, with subsequent loss of the seed bank. The impact of fire on tree species is important in riparian areas as the fire-formed tree hollows provide valuable fauna habitat. Fire can both destroy and create tree hollows (Inions *et al*. 1989). Large areas of riparian vegetation that have accumulated high fuel levels are at greater risk to extensive wildfire. Fuel levels in riparian zones need to be managed to mitigate the risk of large extents of these ecosystems being burnt in a single wildfire event.

Managing Fire to Protect Ecologically Sensitive Areas and Niches – Granite Outcrops

Although comprising a relatively small proportion of the total landscape, these biotic islands are very important for biodiversity conservation on account of the uncommon habitat they afford due to the combined effects of biological isolation, soils, moisture regime and fire regime. Associated with this are often unique assemblages of flora and fauna, including many fire sensitive taxa.

The fire frequency of granite outcrops is generally lower than the surrounding landscape (Hopper 2000, Yates *et al.* 2003). This is because the vegetation is often low in stature and biomass, and is fragmented by areas of sheet rock or boulders that provide a discontinuous fuel bed, thus limiting fire spread under mild/moderate conditions (Burrows 2005). Granite outcrops, such as those scattered along the lower Collie River valley, may therefore act as refuges for fire-sensitive species. However, many species on granite outcrops may also require infrequent fire under certain conditions to regenerate. Hopper (2000) found a high number of fire-sensitive obligate seeders (77%) regenerating post-fire on a granite outcrop in the wheatbelt, and suggested "…intervals between fires measured in decades are likely to be required to ensure an adequate seed bank is available and local extinction is averted." This may also be the case with granite outcrops within the planning area, although intervals of one to two decades (i.e. shorter interval) between fire are more probable due to the higher biomass in the forested regions (Dr N. Burrows *pers. comm*.).

To enable rock outcrops to function as fire refuges, and to decrease the probability of these fire refuges being damaged by large, intense wildfires that sweep onto and over them from the surrounding flammable forest, it is important that fuel build-up in the surrounding forests is managed. Prescribed fire can be introduced under mild conditions such that the rock outcrops do not entirely burn in any one fire event.

Protecting Biodiversity by Managing Fire Based on Fuel Accumulation

In the past, fire management has been based around the manipulation of forest fuels as a means to protect life and community assets from large, damaging wildfires. Controlling the incidence of wildfire, or at least the impacts of such an event, is also important to managing the threat to biodiversity (e.g. maintaining habitat diversity, fire regime sensitive communities and species, and extant populations of threatened flora and fauna).

Fuel reduction burning, the practice of purposefully setting low intensity fires under defined conditions of fuel, weather and topography to consume a portion of the live and dead vegetation, is a fire management technique that aims to reduce the severity (scale and intensity) of wildfires. Fuel reduction burning rarely prevents wildfires but where a significant proportion of the landscape is managed this way, wildfire severity, and consequently the impact on biodiversity, life and community assets can be significantly reduced. Fuel reduction as a mechanism to protect biological assets is particularly important around granite outcrops.

To address these issues, the Department will seek to reduce the threat of wildfire to significant biological assets by:

- employing a mosaic of fuel age classes across the landscape or a system of fuel-reduced buffers, specifically managed to reduce fuels around biological assets;
- periodically undertaking strategic fuel reduction burning in and around the planning area to mitigate intense, large wildfires; and
- integrating fire management with the adjoining State forest and other land tenures.

Managing Fire to Protect Life and Community Assets

The existence of towns and settlements, farmland and other developments, as well as the increasing use of natural areas for recreation, requires that the protection of life and community assets be considered in fire management for the planning area.

Identifying fire vulnerable community assets within the planning area, and determining the risk, likelihood and consequences posed by wildfire to those assets will assist in managing the risk of high intensity wildfires. Table 7 shows the community asset values in and around the planning area that need to be considered in a wildfire threat analysis[9], and defines what is an acceptable outcome in relation to wildfire.

Table 7. Life Community Assets in and Around the Planning Area

Life and Community Assets*	Acceptable Outcome
Fire fighter and public safety	No injury or loss of life due to wildfire
Recreation sites along the lower Collie River valley, including the camping area at Honeymoon Pool and day-use sites along Lennard Drive	Physical infrastructure may be lost, but is readily replaced at an acceptable cost. No loss of life due to wildfire
Townsites of Collie and Allanson	Minimal loss of community assets with little financial loss and disruption to local communities. No loss of life due to wildfire
Built infrastructure including the Wellington Discovery Forest information centre, Wellington Mill Cottages (also known as Wellington Forest Cottages) and the kiosk at the Reservoir	No injury to visitors and minimal financial loss. Minimal disruption to regular activities and impact on historical values/infrastructure
Adjoining plantations, private property (including rural subdivisions at Pile and King Tree roads) and CSIRO research plot	Minimal financial loss and minor affects on productive potential in the medium term
Natural assets, including significant vegetation complexes, specially protected fauna, priority flora and significant habitats and visual landscape values	Impact of wildfire on these assets may cause short to medium term loss but recovery, regeneration, translocation or rehabilitation is possible
Essential utilities including powerlines, the Wellington-Harris pipeline, Lennard Tower and the Wellington Reservoir hydro power station	Minimal and short-term financial impacts on infrastructure and minimal disruption to local communities
Indigenous and non-Indigenous heritage sites	No loss of Indigenous and non-Indigenous

[9] The Department's wildfire threat analysis provides the basis for a more detailed analysis and evaluation of susceptible areas and specific fire pre-suppression tactics. This process will also assist in developing strategies to mitigate the threat to biodiversity values.

Life and Community Assets*	Acceptable Outcome
	heritage. Indigenous heritage is not usually fire vulnerable
Water resource of the Reservoir	Short-term affects on potable water quality and quantity as a result of wildfire
Recreation sites at Potters Gorge, the Munda Biddi Bike Trail, Bibbulmun Track and other recreation tracks	Physical infrastructure may be lost, but is readily replaced at an acceptable cost
Beekeeping sites	Limited sites and short term impacts on production capacity and hives

Note: Natural assets, including significant vegetation complexes, specially protected fauna, priority flora and significant habitats and landscape amenity have been omitted from this table but are considered in assessments of wildfire risk to the planning area.

A wildfire threat analysis of the planning area indicates that the lower Collie River valley is a high priority asset, primarily for the protection of campers and day visitors. The risk posed to visitors in this area is greater than areas such as the Collie and Allanson townsites due to the greater distance from fire response centres, the relative inaccessibility of the area and the high number of people that enjoy recreating in the valley. Consequently, the priority for the management of this area is for asset protection (primarily park visitors and recreation sites). This involves the implementation of a range of strategies for wildfire mitigation (see below), including the maintenance of a reduced fuel level through regular prescribed burning and a fire response capacity appropriate to protect the asset. An evacuation plan will also be prepared for the lower Collie River valley.

While the priority for fire management along the lower Collie River valley is for the protection of life and community assets, the Department will continue, wherever possible, to apply fire in a way that does not compromise biodiversity values. For example, prescribed burns to protect life and community assets may be manipulated using smaller burn cells to achieve biodiversity outcomes. However, where life and community asset protection coincides with high biodiversity values, and it is not possible to achieve multiple objectives, the priority will be given to the protection of life and community assets.

Strategies for Wildfire Mitigation

The Department recognises the significant wildfire threat in the land it manages and proposes the following strategies for wildfire mitigation in and around the planning area:

- managing fuel accumulation across the landscape to acceptable levels;
- maintaining/improving the Department's current fire response capacity;
- liaising with local government authorities, FESA and local fire brigades;
- implementing relevant strategies in townsite protection plans;
- educating and communicating with the community and managing visitor use; and
- managing public access and maintaining access for fire management purposes.

Education, Liaison and Community Involvement

Engaging with the public is vital if their understanding of the role and effects of fire, the application of planned fire and fire suppression operations are to be understood. There is interest in the community about the planning process and outcomes associated with prescribed fire management. The Department will continue to make, its planned burn programs publicly available, enabling the community to be kept informed.

The planning area interfaces with private agricultural lands, large plantations and settlements. It is therefore important for successful fire management, and many other land management issues, to foster 'good neighbour' relations with adjoining landowners, particularly to ensure complementary fire management on adjoining lands. In particular, is the comparatively large area of remnant vegetation on private land adjoining the western portion of the planning area, north of the Collie River. This area contributes significantly to the biodiversity values of the

planning area and poses a wildfire risk to assets along the lower Collie River valley. In the past, the Department has successfully undertaken prescribed burning on portions of private property and will seek to continue this operation where applicable.

Increasingly, people and facilities are being located closer to or within forested areas, exposing them to the risk of wildfire. This often occurs in advance of the capacity of local communities to deliver an adequate level of fire services. As such, early and better intervention when planning land developments is required. The DPI and FESA document – *Planning for Bushfire Protection*, provides guidance for minimising the impact of fire on communities. The document encourages new subdivisions to implement fire protection measures commensurate with the level of bush fire hazard, including hazard separation zones, building protection zones as well as the provision of access and fire services access. Local government is responsible for implementing fire protection measures under this guideline on private lands. The Department will apply the guideline for all applications for subdivisions adjacent to the planning area and encourage a high level of fire protection measures on all adjoining lands. Where possible and consistent with other management objectives, the Department will comply with the guidelines for the planning area.

Liaison and cooperation with other stakeholders in fire management will continue to occur. Engagement with local government, volunteer bush fire brigades, FESA and other State government agencies will be necessary to ensure effective fire management across jurisdictions. An example is the cooperation between the Department and the local fire brigades to ensure that Reserve 10014 (rifle range) is appropriately managed for fire.

As well as an effective public liaison, education and awareness program, the enforcement of legislation and compliance management is essential. The Department will co-operate with agencies responsible for public education and law enforcement, such as the FESA and the Western Australian Police Service.

Managing Access

Public access and visitor use has, where possible, been designed to minimise the impact of wildfire on visitors and to limit the sources of ignitions. A strategic access network for the planning area is outlined in detail within Section 30 *Visitor Access*. The Department will maintain a strategic fire access network within the planning area that will comprise both public and management only access roads/tracks. This network may be maintained to ensure safe access for fire fighting vehicles and to permit effective fire management. An annual road/track maintenance program will be developed based on available funding and will be planned to consider potential impacts on natural, cultural and recreation values.

Where appropriate, fires may be contained within management units defined by existing roads, rather than by constructing new firelines around the perimeter of the fire. Where temporary roads, fire access tracks or firelines are constructed during fire suppression activities, these will be rehabilitated after the fire event to minimise the threat of soil erosion, weeds or spread of disease and unauthorised use of the access.

Fire Research

Fire management and the development of ecologically-based fire regimes within the planning area should take into account all available knowledge and should adapt to new knowledge gained through research, monitoring and experience, including unforeseen events such as wildfires. It is recognised that the knowledge about the science of fire and its interaction with the biota can be improved. In particular, there is a need for research into the fire ecology of rock outcrops and riparian zones, fire behaviour in riparian zones and social science that is aimed at improving community awareness strategies.

The Department also sets aside Fire Exclusion Reference Areas for research purposes, where fire is excluded to ensure long unburnt sites are available for comparison to fire regimes under prescribed conditions. These have been selected across the southwest in accordance with a number of criteria which consider the ability to protect them from unplanned fire, minimising the risk these areas pose to adjacent life and property values and be broadly representative of major vegetation/landforms in the area. Such areas may be located within LCUs that are covered by the planning area.

In addition, the Department may initiate specific fire research/monitoring projects as opportunities arise, including pre and post-burn monitoring. Consistent with principles of adaptive management, fire management will be reviewed and if necessary, adjusted, in response to monitoring results.

25. Fire

Key Points:

- Fire management within the planning area will focus on biodiversity conservation, community and asset protection and fire research.
- Management for biodiversity conservation will be based on the vital attributes of the flora and fauna and will aim for a diversity of seral stages across the landscape.
- Diversity and variability in fire regimes at the landscape scale helps to maintain biodiversity. Patchiness of burning is an important factor in providing environmental heterogeneity at a local level.
- Fire sensitive species and ecosystems are most typically associated with wetland and riverine communities and granite outcrops.
- The Department uses fire in a planned way to reduce the severity of wildfire events and in turn provide safety to fire fighters, neighbours and visitors as well as protection of community assets.

The objective is to conserve biodiversity across the landscape and to protect life and community assets in and near the planning area.

This will be achieved by:

1. continuing to implement prescribed fire plans according to the Regional Master Burn Plan and the relevant fire management policies, principles, guidelines and available knowledge;
2. maintaining a diversity of post fire (seral) stages that approximate the theoretically-derived negative exponential distribution of fuel age class each LCU. At the smaller scale, fire management guidelines and other available knowledge will be used to determine the appropriate fuel age distribution for fire sensitive/atypical habitats;
3. where biodiversity values are at risk, and on the advice of the Conservation Commission, continuing to develop and review specific fire management guidelines for significant habitats;
4. continuing to ensure protection of life and community assets, fire sensitive communities, fire sensitive species, rare and priority flora and other assets;
5. ensuring that an analysis of wildfire potential is incorporated into all risk analyses for proposed works, and that appropriate risk mitigation work is undertaken during developments;
6. maintaining roads and tracks used for fire management according to the Department's standards;
7. preparing an evacuation plan for the lower Collie River valley;
8. monitoring the impacts of fire on key values where resources are available, including trialling low intensity fires at shorter intervals to monitor the survival and recruitment of fire sensitive species;
9. facilitating, and supporting others to undertake, research on fire ecology, biological

indicators and habitat requirements of vegetation communities and include, as relevant, in the preparation of prescribed fire plans for the planning area;
10. liaising with DoW and WC to manage fire, where appropriate and compatible with other values and operations, to an appropriate level for water source protection;
11. continuing to liaise with local government, FESA, WAPC, local bush fire brigades, neighbouring landholders and other appropriate authorities to encourage cooperative arrangements, ensure community protection from fire is at an appropriate level and to encourage new subdivisions adjoining the planning area to implement fire protection measures commensurate with the level of bush fire hazard;
12. promoting public education and awareness on the Department's fire planning and management, the effects of fire on natural values, the need to prevent wildfires and the safety and survival of people and property; and
13. providing opportunities for public input into the Regional Master Burn Plan planning process.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
25.1 The extent of fire diversity measured by the diversity and scale of post-fire (seral) stages within a LCU	25.1 The distribution of post-fire fuel ages (time since fire) for each LCU approximates a negative-exponential distribution	Annually
25.2 The impact of wildfire on life and community assets	25.2 No loss of life or significant community assets, or serious injury, attributable to the Department's fire management	
25.3 The persistence of threatened species/ ecological communities within each LCU	25.3 No permanent loss or significant decline, due to fire, of threatened species/ecological communities in the planning area	Every 5 years

PART D. MANAGING OUR CULTURAL HERITAGE

The *Australia ICOMOS Burra Charter 1999* (Burra Charter 1999) was adopted to provide for 'the conservation of places of cultural significance' and has a series of guidelines for managing cultural heritage (see Section 7 *Legislative Framework*).

A new national heritage system was also introduced in 2004 to strengthen protection for the nation's natural, Indigenous and historic heritage. This included amendments to the EPBC Act to include 'national heritage' as a matter of national environmental significance and to provide statutory protection to National and Commonwealth Heritage listed places. Actions likely to impact on the heritage values of listed places require approval from the Australian Minister of the Environment and Water Resources. Places that are currently not listed (e.g. those listed on the Register of the National Estate) should be assessed for listing on the National or Commonwealth Heritage lists.

In Western Australia, legislation exists to protect both Indigenous and non-Indigenous cultural heritage. The Aboriginal Heritage Act was enacted to protect sites and objects used by, or traditional to Aboriginal people. A register of sites and objects is maintained under the Act, although the Act also protects sites that have not yet been entered on the register. Under the Act, it is an offence for anyone to alter in any way an Aboriginal site or object without the relevant Minister's permission.

The Heritage of Western Australia Act provides for the registering and protection of places of historic interest on the Western Australian 'Register of Heritage Places' database. Places listed on this register are afforded statutory protection and must not be damaged or altered unless a permit to do so has been granted by the Heritage Council of Western Australia. The Department's draft Policy Statement *Management of non-Indigenous cultural heritage on lands and waters managed by the DEC* provides further guidelines for managing non-Indigenous cultural heritage.

Policy Statement No. 18 *Recreation, tourism and visitor services* provides guidance for managing Indigenous and non-Indigenous cultural heritage. The policy recognises the importance of Indigenous heritage and identifies opportunities for Aboriginal involvement in the care of Department-managed lands. This may include such activities as interpretation of cultural history, and anthropological and archaeological survey and site assessment. It also recognises the need for liaison with appropriate Aboriginal Elders about management plans, public works, site management and heritage protection measures.

Many places may have some historic interest, but may not have been assessed or are not considered significant enough to be worthy of listing under legislation. These places are entered on the Department's 'Recreation and Tourism Information System' (RATIS) database. In the pursuit of best practice in cultural heritage management, it is important that the information contained in all aforementioned registers and databases is considered prior to any management operations. To maintain expertise of Regional and District staff in heritage identification and management, training or information days will be held where necessary.

26. INDIGENOUS HERITAGE

The entire Collie River, from its source to the Leschenault Inlet, is considered to be sacred to Aboriginal people and is a registered mythological site under the under the Aboriginal Heritage Act. The local Noongar people believe that this site is connected to

Ngarngungudditj Walgu, who is said to be a mythical being with a 'water snake' or serpentine physical manifestation.

Ngarngungudditj Walgu is thought to have come from the north-east and created the Collie River, the hills of the Collie River valley and the Leschenault inlet, before travelling back up the Collie River to rest at Minninup Pool. Three other sites, listed as interim registered sites under the Aboriginal Heritage Act, are located within or adjoin the planning area. More information is required about these sites to be placed on the permanent register.

As the register is not a comprehensive listing of all sites, assessments may be necessary prior to any operations where there is potential to inadvertently damage sites. Appropriate approvals under the Aboriginal Heritage Act may be required to proceed with any works that may affect Indigenous heritage values.

Aboriginal interpretation of their culture is important within the planning area and should be considered at riverside settings along the lower Collie River (see Section 46 *Information, Education and Interpretation*). Participation of Aboriginal people in promoting cultural heritage to visitors could be encouraged, and facilitated through the provision of commercial concessions (see Section 33 *Commercial Operations*). Further participation of Aboriginal people in the management of the planning area is described in Section 8 *Management Arrangements with Aboriginal People*.

Aboriginal Use and Occupation

There is physical evidence that Aboriginal people have occupied the jarrah forest of Western Australia for over 6000 years (Harris and Goode 2002), although it is possible that they may have used the area for much longer. Tilbrook (1983) suggested that at least 13 different socio-linguistic Aboriginal groups existed in the south-west. These groups shared traditions and a common language, albeit with local variations, and are collectively known as Noongars. The word Noongar, or its linguistic equivalent, is identifiable as the word for Indigenous person from the region, even though they may have different vocabularies. Aboriginal occupation of the Collie area is thought to have encompassed two distinct socio-linguistic communities: the Kaneang and the Willman, whose boundaries intersected at the Collie River (Goode and Rundin 2002, Tindale 1974).

Occupation of the jarrah forest was transient, with family groups migrating seasonally from the coastal plain in the winter months, when travel and camping on the coast were difficult due to large areas of inundation. At these times it is thought that Aboriginal people dispersed into smaller groups and moved inland, possibly along the Collie River (Martinick 1994). During summer, Aboriginal people would exploit food resources on the coast such as fish, waterfowl, turtle, frog and a variety of vegetable foods. In winter, they moved to the jarrah forest where game such as kangaroo, wallaby, possum, bandicoot, quenda and emu were plentiful and vegetable foods, especially yams, became available.

Aboriginal people employed a mobile lifestyle, moving in a pattern that coincided with the availability of resources and tribal boundaries. Family groups usually travelled along defined paths of easiest access through the forest, known as *bidi* (Goode and Rundin 2002). These were often located along river systems such as the Collie River where seasonal food supplies were more abundant and pools offered a supply of potable water. It is likely that these and surrounding areas would have been used for camping, hunting, collecting plant food and producing wooden utensils (Harris and Goode 2002).

Aboriginal people used a deep understanding of the land, its attributes and behaviour to make it easier to acquire food, medicines and the requirements for life. In particular, fire was used to create successional changes in vegetation, thus affecting the productivity of an area for hunting and gathering and ease of movement (Hallam 1975). Aboriginal people lived and cared for the

land with one basic and important understanding – people were in no way separate from the environment.

26. Indigenous Heritage

Key Points:

- There is evidence that Aboriginal people have occupied the jarrah forest of Western Australia for over 6000 years, although it is possible that they may have used the area for much longer.
- The entire Collie River from its source at the Leschenault inlet is a registered mythological site under the under the Aboriginal Heritage Act. Three other sites are interim registered under this Act. This Act protects all Aboriginal heritage sites, including those sites not registered.
- The hunting, gathering and camping lifestyle of Aboriginal people is an important part of their culture.
- The planning area is an important place for Aboriginal people and they have a strong desire to be involved in future management.

The objective is to identify, protect and conserve Indigenous cultural heritage and cultural resources in consultation with Aboriginal people.

This will be achieved by:

1. complying with Commonwealth and State legislation and Departmental policies prior to commencing operations that have the potential to impact on cultural heritage;
2. protecting and maintaining cultural heritage according to the Burra Charter and any heritage conservation management plan;
3. consulting and involving local Aboriginal people and relevant organisations, and referring to the State Aboriginal Site Register and other relevant registers, to improve the protection and conservation of Aboriginal cultural heritage;
4. managing threatening processes (e.g. fire) and visitor activities to ensure Aboriginal cultural heritage is not adversely impacted;
5. providing culturally appropriate information and interpretation on Aboriginal cultural heritage to promote awareness, appreciation and understanding; and
6. consulting with local Aboriginal people to identify areas for Aboriginal cultural and ceremonial purposes based on traditional occupation and use.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
26.1 Disturbance of known or identifiable Aboriginal heritage sites	26.1 No disturbance of a registered place as a result of Department operations without formal approval	Annually

27. NON-INDIGENOUS HERITAGE

European settlement and occupation of the region occurred in 1829 when Dr Alexander Collie and Lieutenant William Preston explored the area and located the mouth of the Collie River at the Leschenault Inlet (Williams 1979, Staples 1979). Further exploration of the Collie River occurred a year later when Lieutenant Governor Sir James Stirling travelled approximately 26 km up the river before proceeding overland and past Mt Lennard. In this expedition, the land abounding the rivers and foothills of the ranges was recognised as having potential as agricultural land. By the late 1880s, the area around Collie was recognised for its coal resources (Hocking Planning and Architecture 1995) and by 1897 the town of Collie was declared and contained a population of approximately 300 people (Dames and Moore 1987). The town grew

to be one of the most important mining towns in the State, supplying coal for power production in railways, shipping and in 1961, for the generation of electricity. Exploration and mining for coal and other mineral resources still continues today.

Over the years, there have been several mining companies in the Collie coal basin, with the earliest, Collie Commercial Coal Mining Company, commencing operation in the early 1890s (Stedman 1988). Underground mining ceased in 1994, and was replaced by large open cut mines. Following the discovery of coal and the development of transport facilities to service the coal mines, the increased infrastructure stimulated the timber industry, accelerating demographic growth and diversifying enterprise (Williams 1979). People came to the area seeking employment and by the 1940s timber production around Collie employed 310 people (Hocking Planning and Architecture 1995). Sawn timber was produced in abundance, with many timber mills established in the surrounding district, particularly adjacent to railway sidings. The mills provided timber to the underground mines and wooden sleepers for railways locally and overseas. Saunders mill began operation in the 1940s and is still in operation today. Several smaller, transient mills, known as 'spot mills', were also used throughout the forest to cut timber into a manageable size (e.g. along the Worsley River and Windy Ridge Road). Formation alignments of old rail routes used to transport logs from the forest to saw mills can be found in the planning area. In particular, the former Gervasse forest block contains a number of spot mills, an old townsite and other remnants of forestry operations, such as log ramps and saw pits.

Construction of the Reservoir began in 1931as part of the unemployment strategies undertaken during the Great Depression. The Reservoir was the headworks for the Collie Irrigation Scheme and at the time of its construction, was the largest Reservoir in Western Australia. In 1945, it was proposed to raise the height of the wall to increase capacity and the Reservoir was consequently emptied and the original rock wall replaced with concrete. To meet increasing demand, the Reservoir wall was raised a further 15 m in 1955, to reach 34 m and a current capacity of 186 GL. Local, regional and State communities value the Reservoir and surrounding environment for its historic significance and as a place to visit for water recreation, walking and picnicking activities.

The history of European settlement in the region has given rise to several notable places of historic significance, although there are no places within the planning area that are listed under legislation or the *Register of National Estate*. However, the Reservoir wall precinct is being considered for interim listing under the Heritage of Western Australia Act. Interpretation of these places can assist in maintaining a sense of place and informing visitors about an area.

27. Non-Indigenous Heritage

Key Points:

- European settlement and occupation of the region occurred in 1829 when Dr Alexander Collie and Lieutenant William Preston explored the area and discovered the mouth of the Collie River at the Leschenault Inlet.
- Collie grew to be one of the most important mining towns in the State, supplying coal for power production in railways, shipping and the generation of electricity. The introduction of railways, mines and timber mills bought people to the area seeking employment and were the impetus for the establishment of infrastructure and development of small business.
- Construction of the Reservoir began in 1931. Today, local, regional and State communities value the Reservoir and surrounding environment for its historic significance and as a place to visit for water recreation, walking and picnicking activities.

The objective is to identify, protect and conserve non-Indigenous cultural heritage and cultural resources.

This will be achieved by:

1. managing non-Indigenous places of cultural heritage significance according to State and Commonwealth legislation, Department policy and the Burra Charter;
2. managing threatening processes (e.g. fire) and visitor activities to ensure cultural heritage is not adversely impacted;
3. identifying where possible, areas of non-Indigenous cultural heritage based on historical occupation and use;
4. progressively updating and collating information on cultural heritage places and stories and maintaining them on the Department's RATIS database;
5. in consultation with the relevant authorities, reviewing as necessary, places (e.g. interim listed places) for listing under State and Federal legislation. The cultural heritage management requirements of these places, should be considered prior to undertaking any operations or works with a view to mitigating potential impacts;
6. incorporating information and interpretation of non-Indigenous cultural heritage into the communication plan where this is appropriate to the management of the site and resources permit; and
7. conducting training and/or information days when required to maintain expertise of Regional and District staff in heritage identification and management.

PART E. MANAGING VISITOR USE

It is recognised that the public conservation estate managed by the Department has the capacity to provide a significant portion of the public's growing demand for outdoor recreation and tourism, in particular 'nature-based' tourism. In doing so the conservation estate contributes significantly to the social, psychological, physical and economic wellbeing of the community.

The number of visitors to the State's reserve system has increased markedly over the past decade, from 4.8 million visits in 1992–93 to over 12 million in 2006–07. The reason for such significant human interest is simple: the estate managed by the Department covers an area of more than 27 million hectares of lands and waters protecting unique landscapes, geological formations, plants and animals, and cultural sites. Conserving these lands and waters for future generations, and managing them for use by the present one, is a complex process for four reasons. Firstly, public expectations for recreation and tourism are as diverse as the environments the Department manages. Secondly, whilst the public conservation estate brings many benefits to the community as well as the environment, the desire to interact with these unique environments can lead to unacceptable impacts on the natural environment. Thirdly, there is a worldwide recognition that healthy outdoor activity is good for people physically and psychologically (Maller *et al.* 2002). Finally, the Department also considers the social and economic dependence of local communities in the way it manages the estate entrusted to it. This part of the management plan addresses these issues, and at the same time ensures that visitors gain an appreciation and understanding of the area's values which should, in turn, foster an appreciation and understanding of conservation.

Strategies for visitor use contained within this management plan were determined following an assessment of existing visitor facilities, recreation opportunities and demands, predicted patterns of use, visitor expectations and safety and the potential impacts on natural, visual landscape and cultural values. This management plan also acknowledges that recreational use of, and access to, the Reservoir spans back through generations of local residents to when the Reservoir was first constructed in the 1930s. It recognises that the area is now a popular recreation destination and intrinsically linked to the lifestyle of local people, who have a strong connection to the area. In light of this, the management plan proposes to maintain, but rationalise, recreational use of, and access to, the Reservoir.

The Department will manage visitor use in the context that decisions regarding the future use of the Reservoir are yet to be determined. If the Reservoir is to be used as a public drinking water supply, it will have significant implications for access to the waterbody and the type of recreational use that may be permitted both in and around the Reservoir (see Appendix 2). This in turn will effect management elsewhere within the planning area and nearby conservation reserves providing for recreation. As a result, the development of recreation facilities and services around the Reservoir will be phased in over time, allowing for flexibility to adapt to this potential change. Appendix 2 outlines the process by which the management of access and recreational use can be changed without the need to review this management plan.

The Department's Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b) outlines the Department's principles, operational guidelines, procedures and administrative controls in relation to facilitating recreation and tourism on the public conservation estate. This management plan follows these policy guidelines where applicable. Tourism Western Australia's publication *Keeping it real: A nature based tourism strategy for Western Australia* (Tourism WA 2004) should be considered in conjunction with this policy.

28. VISITOR OPPORTUNITIES

Regional Recreational Context

The planning area is located in Tourism Western Australia's South West Region, the most visited area of the state. It is situated near the main travel route from Perth, which is about a two-hour drive away, and is close to the major population centres of Bunbury and Collie. It also has links to the Ferguson and Preston river valleys, where visitors currently enjoy many wineries and scenic drives.

The planning area is located in a forest setting along the Collie River and adjoins the Wellington Reservoir. Such forested areas and inland waterways of the south-west are becoming increasingly popular for recreation. Most recreational activities focus on water bodies such as reservoirs, lakes and rivers, or in the surrounding forest. Many water bodies and catchments between Perth and Collie, such as Mundaring Weir, Victoria Reservoir, Bickley Brook, Brunswick, Canning River, Churchman Brook, Samson Brook, Wungong Brook and Serpentine, South Dandalup, Stirling, Logue Brook, Harris dams, are proclaimed as public drinking water source areas under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (MWSSD Act) or the CAWS Act. In many of these catchments, restrictions are placed on access and recreational use so as to protect water quality for drinking purposes. As a consequence, visitors have been displaced from these areas and now seek opportunities elsewhere within the region, increasing pressures on existing reserves and facilities. The planning area receives some of these visitors.

Waroona Dam, Glen Mervyn Dam, the upper Murray River and Stockton Lake are not proclaimed public drinking water supply areas and currently offer opportunities for recreation, including waterskiing and power boating, which is not permitted on the Reservoir or within the planning area. However, in developing viable water sources for the IWSS and GSTWSS, some of these water bodies may be desired as public drinking water sources in the future.

In recognition of the recent loss of Logue Brook Dam for recreation and the displacement of visitors from drinking water source areas further north, WC will create a $10 million trust account that would be used to develop alternative recreation facilities in the south-west. As a first step in the new recreational developments, the State Government have made a commitment to spend $3.29 million, in addition to the $10 million, to enable Lake Kepwari near Collie, to be opened for public recreation in 2008. The Department of Sport and Recreation will also begin a south-west recreational master plan to provide policy direction and clear user guidelines for community access and recreational activities in and around water bodies in the south-west.

Some recreational opportunities have become limited or restricted across parts of the region, especially between Collie and Perth. White-water canoeing is one activity that is available along the lower Collie River but elsewhere between Collie and Perth is restricted to the Murray River and portions of the Harvey River. Flat water canoeing is also available along the upper Murray River and at the Harvey Dam. These areas, and the Reservoir, are the only waterways between Collie and Perth where flat water canoeing exists in the absence of motorised boating. Camping areas are widespread throughout the region but there is a high demand and shortage of designated sites in river settings, with the exception of some areas such as Lane Poole Reserve. Activities associated with river settings, such as marroning and fishing, exist across the region but have reached their capacity in many river systems. South of the planning area, opportunities for recreation in river settings are restricted to sites along the Margaret and Blackwood rivers, St John Brook and sites along the south coast. There are few designated walking and cycling tracks within the region. The most recognised is the Bibbulmun Track and Munda Biddi Bike Trail. Other forms of track use, such as horse-riding, occur across the region on an ad hoc basis.

Visitor pressures may also come from overflow from nearby areas such as the Lane Poole Reserve.

Visitor Numbers and Trends

Visitors to the planning area undertake a variety of activities including picnicking, swimming, fishing, marroning, white-water canoeing, mountain biking, bushwalking, horse-riding, abseiling, scenic and four-wheel driving and camping. Surveys indicate that the most popular activities are bushwalking, swimming, camping, canoeing and white-water rafting, while observations by managers suggest particular growth in recreational activities such as four-wheel driving and mountain biking. Many of these activities are associated with a variety of river and reservoir settings, which are in high demand. Local people have undertaken these activities for many years and have strong attachments to the area, particularly informal campsites along the backwaters of the Reservoir. The lower Collie River valley and former Lennard block are experiencing increasing pressure from a wide range of recreational activities.

Visitation has increased over the past 10 years, peaking in the 1999–2000 financial year when the Reservoir overflowed and up to 145 000 visits[10] were recorded. Observations from park rangers suggest that these figures underestimate the true number of visits, as road counters used to collect the data are largely confined to Wellington Dam and Falcon roads, and exclude other entry points of potentially high usage, particularly around the Reservoir. Further monitoring along Connell Road will indicate to managers the popularity of camping sites around the eastern portion of the Reservoir. This area is primarily used by local people. Similarly, counters along Lennard Drive, River Road and Tom Jones Drive will provide managers with a tool to assess the level of use at Honeymoon Pool and Potters Gorge camping and day-use areas, as well as the correct use of one way roads.

The main period of visitation is in the summer months between October and April, with peak visitation in April. At these times, and especially during school holidays, holiday weekends and the marron season, recreation sites are filled to their designed capacity and visitors spill out of formal camping areas into informal sites. This temporarily affects the sense of seclusion that is available during non-peak periods. Spring is a popular time for activities such as scenic driving because of mild weather conditions and wildflower displays. In summer and autumn, the Collie River and the Reservoir are the focus of activity, with water-based recreation prominent. In the winter months, the kiosk precinct near the Reservoir wall is a focus for activity, particularly when it overflows. Lookouts, parking areas and roads near the Reservoir wall are constantly and heavily used by sightseers. Whilst it is thought that many of these visitors live locally, visitor surveys indicate that the highest proportion of visitors travel from Perth and are in the in the 40-59 year age bracket.

Due to rising visitor numbers, the capacity which many recreation facilities in the area were designed is frequently exceeded. Damage from vandalism and theft is also common at recreation sites.

Visitor satisfaction levels are monitored at selected sites using the Department's standard Visitor Satisfaction Survey. Although limited in the planning area, surveys have enabled trends to be identified and satisfaction levels compared to other areas of the State. This is an ongoing process that can be utilised to plan for visitor management.

[10] A visit is the number of people per day visiting a specific location. The visit figure comprises both recorded numbers of visits from traffic counter devices, surveys and other data sources as well as estimated numbers of visits based on field observation.

28. Visitor Opportunities

Key Points:

- The planning area is quickly and easily accessible from the major population centres of Bunbury and Collie and lies near the main travel route linking Perth to the south-west of the State. It also has links to the Preston and Ferguson river valleys, adding to its tourism potential.
- Visitor surveys indicate that the most popular activities are bushwalking, swimming, picnicking, camping, canoeing and white-water rafting while activities such as four-wheel driving, mountain biking, marroning and fishing are also popular. Visitation is steadily increasing.
- The planning area may come under additional pressure from visitors displaced from water bodies such as Stirling, Logue and Samson Brook dams, which are situated within proclaimed drinking water catchments and have reservoir protection zones that exclude public access.
- The Reservoir is a proclaimed public drinking water catchment and was formerly used as a drinking water supply until 1990 when the Reservoir became too saline. The Reservoir was made available for non-motorised water sports in 1990 but has been used informally for recreation since its construction. It is now a primary attraction for visitors and a focal point for recreation. The source could again be used as a drinking water source by 2017 (or sooner if the currently dry climate circumstances worsen).

The objective is to provide and maintain a range of sustainable, nature-based recreation opportunities based on visitor demand and trends.

This will be achieved by:

1. allowing for changes in access and recreational use should the Reservoir be required for public drinking water purposes. Appendix 2 provides a process by which such changes can occur;
2. considering other recreation and tourism opportunities within the region to avoid unnecessary duplication of opportunities within the planning area;
3. undertaking social research, including the Department's Visitor Satisfaction Survey, Visitor Statistics Program and research into visitor impacts, and opportunistic research, especially projects nominated through the Nature Based Tourism Research Reference Group; and
4. using the data collected from visitor surveys and research to improve management.

29. VISITOR USE PLANNING

Managing visitor use within the planning area involves the management of recreation activities, commercial activities, public safety and visitor interpretation, education and information. Consideration will also need to be given to any future decisions on the use of Reservoir (see the introduction to Part E *Managing Visitor Use* and Appendix 2). The planning framework adopted in this plan uses visitor management settings. An access strategy and a communication plan that is consistent with this framework is provided to complement management settings.

Visitor Management Settings

As the use of natural areas increases, resource conditions can change until the character of the setting is modified to a point where it no longer has the attributes that originally attracted people to the area. As a consequence, the initial users are displaced by people who are more tolerant of the changed conditions, with the process continuing until a uniform high level of services and facilities is provided. This is the concept of 'recreational succession' – where the very conditions of an area that attract recreational use are inevitably changed by that use (Prosser 1986).

The Recreation Opportunity Spectrum has been commonly applied as a standard planning tool in natural areas to address this issue (Clarke and Stankey 1979). The Department proposes the use of 'visitor management settings', derived from the Recreation Opportunity Spectrum principals, to manage recreational succession in natural areas and ensure that impacts on the environment are managed within acceptable limits. This is based on the concept that a range of different visitor management settings in an area provides opportunities for a range of different recreational experiences. Settings range from 'wilderness', which is the most remote end of the spectrum, to 'highly modified' (Appendix 5). Map 5 shows how these settings have been applied to the planning area. This application of visitor management settings within the planning area is consistent with the Department's and Conservation Commission's Statewide approach.

The system of visitor management settings is intended to guide the Department and Conservation Commission in determining what sort of recreation development may be appropriate within the settings. It is expected that this system will prevent the 'natural' sections of the planning area being subjected to incremental development.

It is important to note that not all visitor management settings need to be located in the planning area and that the allocation of an area to a particular setting does not necessarily mean that it should be developed to the full extent of the setting. In many cases, it is still desirable to maintain areas at lower levels of development.

Outside the planning area there are also a number of different settings, such as pine plantations and Lake Kepwari (the former open cut coal mine), that have the potential to support recreational use and provide alternative options to the planning area. However, it should be noted that such locations may offer a different visitor experience than can be provided by the planning area.

29. Visitor Use Planning

Key Points

- The challenge for protected area managers is to preserve the natural values of an area whilst managing visitor use.
- The planning framework for managing recreation across the planning area uses visitor management settings. This is used to limit unintended incremental development and ensure that impacts on the environment are managed within acceptable limits.

The objective is to provide visitors with a wide range of nature-based experiences whilst ensuring the impacts on key values are minimised.

This will be achieved by:

1. ensuring future recreational development is consistent with the visitor management settings shown in Map 5 and criteria in Appendix 5;
2. referring any future recreational developments or non-conforming use that will be inconsistent with the visitor management setting to the Conservation Commission; and
3. ensuring recreation and tourism developments and visitor activities are designed and constructed to minimise environmental, visual, cultural and social impacts.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
29.1 The range of visitor management settings	29.1 Maintain visitor management settings over the life of the plan	Every 3 years

30. VISITOR ACCESS

Lands and waters entrusted to the Department are generally open to public use. There are some areas where public access is restricted for reasons of safety, cultural sensitivity, disease control, protection of important natural values or the maintenance of roads and tracks.

The planning area has a high level of accessibility, with public access available to two and four-wheel drive vehicles via sealed and unsealed public roads and tracks. However, fully satisfying the demand for access could compromise key values. For example, increasing or improving access could lead to incremental changes to visitor management settings, and cause degradation of key values unless there is a concomitant increase in management effort. Therefore, access needs to be carefully managed in consultation with visitors and according to the proposed visitor management settings (see Map 6).

The lower Collie River valley and Reservoir foreshore are already at capacity and access to these areas needs to be controlled. Indicative access tracks to the Reservoir are indicated on Map 6. The final location of these tracks requires more detailed site assessment of both tracks and suitable campsites. These will be determined within 1 year of the commencement of this management plan. Access to the Reservoir will also be dependant on decisions regarding the future use of the Reservoir (see Appendix 2). Due to increasing visitation to the lower Collie River valley, it is possible that a more regulatory style of management may be required in the future.

Two-Wheel Drive Vehicle Access

Two-wheel drive access is focused on ensuring safe and enjoyable access to major developed visitor facilities such as the kiosk precinct near the Reservoir wall, Potters Gorge, Honeymoon Pool and popular day-use sites located along Lennard Drive. Facilitating access to the kiosk precinct is particularly important as this is the main area visited by tourists and an ideal location to provide information on the planning area, its attractions and tourism within the region. The Vehicle Access Strategy for the planning area is listed in Appendix 6 and shown on Map 6.

Two-wheel drive access to major visitor facilities is provided from the north and the south of the Collie River, thereby enabling convenient access for visitors from the Dardanup and Collie Shires, as well as people travelling from Perth and Bunbury. North of the planning area, the primary access route is Wellington Dam Road, which provides sealed, all weather access to the Reservoir. This route is the main conduit for visitors from Perth and Collie. From the south, visitors can access the Reservoir via Falcon Road. Pile/Mungalup Road provides an alternative route to the Ferguson River valley, the planning area and State forest, primarily for visitors on their way to Collie. These roads receive high visitor use and are the primary access routes to the planning area. As a result, they have been recommended for upgrading under the Roads 2020 Regional Road Development Strategy and should be maintained and developed accordingly (see *Roads 2020 Regional Road Development Strategy* below).

Access from the north and south of the planning area enables roads, such as the scenic Lennard Drive, to be easily reached. Lennard Drive has been designated as a one-way road to preserve its highly valued driving, picnicking and water-based recreational experiences and due to the high costs of upgrading it to a safe two-way road. Scenic drive opportunities are available along this road with visitors able to return to the Reservoir in a loop via River Road and the Honeymoon Pool camping and day-use area.

Recreation sites such as the Wellington Discovery Forest and King Jarrah can be accessed by two-wheel drive via Wellington Forest Road and King Tree Road respectively. These roads provide a link to Pile and Falcon roads and their sealing would facilitate links to all major recreation developments as well as links to the Ferguson River valley. Two-wheel drive access

can also be gained along Lennard Road where several mountain bike tracks originate. The eastern part of Wellington National Park and the backwaters of the Reservoir can be accessed via four-wheel drive tracks emanating from Connell Road. Flora Road, along the western edge of Westralia Conservation Park, has the potential to be upgraded, thereby improving access to the upper Collie River. From Collie, the main road connecting these areas from the south is Mungalup Road.

Several utilities also traverse the planning area, all with associated roading (see Section 41 *Public Utilities and Services*). Thirteen permanent fire appliance refilling points (small dams or wells) exist for fire management purposes and require access. Many of these are already located along existing two-wheel drive roads. Furthermore, access is also required to research plots (e.g. the CSIRO Salinity Research Plot off Wights Road) and for commercial operators with lease arrangements.

Enclaves of private property are accessed via Coalfields Road and tracks branching from it, as well as Wellington Dam Road, Polo Road, Windy Ridge Road and Beela Road.

Roads 2020 Regional Road Development Strategy

The Roads 2020 Regional Road Development Strategy (Main Roads Western Australia 1997) identifies proposed road developments in the south-west (Table 8).

Table 8. Roads 2020 Regional Road Development Strategy

Road	Development Strategy	Proposal*
Coalfields Road	Improve road geometry to allow for anticipated traffic growth	Improve to a Type 6[11] sealed road standard
		Construct a dual carriageway or 4-lane road
Mungalup Road**	Improve roads to a consistent standard to cater for the mix of tourist and commercial use	Upgrade approximately 4.5 km to Type 4[12] sealed road standard
Pile Road**	Improve roads to a consistent standard to cater for the mix of tourist and commercial use	Realign, widen and seal to Type 4 sealed road standard
Wellington Dam Road**	Improve roads on crests and curves to achieve satisfactory sight distances	Upgrade to Type 5[13] sealed road standard
Falcon Road**	Improve roads to improve sight distances and cater for current traffic and forecast growth	Upgrade to Type 4 sealed road standard

* Recommendations of the Roads 2020 Regional Road Development Strategy describe proposed road upgrades in terms of eight service levels ranging from Type 1 – unformed roads with minimum construction to Type 8 – dual carriageways.

** Road managed by the Department.

Typically, these roads are major traffic routes of strategic importance and are expected to have high usage in the future. For example, Coalfields Road is used primarily for regional transportation and is the most heavily used road connecting to the planning area. The Dardanup and Collie Shires recognise the values in Pile, Mungalup and Wellington Dam roads in terms of nature-based tourism and have contributed previously to their maintenance.

When implementing road developments, the Department or Main Roads Western Australia undertake the necessary environmental impact assessments to satisfy the requirements of the Environmental Protection Act, the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and the Wildlife Conservation Act. The Department, in consultation with the Conservation Commission, should also consider the principles of visual landscape management where practicable and provide advice to Main Roads Western Australia as to how this can be best incorporated into any developments.

[11] Type 6 roads are sealed roads with extra seal width than Type 5 roads to improve safety, reduce maintenance costs, provide space for a stationary vehicle to stand clear of traffic lanes and to assist cyclists.

[12] Type 4 roads are sealed roads designed to improve road user comfort and safety with higher traffic volumes.

[13] Type 5 roads are sealed roads with extra seal width than Type 4 roads to cater for higher traffic volumes and a high proportion of heavy vehicles.

Four-Wheel Drive Vehicle and Trail Motorcycle Access

Ownership of four-wheel drives has increased significantly in recent years and subsequently a growing number of people are enjoying this type of activity. Many four-wheel drive users are attracted to the isolation, peaceful bush settings, scenic driving opportunities and sense of freedom associated with travelling on tracks that, by virtue of the more difficult access, are less visited and offer a different quality of experience.

Within the planning area, four-wheel drive use is most common in the lower Collie River valley, portions of the former Gervasse Block and in the backwaters of the Reservoir. Trail motorcycle use is particularly evident towards park boundaries in areas such as the Westralia Conservation Park, throughout the former Lennard Block and nearby to adjoining subdivided land. Most tracks are not maintained on a regular basis and use may lead to environmental degradation and the spread of weeds and disease. Use of trail motorcycles on designated walk and bicycle trails is causing conflicts between users and creates noise problems.

Lennard Drive, west of River Road (also known as Lennard Track), is a favourite area for four-wheel driving as is Sneaker, Goat, Goon and Lookout roads and the track along Sailor's Gully (see Map 6). However, heavy use and increasing traffic volumes, combined with steep slopes and erodible soils, is accelerating erosion and has seen the condition of many tracks deteriorate. Specific management of these tracks is required to minimise impacts.

Lennard Track, because of its relatively natural state, steep slopes, sensitive vegetation types and proximity to the Collie River (a registered Aboriginal heritage site) will require specific management to prevent further degradation. Currently, the environmental damage caused by the use of the Track (primarily by inappropriate four-wheel drive use combined with camping adjacent to the Collie River) is not sustainable or appropriate and cannot continue. Camping in particular cannot be sustained in the long-term without major site hardening (including engineering works) and a significant change to visitor experiences, which will change the relatively 'undeveloped' nature of the area. Since developed sites already exist at Honeymoon Pool, camping along the Track will be discontinued. The local Aboriginal people also desire camping to be discontinued, as it will minimise disturbance to the registered heritage site. However, alternatives for semi-remote camping will be identified elsewhere within the planning area.

To address continued access, Lennard Track will be closed seasonally[14] (on a trial basis) to see if this can protect the natural values of the area. If not, access may be restricted to a permit system or the Track closed, either temporarily or permanently. To maintain access, small-scale day-use facilities (e.g. for car parking and river access points), would need to be provided to manage visitor use and minimise impacts on the natural and cultural values. These would be sensitively designed in consultation with local Aboriginal people and constructed to be sustainable and appropriate to the visitor management setting.

The Department, the WA Four Wheel Drive Association and Trackcare have signed a memorandum of understanding to establish a framework to support the management and maintenance of sustainable four-wheel driving opportunities on lands managed by the Department. In the planning area, co-operative work between the Department, four-wheel drive clubs and Trackcare has lead to rehabilitation and reinforcement of Lennard Track and some of the other eroded tracks. Four-wheel drive clubs and Trackcare have also adopted Lennard Track and planned repair work to areas such as Sailors Gully. However, with unrestricted use and no routine maintenance, some tracks can not be sustained in the long term for four-wheel drive activities and management intervention is needed. Where the values of the land are under threat (e.g. by disease, erosion or loss of vegetation) or an incident has occurred, tracks will be

[14] Gates may be installed on tracks to be closed seasonally. These will remain open at all times except during periods when it is necessary to close the tracks, such as for environmental reasons, fire risk, management operations or emergency purposes.

subject to seasonal closure on a trial basis. If these values continue to be threatened, access may be restricted to a permit system or the track will be temporarily or permanently closed to all public use or to selected classes of vehicles. Such roads are described in Appendix 6 and shown on Map 6. Some roads/tracks may also be designated as being for management purposes only and therefore not available to public access by vehicle. These roads/tracks will generally remain open for management operations only, such as for fire management, strategic access for conservation or for evacuation purposes. Signs and gates will be erected in disease risk areas and areas of restricted use.

In addition to access for recreational use, access to beekeeping sites must be maintained to support this enterprise. However, the spread of weeds and disease needs to be considered in maintaining access routes. It is essential that these roads be maintained according to established standards.

30. Visitor Access

Key Points:

- Access needs to be carefully managed in consultation with visitors to make sure that it is consistent with the visitor management setting for the area and environmental and cultural values are maintained. This ensures that highly valued qualities of the setting, such as remoteness, are preserved and not subject to incremental changes.

The objective is to provide and maintain a range of access types consistent with maintaining or enhancing key values.

This will be achieved by:

1. providing access as shown in Map 6 that is consistent with Department policy and the appropriate visitor management setting;
2. maintaining, upgrading, realigning, closing or rehabilitating roads and tracks in accordance with the Vehicle Access Strategy (see Appendix 6). In addition to those not identified in the Vehicle Access Strategy, rehabilitate tracks that are deemed unnecessary or if there is an adverse impact on the environment;
3. modifying access as required following the identification of protectable areas (see Section 24 *Disease*);
4. continuing to prohibit vehicles driving off dedicated roads, CALM Act roads and tracks and designated walk and bicycle trails, except with the approval by the District Manager;
5. ensuring 'management only' tracks are effectively closed to the public;
6. in consultation with the local Aboriginal people, providing day-use facilities along Lennard Track that are sensitively designed, sustainable and appropriate to the visitor management setting;
7. determining final access routes to the Reservoir within 1 year of commencing this management plan;
8. liaising with Main Roads Western Australia where development is proposed in road reserves adjacent to the planning area to ensure appropriate management with regards to flora surveys, *P. cinnamomi*, weeds, drainage control, visual amenity and rehabilitation;
9. providing information to users on appropriate four-wheel drive techniques and introduce a code of practice for driving on four-wheel drive tracks; and
10. monitoring the environmental impacts of four-wheel drive and trail motorbike use and take appropriate management action as required.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
30.1 Changes in the condition of Lennard	30.1 Track condition is maintained or improved	Annually

Track and four-wheel drive tracks designated for seasonal closure	from 2008 levels	

31. VISITOR ACTIVITIES AND USE

31.1 Overnight Stays

Overnight stays may be catered for by built accommodation or through the provision of camping facilities, some of which attract fees. The Department's Policy Statement No. 18 *Recreation, tourism and visitor services* covers accommodation and camping policies in detail.

Built Accommodation

Built accommodation on lands and waters managed by the Department is generally provided by way of a commercial concession and gives due consideration to cooperating with the private sector in the provision of a range of accommodation. In the planning area, built accommodation, in the form of self contained cabins, is available at Wellington Mill Cottages (also known as Wellington Forest Cottages), located off Wellington Forest Road. This area contains eight cottages and operates under a lease agreement issued by the Department. It is used extensively by school groups who undertake educational tours of the area.

A range of built accommodation is also available in nearby areas, such as the Ferguson River valley and Collie and Allanson townsites. These areas support a range of accommodation types including chalets, farmstays, caravan parks, motels and lodge accommodation. Directing visitors to use these facilities may benefit these enterprises and tourism within the region. Therefore, it is preferred to locate future built accommodation outside the planning area. The Department will aim to provide opportunities that are not otherwise provided in these areas. Key values of this plan, visitor management settings and the capacity to accommodate further development should be considered.

Camping

Camping is a common and popular activity allowing visitors to relax in a natural environment. Camping areas and facilities exist at Honeymoon Pool and Potters Gorge, both of which are well patronised by visitors. They offer high quality facilities including two-wheel drive access, parking areas, toilet facilities, reticulated water, rubbish removal, picnic furniture and access to the water for swimming and boating (see Map 7). Potters Gorge is a relatively 'developed' recreation facility designed to accommodate special events. Hike/cycle-in campsites with limited facilities and services diversify the visitor experience and are available along the Bibbulmun Track and Munda Biddi Bike Trail.

Expanding and hardening campsites such as Honeymoon Pool and redeveloping Potters Gorge, and providing larger camping sites suitable for campers/trailers at the latter, will cater for an increasing demand for group camping, as well as a greater number of individual campers. The expansion of the Honeymoon Pool camping area will continue to be subject to ongoing monitoring of western ringtail possums, which will determine the effect that recreation is, or may, have on this species. The use of generators at Honeymoon Pool is a problem as it disrupts visitors and affects their enjoyment of the site. Prohibiting their use or introducing a curfew for operating times is necessary and will be employed at this site, and other sites, as required.

With few suitable planned campsites available at the time of writing, a number of informal or 'wild' campsites have developed, particularly around the backwaters of the Reservoir. Some sites around the Reservoir have existed for over 20 years and have become traditional camping areas, used by generations of visitors for marroning, fishing and other water-based activities. These informal sites are not maintained and have a high intensity of visitor use, particularly

during the marron season. As a result, site degradation, particularly loss of vegetation and scenic quality, erosion and soil compaction are common occurrences at many sites. There are also issues regarding to toilet waste, rubbish disposal and firewood collection. Increasing vehicle access to these sites without appropriate management may exacerbate their expansion and subsequent degradation.

To maintain sustainable opportunities in the long-term, camping around the Reservoir will be limited to designated campsites in recreation nodes (indicative locations are shown on Map 7). Potters Gorge is an established formal campsite with pre-existing infrastructure and therefore will be retained.

At some campsites around the Reservoir, it may be desirable to restrict access or limit visitor numbers in order to protect the environment or maintain a particular visitor management setting. This may result in some sites being permanently closed, but will allow managers to maintain sites that remain open and provide an adequate level of facilities (e.g. toilets). Campsites that are developed around the Reservoir will contain basic facilities and will be phased in over time, allowing for flexibility to remove facilities or alter management if the Reservoir is required for drinking water purposes in the future.

Informal campsites also exist along Lennard Track, including one site used frequently by the WA Four Wheel Drive Association. These sites offer considerable attractions to visitors and are popular for scenic driving. However, camping in this area presents several issues to managers:

- important natural values;
- significant cultural heritage values;
- erodible soil types;
- exclusive use of campsites;
- campsite expansion and an increase in the number of informal campsites;
- steeply sloping landscape, limiting areas suitable for camping and increasing the risk of erosion;
- high cost of engineering works required to develop campsites; and
- change towards a more developed visitor management setting if campsite development were to occur.

Consequently, camping along Lennard Track will be prohibited. A more suitable use is to designate the area as day-use only and promote it as a scenic four-wheel drive route. This will be accompanied by minimal facilities such as small parking areas and picnic tables. An alternative for a semi-remote basic campsite, accessible only by four-wheel drive, will be developed north of the Collie River.

Consideration will also be given to the development additional camping opportunities which can be accessed by two-wheel drive. This will take some of the pressure off Honeymoon Pool and ensure the long-term sustainability of this site. The need for additional campsites would be triggered by the degree to which visitor use is impacting on Honeymoon Pool and the availability of camping opportunities around the Reservoir. Opportunities for additional campsites to be developed along the Collie River below the Reservoir wall are limited.

As a general principal, the Department will continue to promote the ‘tread lightly’ and ‘leave no trace’ minimal impact camping philosophy, which encourages visitors to adopt a ‘clean, crush and carry out’ policy and take their rubbish home with them.

Remote Camping

A proposed walk/canoe-in only campsite, which will contain minimal facilities and cater for groups, is to be developed near the Reservoir. This site will be limited to walkers, canoeists and

management vehicles only (see Map 7). It will form part of a canoe trail from Allanson to Potters Gorge.

Campfires

Campfires provide a focal point for social interaction, and to many visitors are a traditional and valued part of their park experience. Fire rings and barbecue plates for campfires are available at campsites such as Honeymoon Pool and Potters Gorge as well as day-use sites along Lennard Drive, including the Rapids, Big Rock, Little Rock and Long Pool. A number of illegal campfires are also lit in informal campsites. Firewood is currently supplied at Honeymoon Pool and Potters Gorge.

The collection of firewood and escapes from campfires is a particular concern for managers. Firewood removal has detrimental effects on natural ecosystems, including loss of vegetation cover, reduction in habitat integrity, the spread of *Phytophthora* and possible changes to the nutrient balance of ecosystems. The area around fireplaces also suffers from vegetation loss and compaction, the accumulation of ash and the failure of groundcover to regenerate where there have been continuous open fires. Sites impacted by open fires and firewood collection can take many years to recover and regenerate. Degradation can already be seen at many campsites including tree stumps from felled trees. Consequently, the firewood collection will be prohibited (see Section 43 *Forest Produce*).

There are significant management costs associated with firewood supply and the Department is investigating the most cost-effective option to supply a source of fuel in the long-term. This may include:

- the Department continuing to provide firewood;
- the Department providing firewood in designated areas or at suitable park entry points;
- a contractor providing firewood;
- visitors may be encouraged to bring their own firewood; or
- a combination of the above.

For cooking purposes, gas or electric barbecues will be provided at the most popular recreation sites where this is cost effective and practical. Elsewhere, visitors will be required to supply their own gas for cooking.

Escapes from campfires can lead to wildfires within the planning area. This is a significant problem in the backwaters of the Reservoir and is likely to become more of a problem in other areas as visitor numbers increase. Consequently, campfires can only be lit in authorised fire places (i.e. fire rings provided in designated camping sites). Furthermore, campfires will only be permitted after nightfall (6 pm to 9 am) from December to April. Gas-only cooking is an alternative and is permitted at all times.

31.1. Overnight Stays

Key Points:

- Overnight built accommodation, in the form of self-contained cabins, is available at the Wellington Mill Cottages (also known as Wellington Forest Cottages).
- Designated camping areas for overnight stays have been established at Honeymoon Pool and Potters Gorge. Fees are charged at these sites to partially offset the cost of maintaining these areas.
- Informal (wild) campsites exist throughout the planning area, particularly near the Reservoir. Site degradation, particularly loss of scenic quality, erosion and compaction of the soil, loss of vegetation and littering, is occurring.
- Campfires are a valued part of the camping experience. However, the use of firewood

can have significant impacts on natural values within the vicinity of campsites and escapes from campfires can occur.

The objective is to provide appropriately located and designed built accommodation and a range of sustainable camping opportunities whilst minimising environmental and other impacts.

This will be achieved by:

1. retaining existing built accommodation, and considering further built accommodation in accordance with Department policy and in consultation with the Conservation Commission, where it is commercially viable, consistent with the visitor management setting, meets environmental, visual landscape and social objectives of this management plan and provides opportunities not already available on adjoining lands;
2. investigating opportunities for partnerships with commercial concessionaires to provide built accommodation;
3. providing a range of camping opportunities (i.e. Honeymoon Pool, Potters Gorge, nodes around the Reservoir and a walk/canoe-in only sites) in accordance with Department policy and relevant legislation;
4. redeveloping the Potters Gorge camping area and considering the expansion of Honeymoon Pool;
5. considering the development of additional, two-wheel drive accessible campsites, to take some of the visitor pressure off Honeymoon Pool;
6. prohibiting the use, or restricting the operating hours, of portable generators or battery charging plants at Honeymoon Pool and other selected campsites;
7. prohibiting camping along Lennard Track;
8. charging fees for camping at designated camping sites;
9. developing a monitoring system to quantify the impacts of camping at selected sites. Where the impacts are unacceptable, permanently or temporarily restricting access to these areas; and
10. managing campfires by:
    - permitting campfires in designated fireplaces (i.e. fire rings provided in designated camping sites) only and, from December to April, only at night;
    - investigating the most cost effective and efficient method to supply firewood and applying this to the planning area;
    - providing fuel (e.g. gas or electric barbeques) to designated overnight sites and selected day-use sites where this is cost effective and practical; and
    - reducing the collection of firewood through public education.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
31.1.1 Changes in the area of disturbance zone around campsites	31.1.1 No increase in the disturbance zone around campsites from 2008 levels	Annually
31.1.2 Number of trees at selected campsites that are damaged	31.1.2 Less than 10% of trees damaged around campsites	
31.1.3 Number of trees at selected campsites with exposed roots	31.1.3 Less than 10% of trees around campsites with exposed roots	
31.1.4 Number of wildfires in the planning area attributed to escapes from campfires	31.1.4 Reduction in percentage of wildfires per visit attributed to escapes from campfires	Every 5 years

31.2 Day-use

Many recreational pursuits within the planning area can be carried out over the course of a single day. These include picnicking, barbecuing, sightseeing, swimming, photography, marroning, fishing and nature study. Existing facilities enable the visitor to enjoy a high quality experience that is both comfortable and safe. Day-use facilities are provided at the kiosk and quarry, Honeymoon Pool, Potters Gorge, Wellington Discovery Forest, Lennard Drive and King Jarrah. These are shown on Map 7.

The kiosk and quarry, Honeymoon Pool, Potters Gorge and Wellington Discovery Forest are the major day-use sites, offering a range of facilities including picnic tables, reticulated water, septic toilets, visitor information and group facilities. The kiosk also provides take-away/cafe food and basic provisions. All day-use facilities located in high use areas, such as Honeymoon Pool, Potters Gorge, Wellington Discovery Forest and the kiosk and quarry, have rubbish bins. Potters Gorge and the quarry also have gas barbecue facilities whereas Honeymoon Pool offers fire rings for open fires and a supply of firewood. Smaller day-use areas occur along Lennard Drive, including the Rapids, Long Pool, Big Rock and Little Rock. Other small day-use areas exist at specific points of interest, such as the King Jarrah site, which offers vehicle access and parking facilities as well as information interpreting the site.

Additional day-use facilities are required along Flora Road on the upper Collie River. This road is a popular scenic tourist route and basic facilities such as picnic tables and toilets are needed for visitors wishing to pass through the area. This will minimise the erosion of streambanks and adhoc recreation that may damage riparian vegetation. Similarly, small-scale facilities such as stopping and river access points, would need to be provided to manage visitor use and minimise impacts along Lennard Track. These will be sensitively located and designed in further consultation with the local Aboriginal people and the WA Four Wheel Drive Association and constructed to be sustainable in the long-term.

Whilst some provision will be made for rubbish collection in day-use areas, there will be an emphasis on encouraging visitors to take their rubbish home or to approved disposal sites.

Future development of day-use facilities will be in keeping with visitor management settings and be compatible with key values.

31.2. Day-use

Key Points:

- The Department provides day-use sites at the kiosk and quarry, Honeymoon Pool, Potters Gorge, Wellington Discovery Forest, Lennard Drive and King Jarrah. Activities include picnicking, barbecuing, sightseeing, swimming, photography, fishing, walking and nature study.
- Informal day-use sites exist along Flora Road and Lennard Track.
- Erosion of streambanks and damage to vegetation is a particular issue at day-use sites.

The objective is to provide opportunities for day-use in appropriate environmental and visitor management settings, which encourage visitor enjoyment and understanding of key values.

This will be achieved by:

1. implementing proposals for day-use sites as per Maps 7 and in accordance with Department policy, site capabilities and established standards;
2. designing day-use sites along the Collie River in consultation with local Aboriginal people; and
3. encouraging visitors to take their rubbish home or to approved disposal sites.

Key Performance Indicator (see also Appendix 1):		
Performance Measure	**Target**	**Reporting Requirements**
31.2.1 Satisfaction of the local Aboriginal people	31.2.1 The design of day-use facilities along Lennard Track satisfies the local Aboriginal people	On completion of designs for day-use facilities

31.3 Abseiling and Rock Climbing

Abseiling and rock climbing are popular outdoor adventure sports that occur at the quarry near the Wellington Reservoir wall. This area, which has been formally assessed, is suitable for this activity, providing easy access, approved abseil anchor points and adequate facilities such as toilets and parking. The quarry offers one of the few opportunities for this type of activity within, and nearby to, the planning area. Other areas, such as granite outcrops, are not suitable as they are fragile and contain important natural values.

Recreational abseiling and rock climbing is usually undertaken in very small numbers, often by only one or two people. However, commercial operators and other organised groups also use the area. Typically, participants in these groups are inexperienced novices and are under the control of experienced instructors. Instructors have a responsibility to ensure that all members of the group observe safety, environmental and ethical standards. This requires certain minimum standards of experience, competency in instructors and acceptable student to instructor ratios. Consequently, all commercial operators, as well as not-for-profit groups conducting rock climbing and abseiling activities with dependent participants, must be registered under the National Outdoor Leader Registration Scheme or hold current equivalent accreditation recognised by the Department. A permit is required and commercial operators must obtain a commercial activity licence.

Permits may limit the time of use and number of participants. The impact of erosion, the danger of falling rocks and the rights and enjoyment of other visitors will be considered for all permits and site assessments. A fee is required to allow for regular inspections of the site and the maintenance and testing of abseil anchor points. Information on booking and permit requirements to use the site will be signposted and published in pre-visit information.

31.3. Abseiling and Rock Climbing

Key Points:

- Abseiling and rock climbing opportunities exist at the quarry but are limited elsewhere within, and nearby to, the planning area.
- Areas considered of high conservation value, such as granite outcrops, or unacceptable visitor risk, are not suitable for abseiling or rock climbing.
- Commercial operators and organised groups who conduct abseiling and climbing activities on Department-managed lands must book and obtain a commercial activity licence and/or permit. This also applies to recreational users in groups greater than five.

The objective is to provide opportunities for abseiling and rock climbing, which are safe and located in areas able to sustain such use.

This will be achieved by:

1. designating the quarry for abseiling and permitting recreational use, organised groups and commercial operators at the site in accordance with the CALM Regulations, relevant Departmental policies and site capability;
2. permitting abseiling and rock climbing in organised groups or with commercial

operators where they have booked and a commercial activities licence and/or permit is granted. Where recreational groups sizes are greater than five people, participants are also required to book and obtain a permit;
3. maintaining abseiling and climbing facilities according to established standards; and
4. signposting and publishing in pre-visit information the requirements for using and booking the site.

31.4 Boating

Boating, which includes canoeing, kayaking and white-water rafting, is a popular activity within the planning area. People enjoy canoeing from the Allanson townsite down to Potters Gorge, camping along the way, whilst others travel down the lower Collie River. The latter is popular for commercial operators for white-water rafting tours, although the inconsistency of water discharged from the Reservoir is a constraint. Regattas, such as the King's Cup and dragon boat events, have occurred at Potters Gorge.

Non-motorised boating, principally canoeing and white-water rafting, will continue to be permitted along the Collie River downstream of the Reservoir wall and upstream of the Black Diamond Pit. Opportunities may also exist for licensed commercial operators to undertake canoe, paddle and rowboat hire along these portions of the Collie River. Special events will be considered on a case-by-case basis.

At the time of writing, non-motorised boating is permitted on the Reservoir, except for sailing and windsurfing which are prohibited due to the presence of submerged stumps and logs. The Department will facilitate the development of a canoe trail from Allanson to Potters Gorge by including a canoe/walk-in only campsite on the banks of the Reservoir (see indicative location on Map 7).

Motorised boating is generally not permitted on inland waters where its use is not already established. At present, motorised boating is not permitted on the Reservoir as it poses an unacceptable risk to water quality (principally from fuel pollution), submerged hazards pose a risk to visitors and because it disturbs the natural amenity of the area. This situation will continue. However, it is recognised that it may be necessary for motorised boats to operate on the Reservoir in some circumstances. These may include Departmental and search and rescue operations, scientific research, inspections by Government agencies and for safety purposes during organised non-motorised boating events. In these instances, approval of the District Manager and consultation with DoW is required. The Department for Planning and Infrastructure, under the *Navigable Water Regulations* of the *Marine Act 1982*, control boating activities in terms of vessel and operational safety.

Much of the impact of boating occurs at the point of access to the water body where erosion of riverbanks, compaction of soil, littering and the removal of stabilising riparian vegetation can occur. Access points need to be carefully selected for environmental reasons, to maintain visitor safety and to reduce visitor conflict over congestion. Current access points for boat/canoe launching are available at Potters Gorge and Honeymoon Pool and will be provided at appropriate locations downstream of the Reservoir wall. Suitable boat access points will also be developed on the banks of the Reservoir.

31.4. Boating

Key Points:
- Non-motorised boating occurs in the Reservoir and the lower Collie River. Some people enjoy canoeing from the Allanson townsite down to Potters Gorge, camping along the way.
- Motorised boating can have negative effects on other users, fauna, and water quality

and may cause bank erosion or sediment disturbance. In the past this type of activity has been prohibited on the Reservoir, and will continue to be prohibited in the future.

The objective is to provide for boating activities that are sustainable and consistent with the protection of key values.

This will be achieved by:

1. managing boating in accordance with Department policy and other relevant legislation;
2. providing for non-motorised boating along the Collie River and, in consultation with DoW, continuing to support the activity on the Reservoir;
3. providing appropriate access points for boat launching and stopping and designing, constructing and maintaining these areas according to established standards and site capability;
4. permitting non-motorised boating events on assessment and approval of the District Manager and following consultation with DoW;
5. permitting commercial operators to run non-motorised boating tours of the lower Collie River subject to environmental sustainability, visitor safety, maintenance of cultural values and the relevant licensing conditions;
6. liaising with DoW and WC regarding the provision of water flows for recreational use along the lower Collier River, below the Reservoir wall;
7. prohibiting motorised boating along the Collie River and, in consultation with DoW, continuing to prohibit the activity on the Reservoir. Exemptions may be granted for Department operations, research activities or safety purposes during organised boating events. A permit and/or approval by the District Manager will be required; and
8. providing information and signs at popular boat launching areas regarding hazards and boating regulations. Alternative boating opportunities in the region should also be identified.

31.5 Bushwalking

Bushwalking is an activity that is enjoyed by people of varying ages, interests and levels of physical fitness and mobility. In its various forms, bushwalking can encompass everything from a short, leisurely stroll to a major trek lasting days or even weeks.

In the planning area, walkers commonly seek opportunities for half, one and two day walks, which can be carried out over the course of a day or weekend. Half-day or shorter walks in loops from recreation nodes are particularly popular for visitors as they can be combined with other activities such as scenic driving and picnicking. Locations that provide an assortment of these opportunities in the one area, and provide links to suitable accommodation and visitor facilities, are most desirable to walkers.

Several walks and tracks, covering approximately 70 km, are currently in place. These are summarised in Table 9 below and shown in Map 7. Walking is also available along public roads, management only tracks and tracks that are seasonally closed.

Dual use walking and cycling tracks exist from the kiosk/Reservoir wall to Potters Gorge and along the Sika Circuit (Table 9 and Map 7). These tracks are located in areas of high visitor demand and use, and provide a variety of recreation opportunities in areas where it is desirable to manage the impacts on the natural environment by confining visitor use to a single track. In the case of the Sika Circuit, dual use is applied to protect riparian vegetation, limit the number of unnecessary tracks and minimise erosion.

Table 9. Walk Tracks in the Planning Area[15]

Walk Track	Approximate Length (km)	Visitor Management Setting	Current Status*	Proposed Status	Walk and Cycle Track
Existing Walk Tracks					
Quarry to the Reservoir wall	0.2	Highly Modified (Class B)	Class 2	Class 2	No
Kiosk to Potters Gorge	1 (one way)	Highly Modified (Class B)	Class 2	Class 2	Yes
Jabitj Track (Running water track)	5.6 (one way)	Highly Modified (Class A)	Class 2	Class 2	No
Kurliny Tjenangitj Track (Come and see track)	5.2 (return)	Natural-Recreation	Class 3	Class 3	No
Wellington Discovery Forest (two tracks)	1.1 and 5 (return)	Recreation	Class 3	Class 3	No
Bibbulmun Track	965 (total track length)	Natural-Recreation	Class 4	Class 4	No
Sika Circuit	9.3 (return)	Natural-Recreation	Class 4	Class 4	Yes
Tynedale Track (former Bibbulmun Track circuit route)	39.8 (return)	Natural-Recreation	Class 4	Close	No
Lennard Circuit (former Bibbulmun Track circuit route)	24.3 (return)	Natural-Recreation	Class 4	Close	No
Proposed Walk Tracks					
Honeymoon Pool to the Reservoir wall (southern side of the river)	6.2	Highly Modified (Class A)	Proposed walk track	Class 3	No
Wellington Discovery Forest Information centre to King Jarrah	5.2	Recreation	Proposed walk track	Class 4	No

* As defined by the Australian Standards for walk tracks (refer to the Department's Policy Statement No. 18 *Recreation, tourism and visitor services*).

The existing network of tracks will be expanded, providing short to medium length walking opportunities by linking areas such as Wellington Discovery Forest information centre and the King Jarrah day-use site. Informal walk tracks also exist along the southern side of the Collie River, linking day-use sites and providing paths for marroning and fishing activities. These paths are numerous in places and in some cases there are several different paths parallel to the River. These are to be consolidated and formalised into a single path with appropriate river access points. Formal access to the portion of the Collie River that runs through the proposed Westralia Forest Conservation Area will also be provided. Walk-in only opportunities providing remote overnight stays for walkers will also be developed along the Reservoir foreshore (Map 7).

Opportunities exist for further walk tracks, varying in distance, difficulty, accessibility and scenic environment. For example, there is the opportunity to link the Bibbulmun Track to the eastern side of the Reservoir and for a two-day walk track around the Reservoir, both providing scenic views of the waterbody. These tracks may also link up to walk/canoe-in camping opportunities. A loop walk track around the Reservoir also provides a suitable alternative to the Tynedale and Lennard Circuits, which are not well used by visitors as much of their alignment follows roads. Smaller walk tracks branching from designated access roads can also provide feature stop points along scenic drives, thereby taking advantage of spectacular views. Tracks

[15] Informal walk tracks are not included in this table.

emanating from recreation sites such as Potters Gorge may also provide the opportunity for the development of interpretive heritage tracks. An opportunity also exists to link the Reservoir to the Wellington Discovery Forest via a walk track. Walk tracks in the Wellington Discovery Forest may be expanded according to visitor demand. Such opportunities should be pursued if demand warrants it and resources are available.

The impact of bushwalking on the physical environment, while generally low compared to other recreation activities, can be quite variable depending on soil conditions, landform, vegetation type and intensity of use. Where use levels are high, bushwalking has the potential to lead to the loss of vegetation, introduction and/or spread of weeds and plant diseases (e.g. *P. cinnamomi*) and localised soil compaction and erosion problems. Sensitive sites include riparian vegetation along streambanks, granite outcrops and wetland areas. Usually these problems can be minimised through the sensitive location and design of paths and the adoption of environmental codes of conduct such as those for the Bibbulmun Track.

31.5. Bushwalking

Key Points:

- Bushwalking enables visitors to experience the natural environment at close quarters.
- Approximately 70 km of walking tracks (classes 2, 3 and 4) exist within the planning area, including the Bibbulmun Track, short interpretative tracks at the Wellington Discovery Forest and the quarry, Sika Circuit, Kurliny Tjenangitj Track and Jabitj Track.

The objective is to provide a range of bushwalking opportunities that meet visitor needs and do not adversely impact on key values.

This will be achieved by:

1. developing bushwalking tracks as shown in Map 7 in accordance with Department policy and the proposed track classification in Table 9;
2. considering opportunities for developing further walk tracks;
3. designing, constructing and maintaining all tracks in accordance with established planning procedures, environmental controls and standards;
4. introducing management controls, including the temporary resting, realignment or closure of tracks, where the intensity of walking threatens key values or the enjoyment of other users;
5. applying the Bibbulmun Tracks 'Caring for Campsites and the Track' code of conduct; and
6. providing adequate information from which visitors can choose the walk best suited to their needs.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
31.5.1 The satisfaction that visitors express with their visit in relation to the use of dual use trails	31.5.1 Bushwalkers continue to be satisfied with tracks designated for dual use	Every 5 years

31.6 Cycling

Recently, there has been extraordinary growth in the popularity cycling, particularly mountain biking, both as a recreational and competitive activity. This popularity has corresponded to an increased demand for new trails and the expansion of the current trail network on Department-managed lands.

In response to this, the Department established a Mountain Bike Working Group and is working with the Western Australian Mountain Bike Association, Perth and South West mountain bike clubs and other groups/users to develop a classification system for developing sustainable, purpose-built mountain bike facilities throughout the State. As part of this process, representative mountain bike groups have identified several different types/styles of mountain biking as well as their different track requirements (Table 10). The most suitable style of riding on the conservation estate appears to be cross-country mountain biking.

Table 10. Requirements for Mountain Bike Riding

Type/style of Use	Trail Characteristic/Requirements
Singletrack	The trail type sought by enthusiasts, because of the technical challenges, segregation from motor vehicles and the experiences of natural areas it offers
Cross-country mountain biking	Focuses on trail riding, using standard mountain bikes that are designed to go uphill as well as down. Most mountain biking is cross-country riding. Cross-country trails vary in technical challenge from easy to extremely difficult. Cross-country racing is the most common mountain bike race format and is an Olympic and Commonwealth Games sport
Downhill mountain biking	Focuses on descending as fast as possible, usually on technically demanding 'singletrack' trails, and usually either competitively or in training for competition. Purpose-built downhill bikes are used, that are too heavy and highly geared to be ridden uphill
Free-riding	A newer form, focusing on extreme technical challenge, high risk and riding in unconventional or extreme terrain. It crosses over with downhill and cross-country mountain biking

Note: toilets, parking, signs and trail marking may be required for events.

Mountain bike tracks in the planning area have been developed at Mount Lennard, in a cooperative effort between the South West Mountain Bike Club and the Department (see Map 7). These include the Lennard Half Circuit (6 km), Butcher Trail (9km), Pallet Trail (3km), Mill Brook Trail (11.5km) and the Wals Trail (4km). These tracks cater for beginners and experienced cyclists, having areas of easy riding as well as moderately steep sections and areas of singletrack riding. The Mill Brook and Wals trails are recommended only for experienced cyclists. Connecting to the Mount Lennard circuits is the 6km Grizzly Trail along Pile Road. All of these tracks travel through jarrah forest and offer spectacular views of the lower Collie River valley. The Department and the South West Mountain Bike Club have developed codes of practice for cycling on the Mount Lennard circuits.

In addition to, and linking to the Mount Lennard circuits via public roads, is the Munda Biddi Bike Trail. This is the first long distance (touring) mountain bike trail to be constructed in Western Australia. The trail will be 900 km in length and start on the outskirts of Perth (Mundaring) from where it will wind its way through national parks and State forest of the south-west to Albany. It will use a network of bush tracks and old railway lines to link cyclists with many forest attractions and towns including Collie, Jarrahdale, Dwellingup, Donnybrook, Nannup, Manjimup, Pemberton, Northcliffe, Walpole, Denmark and Albany. At the time of publication, the Stage 1 of the trail from Perth to Collie has been completed. The Munda Biddi Bike Trail will connect to prominent features such as the Reservoir and provide opportunities for camping that meet the needs of cyclists (see Map 7). As Lennard Drive is a one-way road, crossing the Collie River requires a separate two-way trail adjoining Lennard Drive. Sections of the Munda Biddi Bike Trail will also be designed and constructed for dual use. Other dual use paths for mountain bike use include the track from the kiosk to Potters Gorge and the Sika Circuit. The Sika Circuit requires further upgrading to better facilitate this activity.

The impacts of cycling on the natural environment are generally minimal, providing this activity is confined to roads and tracks that are appropriately located, designed, maintained and managed. As a result, cycling, including mountain bike riding, will be permitted on specially

designated bicycle tracks, dedicated roads and Department-managed roads and tracks open to the public. Riding of bicycles off public roads or designated tracks will not be permitted. As bicycles are considered vehicles under the *Road Traffic Act 1974*, they are not allowed to be ridden within Disease Risk Areas without a permit. Cycling may be permitted as a dual use on tracks designed and maintained for that purpose, subject to conflicts with other track users (see Table 9). Commercial cycling tours and the operation of bicycle hire businesses may be permitted subject to normal licensing and approval processes. Where specific single or dual use is designated, the tracks will be clearly signposted. Cycling events will be considered for approval on a case-by-case basis.

The development of future bicycle tracks in the Mount Lennard circuit area will be considered based on environmental, social and management criteria that will be developed over the life of the plan. Consideration in planning these trails will be given to Statewide strategies developed with the Mountain Bike Working Group, the Department's Mountain Bike Management Guidelines (draft) and alternative cycling opportunities outside the planning area (e.g. nearby State forest). Downhill riding in particular needs to be located in areas where the impacts on natural values are manageable and may be more suited to locations outside the conservation estate.

31.6. Cycling

Key Points:

- Recently, there has been extraordinary growth in the popularity cycling, particularly mountain biking, both as a recreational and competitive activity.
- Impacts are minimal on well-maintained tracks but may include damage to vegetation, soil erosion, conflict with other users or the spread of disease.
- The long-distance Munda Biddi Bike Trail is proposed to traverse the planning area, providing visitors of a range of age groups and cycling abilities with the opportunity to enjoy the forest environment. This will link to the existing Mount Lennard circuits via public access tracks.

The objective is to provide opportunities for cycling that do not adversely impact on key values.

This will be achieved by:

1. permitting cycling on dedicated roads, Department-managed roads and tracks open to the public and designated tracks in accordance with Map 7, Departmental policy, site capability and established standards;
2. considering the development of additional bicycle trails in the Mount Lennard Circuit area based on environmental, social and management criteria that will be developed over the life of the plan;
3. permitting cycling on dual/shared-use tracks provided the safety and enjoyment of pedestrians is not jeopardised and the track surface can be adequately maintained. Dual/share use paths will be signposted accordingly;
4. upgrading, where resources permit, the Sika Circuit for bicycle use;
5. assessing cycling events on a case-by-case basis and permitting them where the activity is consistent with Policy Statement No. 18 *Recreation, tourism and visitor services* and the provisions of this management plan (see also Section 31.11 *Special Events*);
6. monitoring the impacts of cycling and modify or restrict use if the activity is environmentally or socially unacceptable. Monitoring of this activity can be reviewed in year 5 of the management plan to assess its sustainability;
7. educating cyclists about the impacts on the environment and actions that can be taken to minimise these impacts; and
8. providing adequate information from which visitors can choose the tracks best suited to their needs.

Key Performance Indicator (see also Appendix 1):		
Performance Measure	**Target**	**Reporting Requirements**
31.6.1 Changes in bicycle track condition	31.6.1 Track condition is maintained or improved from 2008 levels	Every 5 years

31.7 Horse-riding

Horse-riding in natural bush settings is a popular recreational activity in the south-west. Riders come to these areas to enjoy the quiet of the bush, to experience the feeling of being in a remote place and to enjoy the challenge of different terrains and distance of rides.

The planning area has a history of recreational horse-riding, mainly on bush tracks and fire breaks/access roads south of the Collie River. In particular, horse-riding activities occur in the former Lennard and Davis blocks, the latter which is a designated disease risk area. Small numbers of riders also travel from Coalfields Road down the Wellington-Harris reservoir pipeline to Potters Gorge, and along the Sika Circuit. The Collie River Marathon, which has a horse-riding component, has been undertaken in the Westralia Conservation Park. This area also experiences recreational use from the Collie Pony Club. Other riding groups that are known to use the planning area include the South West Equestrian Club and members of the Western Australian Endurance Riders Association. The latter have held events in the planning area.

Horse-riding by individuals, equestrian clubs and commercial operators is permitted in national parks and conservation parks where the environmental and social impacts are considered manageable and the activity does not conflict with management operations or estate values. Horse-riding is also permitted on State forest, timber reserves and CALM Act section 5(1)(h) reserves. Horse-riding must occur on designated tracks or in designated areas and is generally not permitted in nature reserves or wilderness areas, areas of specific scientific or cultural value or in areas requiring special protection (e.g. from the spread of disease). Riding off designated tracks and areas is prohibited. Horses are not allowed to ride along the Reservoir shoreline or swim in the Reservoir.

While horse-riding is a legitimate activity, careful management is required to ensure that the risk of overuse and disturbance does not lead to the deterioration of natural values. The introduction of designated bridle tracks can be used to direct use away from biologically, physically and socially sensitive areas and promote use in areas where the soils are more stable, the vegetation is less susceptible to trampling and grazing and the conflict with other users is not as great. Limiting use to more resilient environments will also reduce the spread of weeds and disease, disturbance to native fauna and the siltation and fouling of watercourses (Phillips and Newsome 2002).

Consequently, a designated bridle track will be developed in the area specified on Map 7. The track will be available to recreational riders, commercial operators and for special events. Recreational horse-riders will be encouraged to adhere to appropriate codes of conduct and partake in best management practices, such as using weed-free feed and yarding and tethering horses during rest periods. Commercial operators will require a licence. The track will also be subject to an assessment of its ongoing sustainability. In circumstances where action is required to enable a more sustainable use, a permit system may be introduced or the track may be seasonally or permanently closed.

Owing to the environmental sensitivity of the Westralia Conservation Park, commercial equestrian operators, individual riders and group horse-riding events will be prohibited in this area. Alternative horse-riding areas, more capable of sustaining large groups of horses, will be

identified outside the planning area. The Proprietary Block in nearby State forest is a local alternative for events such as the Collie River Marathon. Areas surrounding the Harvey Dam may also provide opportunities for one-off endurance horse-riding events.

31.7. Horse-riding

Key Points:

- There is a history of horse-riding within the planning area, particularly in the former Lennard and Davis blocks. The latter however, contains designated disease risk areas.
- While horse-riding is a legitimate activity, careful management is required to ensure that the risk of overuse and disturbance does not lead to the deterioration of natural values.
- Landforms of the planning area have an adequate capacity to sustain horse-riding on designated bridle tracks. Opportunities exist for additional bridle tracks to be developed in nearby State forest.

The objective is to permit horse-riding where the environment can sustain its long-term use and the social impacts are considered manageable.

This will be achieved by:

1. permitting horse-riding on a designated bridle track within the area specified on Map 7, subject to ongoing monitoring which assesses its sustainability;
2. allowing horse-riding events subject to the approval of the District Manager;
3. designing and constructing horse-riding tracks to address site capability and minimise impacts on natural values;
4. separating paths for horse-riding, cycling and bushwalking as much as practicable to reduce visitor conflicts;
5. restricting access to the Reservoir shoreline for horse-riding;
6. investigating opportunities for horse-riding outside the planning area;
7. developing a code of conduct for horse-riding that encourages recreational riders to implement best practice management including the use of weed-free feed prior to, and during their use of the area and the yarding and tethering horses during rest periods;
8. monitoring the impacts of any horse use and modifying or further restricting use if the activity is environmentally, socially or culturally unacceptable. Monitoring of this activity will be reviewed in year 5 of the plan to assess its sustainability; and
9. developing monitoring systems in conjunction with horse-riding groups.

31.8 Hunting

Illegal recreational hunting, particularly for pigs, occurs in the planning area. This poses a serious risk to visitor safety and natural values. The recreational hunting of animals using any kind of weapon, such as a firearm, bows (long and cross), sling, gidgee or any other device which projects an object, is not generally permitted on lands managed by the Department.

Shooting in the planning area is strictly for the control of introduced and other problem animals and occurs only as part of an integrated management program. Shooting is not the sole means of control and other, safer and more effective techniques, such as trapping, are being employed more regularly. In particular, a trapping program for pigs has been initiated by the Department (see Section 23 *Introduced and Other Problem Animals*).

31.8. Hunting

Key Points:

- Hunting occurs in the planning area but poses a serious risk to visitor safety and is

generally not permitted on lands managed by the Department.
- A trapping or shooting program for controlling introduced and other problem animals, such as pigs, may be employed by the Department on approval of the Director General.

The objective is to ensure visitor safety and the protection of natural values by appropriately managing hunting.

This will be achieved by:
1. prohibiting recreational hunting;
2. allowing trapping and shooting where the Director General has authorised its use by the Department to control introduced and other problem animals; and
3. prohibiting the taking of wildlife in accordance with the Wildlife Conservation Act.

31.9 Marroning and Fishing

The Department of Fisheries manages recreational fishing throughout the State in accordance with the Fish Resource Management Act. This provides legislation to regulate size, bag limits, gear controls, closed seasons and licensing. *Conservation and Land Management Regulations 2002* (CALM Regulations) also regulate fishing activities in restricted areas.

Marroning is a popular activity in most of the rivers and permanent fresh water lakes in the south-west. Within the planning area, it occurs primarily on the shores of the Reservoir, although considerable marroning also takes place along the Collie River downstream of the Reservoir wall and upstream of the Black Diamond Pit. At the time of writing, the Reservoir is a snare-only fishery whilst scoops, dropnets and snare poles may be utilised downstream of the Reservoir wall. A licence is required in both circumstances. To sustain marron populations into the future, the marron season, which commences in January, is currently limited to 23 days. Other conservation controls such as size, bag and possession limits also apply. However, illegal marroning out of season undoubtedly occurs.

During the marron season, many people are attracted to the planning area, placing it under heavy fishing pressure. In 2006, 25% of the recreational fishing effort for marron in reservoirs was directed to the Wellington Reservoir. This makes the Reservoir one of the most significant reservoirs in the State for marroning.

Fishing for introduced species such as redfin perch and trout is also popular, occurring mainly along the shores of the Reservoir and lower Collie River. Trout have been stocked successfully since 1970, when they were introduced by the South West Freshwater Research and Aquaculture Centre. Since this time, regular stocking has created a consistent and worthwhile fishery. In the years from 2000 to 2007, 8800 brown trout were released into the Collie River (N. Harrison *pers. comm.*). The trout fishing season is currently from 1 September to 30 April, whilst fishing for redfin perch is permitted year round.

The fishery is particularly important to recreational fishers, as Waroona Dam and Harvey Dam are the only reservoirs within a day-trip of Perth that are stocked with trout. Some of these areas are also being viewed as potential drinking water supplies, which may further impact on the availability of this activity.

Access for fishing and marroning will continue to be provided along the Collie River and to the Reservoir. Motor vehicle access to the banks of the Reservoir will be allowed during the marron season and visitors will be required to camp in designated nodes. Controlling access to the Collie River is important to minimise the disturbance of riverbanks and damage to riparian vegetation, and to reduce the need for further remediation works. In the past, some marroners and fishermen, along with other users, have contributed to the introduction of new tracks or removing or avoiding barriers. A walk track linking Honeymoon Pool to the day-use sites along

Lennard Drive and the Reservoir will enable the use of a single path parallel to the river, reducing this impact. Small paths branching from this will provide access to the water. The Department and Conservation Commission are also concerned about the impact of trout on native species and ecosystems (see Section 23 *Introduced and Other Problem Animals*).

31.9. Marroning and Fishing

Key Points:

- Marroning and fishing on the banks of the Reservoir and lower Collie River are amongst the most popular recreational activities within the planning area, especially during the open season for marron. Poaching of marron out of season occurs.
- The Reservoir is particularly significant for marroning. In 2006, 25% of the recreational fishing effort in reservoirs was directed to the Wellington Reservoir.
- Marroning effort in the Reservoir has increased due to visitors being displaced from nearby proclaimed public drinking water supply areas with reservoir protection zones, such as Stirling Reservoir, Logue Brook and Samson Reservoir.
- Controlling access by marroners and fishers as well as other users is a significant problem.
- Regular stocking of introduced species of fish, such as trout, has created a consistent and worthwhile fishery. The Reservoir is particularly significant as there are few reservoirs open to fishing that are within a day-trip from Perth.

The objective is to permit marroning and fishing under the Fish Resource Management Act where this does not lead to degradation of the environment or unacceptable levels of conflict between users.

This will be achieved by:

1. providing access to enable fishing and marroning along the Collie River and in the Reservoir in accordance with Department policy and Department of Fisheries regulations;
2. designing, constructing and maintaining access for marroning and fishing to address site capability and minimise environmental impacts and conflict with other visitors;
3. allowing motor vehicle access to the banks of the Reservoir during the marron season;
4. ensuring people camp in designated nodes around the Reservoir when undertaking marroning activities;
5. liaising with the Department of Fisheries with regards to the ongoing stocking of trout and other non-native species; and
6. providing information on behalf of fishers in Western Australia about trout and marron fishing and the methods of reducing environmental impacts.

31.10 Scenic Driving

Driving for pleasure and sightseeing on roads and tracks managed by the Department is a popular recreational pursuit, and particularly popular within the planning area. Much of the experience and enjoyment that visitors gain from the forest environment is derived from two-wheel drive routes in areas of high scenic quality. In preserving the inherent scenic values of all public travel routes, selected roads that have important scenic values and which afford outstanding views of surrounding landscapes may be identified, promoted and managed as scenic drives (see Map 6).

Of special interest is the picturesque Lennard Drive (which includes Lennard Track). These roads, distinguished by the Collie River, feature deeply incised slopes, attractive views and intact native vegetation, and have been identified as two and four-wheel drive scenic drives. Scenic drives are also available Wellington Dam Road, where impressive views of the Reservoir wall and Reservoir can be had, and Coalfields Road, which is designated by Main Roads

Western Australia as a scenic Tourist Drive. Opportunities to link areas of high scenic quality and establish scenic drive loops are available along Pile Road, River Road, Falcon Road, Wellington Forest Road and King Tree Road (see Map 6). From the Collie townsite, Flora Road also provides an alternative scenic route. All major two-wheel drive roads are accessible to buses, but there is a need to upgrade several roads, particularly Falcon and River roads, to better cater for this need. Scenic driving need not be limited to the planning area, or to two-wheel drive access, and links to regional routes to areas such as the Ferguson and Preston river valleys should be considered.

Two-wheel scenic driving is permitted on dedicated roads and CALM Act roads open to the public. All vehicles must be registered under the Road Traffic Act, drivers must possess a current driver's licence and normal road rules apply. Vehicles not registered under this Act or the *Control of Vehicles (Off-road Areas) Act 1978* are not permitted to operate in the planning area without written approval from the District Manager.

31.10. Scenic Driving

Key Points:

- Much of the experience and enjoyment that visitors gain from the forest environment is derived from two-wheel driving in areas of high scenic quality.
- Popular roads for scenic driving include Lennard Drive and Coalfields, Pile, River, Falcon, Wellington Dam, Wellington Forest, King Tree and Flora roads. Linking public roads and tracks that have important scenic value provides the opportunity for scenic drive loops. These roads can be linked to other scenic travel routes within the region, such as those within the Ferguson and Preston river valleys (see Map 6).
- Lennard Track provides opportunities for scenic four-wheel driving.

The objective is to provide a range of scenic and recreational driving opportunities that is consistent with the visitor management setting and the protection of key values.

This will be achieved by:

1. maintaining the identified scenic drives and tourist routes (see Map 6) and linking these to areas outside the planning area, such as the Ferguson and Preston river valleys; and
2. liaising with tourism associations to disseminate information, particularly promotional material, about the scenic drives and tourist routes throughout the planning area.

31.11 Special Events

Requests are often made to undertake 'one-off' special events within the planning area. Generally these involve large groups of people who require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets. In the past, the planning area has hosted special events such as the Kings Cup Regatta, Collie River Marathon, the South-West Car Club Hill Climb, Rally Australia, endurance motorcycle events, orienteering and rogaining events, and several triathlon events emanating from Potters Gorge. The Kings Cup Regatta attracted thousands of people in 1989. At the time of printing, there is an increasing demand for mountain bike events.

Special events that present opportunities for nature-based recreation may be permitted in sections of the planning area, subject to approval from the Department. These events must be consistent with the Department's Policy Statement No. 18 *Recreation, tourism and visitor services*. Where requests are made to conduct special events for activities that are inconsistent with this policy, the event must be of national significance and consultation with the Conservation Commission is required. If events are considered a commercial operation, a commercial operations licence is also required. This requires consultation with the

Conservation Commission and approval by the Minister for the Environment. Where possible, events should use existing roads and tracks.

Competitive car rallies and other motor sports are generally not permitted in national parks and conservation parks. However, where there has been a change in land tenure from State forest, and there has been a history of competitive car rallies and other motorised sport events, consideration can be given to allowing the activity to continue. In the case of the South-West Car Club Hill Climb event, the event will be permitted to continue as it can be sustainable, there are adequate facilities and there are potential economic benefits to the lessee of the kiosk.

The suitability of events will be assessed on a case-by-case basis and considered against the following general criteria:

- availability of alternative locations outside the planning area. This may include nearby areas of State forest and pine plantations;
- protection of flora, fauna and cultural values;
- potential for the event to cause or exacerbate soil erosion and disturbance;
- safety and enjoyment of all visitors as well as those who partake in the event;
- the availability of suitable facilities such as car parking areas, camping areas, toilets, and barbeque areas;
- potential to spread disease;
- the overuse of sensitive areas;
- past history of use and compatibility with Departmental operations; and
- location of the event in an appropriate visitor management setting.

Limits or restrictions may be placed on events to assist in meeting the above criteria. This may result in an alternative location for the event, limitations on the number of events or participants, changes to the conditions of approval or prohibition of the event where its use is deemed inappropriate. It is generally preferred that events are located outside the planning area.

Where an event is approved, strict hygiene controls will apply. At the completion of the event, proponents will be required to remove any temporary fixtures or facilities constructed for the event, rehabilitate disturbed areas and remove signage.

31.11. Special Events

Key Points:

- Requests may be made to undertake 'one-off' special events within the planning area, which require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets.
- Special events will be assessed on a case-by-case basis and may be permitted in sections of the planning area subject to approval from the Department.

The objective is to provide for organised special events that offer the opportunity for participants to experience the planning area in suitable locations where its use can be sustained.

This will be achieved by:

1. assessing special events on a case-by-case basis according to the general criteria stated above and permitting them where the event is consistent with Department policy. Where the event is inconsistent with Department policy, events will be permitted only where the event is of national significance and after consultation with the Conservation Commission. Conditions stipulated by the Department may apply;
2. where events are considered to be a commercial operation, requiring that a commercial operators licence is obtained;

3. ensuring that special events are held only within an appropriate visitor management settings and pose no adverse impacts on the environment;
4. requiring event proponents to remove any temporary fixtures or facilities constructed for the event, rehabilitate disturbed areas and remove any signage; and
5. permitting the South-West Car Club Hill Climb event subject to it continuing to meet the general criteria for events.

31.12 Swimming

Swimming is one of the most popular outdoor recreational activities in the planning area, particularly at Potters Gorge, the backwaters of the Reservoir and at Honeymoon Pool. One of the most desired areas for this activity has been at Potters Gorge, where sand has previously been imported to enhance visitor enjoyment.

Access to the Reservoir for swimming will be provided in this management plan. Redevelopment of traditional swimming holes such as Honeymoon Pool will facilitate safe and easy pedestrian access to the river and cater for disabled visitors. The redevelopment of this area is necessary due to the high frequency and intensity of visitor use, and will include works to prevent the bank from collapsing. Riverbank erosion is a common occurrence along the lower Collie River where visitors seek access to the water for swimming and marroning activities. Careful management in these areas is required to minimise environmental impacts.

31.12. Swimming

Key Points:

- Popular swimming areas in the planning area include Potters Gorge, the backwaters of the Reservoir and at Honeymoon Pool.
- Swimming at river-based recreational sites can have impacts including damage to riverbanks and riparian vegetation.

The objective is to facilitate access for swimming, except where there is a threat to natural or cultural values or an unacceptable level of risk to public health or visitor safety.

This will be achieved by:

1. providing opportunities for visitors to swim safely in the planning area, including the Reservoir;
2. in consultation with DoW and WC, considering the development of opportunities for swimming away from the Reservoir; and
3. assessing the risk potential and likelihood of unsafe behaviour by visitors and implementing risk management measures, including signage and providing information, to limit that behaviour.

32. TOURISM

Tourism within the south-west region continues to grow strongly, offering a variety of accessible, affordable getaways in close proximity to Perth. Key attractions include wineries, gourmet food production areas, coastline and inland waters, forest, wildflowers, nature-based experiences (e.g. wildlife viewing, nature appreciation and sightseeing), inland rural experiences and farmstays, events and cultural activities/experiences. Nature-based tourism has emerged as an area of enormous growth potential. Many of these tourism opportunities are regarded as specialised tours catering for niche markets, are seasonal, and run as secondary businesses.

Local tourist attractions include the tourism entrance precinct at Collie, the Collie Tourist Bureaux replica mine, Collie Motorplex and the Lake Kepwari project. The latter is a $3.29 million project involving the former open cut coal mine void, approximately 20 km east of Collie. The State Government has made a commitment to develop this site for public recreation, including facilities such as barbecue and picnic areas, jetty pontoon facilities, access roads, car parks and water and power infrastructure. The void has been filled with water and will provide a destination for water-based and lake-side recreation activities, including the use of powered watercraft.

Lake Kepwari is a welcome addition to attractions within the Shire of Collie but will provide for different activities and recreational experiences to that which is found in and around the Reservoir. As powered craft are not permitted on the Reservoir, the Lake may not greatly relieve the recreational pressure on the planning area. Visitors to the Reservoir are more likely to be looking for quiet, nature-based experiences in a forest environment, such as semi-remote camping, swimming, canoeing and marroning/fishing sites. The use of powered watercraft on the Lake may also conflict with some of these activities.

Numerous bed-and-breakfast establishments, cafes and restaurants and a variety of accommodation types support these activities and attractions. With the exception of resort style accommodation, most types of accommodation are readily available in areas adjacent to the planning area and visitors should be encouraged to use these venues. Opportunities that cannot be catered for elsewhere, such as camping in a forest environment, will be the focus for development within the planning area.

32. Tourism

Key Points:

- Tourism within the south-west region continues to grow strongly, with nature-based tourism emerging as an area of enormous growth potential.
- Key tourist attractions within the region include wineries, gourmet food production areas, coastline and inland waters, forest, wildflowers, nature-based experiences, inland rural experiences and farmstays, events and cultural activities/experiences.
- Tourism activities within the planning area are focused on attractions such as the lower Collie River valley, the Reservoir, Bibbulmun Track and Munda Biddi Bike Trail.
- In the nearby area, the tourism entrance precinct at Collie, the Collie Tourist Bureaux replica mine, Collie Motorplex, Lake Kepwari and numerous wineries and gourmet food production areas also attract tourists. Infrastructure to support this includes cafes, restaurants and variety of accommodation.

The objective is to enhance sustainable nature-based tourism opportunities.

This will be achieved by:

1. liaising with local tourism associations to provide input on tourism proposals that may influence the planning area;
2. ensuring tourism developments are designed to minimise environmental impacts and are consistent with visitor management settings for the planning area; and
3. encouraging major tourism infrastructure off-site, and focusing on the provision of opportunities that cannot be catered for elsewhere.

33. COMMERCIAL OPERATIONS

Commercial concessions can help meet the rising demand for high quality recreation and tourism opportunities, facilities and services, whilst ensuring that financial contributions from tourism help the Department meet the costs of managing the natural resource. A commercial concession is a right granted by way of a lease, licence or permit for occupation or use under appropriate conditions, of an area of land or water managed by the Department. The Department's Policy Statement No. 18 *Recreation, tourism and visitor services* governs conditions for commercial concessions.

Leases

Leases are formal agreements that allow exclusive use of land and are generally issued when the activity involves significant infrastructure and/or retailing. A lease allows a lessee to occupy a particular area of land and hence provides security to protect significant investments. Leases are granted under section 97 (forest leases) or section 100 of the CALM Act and may be up to 21 years with an option of a further lease up to 21 years. The length of a lease is usually proportional to the level of investment and the return on that investment.

At the time of printing, there are four leases issued within the planning area (Table 11).

Table 11. Leases of the Planning Area

Lease Number	Purpose	Location
1576/97	Broadcasting Communications Site	River Road
1880/97	Tourist, Holiday and Recreation Resort	Wellington Forest Road
2159/97	Kiosk	Wellington Dam Road
1975/97	Collie Power Station – Saline Waste Disposal Pipeline	Former Gervasse Block

The Wellington Mill Cottages (lease number 1880/97) (also known as Wellington Forest Cottages) was previously operating under a lease which was terminated in April 2004. Consideration is being given to calling for an expression of interest for the continued operation of the facility.

Given the strong growth in nature-based tourism throughout the region, it is likely that demand for facilities in or near the planning area will increase. To cater for this, as well as preserving the area's natural values, it is preferred that any new commercial operation not listed in Table 11 be located outside, but linked to, the planning area. Such locations may include the Collie townsite, the Ferguson River valley or surrounding private property. These areas have scope for increased accommodation and have potential to cater for a variety of visitors seeking either a different class of facilities or type of accommodation, which is currently unavailable within the planning area. However, it is possible that future built accommodation developments may be considered in appropriate visitor management settings. In particular, there is the opportunity for a visitor centre to be developed in the kiosk precinct. This would provide a focal point for providing information about facilities, park orientation and the natural and cultural values of the area.

Proposed nature-based accommodation/development leases on Department-managed lands will be assessed against a range of sustainability indicators, including:

- design (site layout, style and character of buildings, form and function, vehicle and visitor numbers);
- environmental impact (maintenance of natural ecosystems, energy production and use, soil disturbance, loss of vegetation, water quantity and quality, waste management, fuel storage and handling, noise and light spill);

- cultural and social impacts (Indigenous involvement, employment and economic benefits);
- safety and risk management (safety equipment and processes);
- interpretation and education (interpretive material);
- customer service (visitor satisfaction);
- marketing; and
- contribution to management.

KPIs are also being added to leasing conditions as a way of assessing the performance of lease holders. New leases are required to have KPIs.

Licences

Licences allow tourist operators to enter and use lands and waters managed by the Department. Activities carried out under a licence are generally itinerant and do not require substantial infrastructure. All private tour operators conducting commercial tourist activities on conservation reserves and State forest are required to obtain a licence in accordance with the CALM Act. Licensing is a useful tool to monitor and regulate access and use of lands and waters managed by the Department and thereby assist in protection of an areas value. Collection of data can be made a condition of licensing.

Two types of licences are issued, depending on the nature of the activity, the security of the resource, and the risk to participants. E Class licences are issued where there is safety, environmental or management concerns and hence the number of licences needs to be restricted. Generally E Class licences are issued following a formal 'Expression of Interest' process. Alternatively, T Class licences are unrestricted and most commonly apply to low-impact vehicle-based operations. At the time of publication, there are 99 T class licences issued for the Wellington National Park.

Opportunities exist to continue to develop appropriate commercial tourism operations. Concessions for activities and services such as vehicle-based tours, horse-riding, abseiling, white-water rafting, canoeing and boat hire, guided walks, camping and nature study tours could increase visitor interest in, and attract more visitors to, the planning area. An assessment of these activities, based on protecting the key values of the planning area should be carried out prior to the issuing of any commercial concession.

The participation of local Aboriginal people in promoting aspects of culture and lifestyle, including reference to medicinal and nutritional uses of native plants and bush tucker is of interest to visitors and offers commercial opportunities. Interpretation from the perspective of Aboriginal people must take place in a manner supported by the local Aboriginal people.

Conditions apply to all licences to minimise the impacts of activities, or to aid in management of the value being appreciated by the public. Managers consider the following factors before issuing licences:

- infrastructure requirements of tour operations (e.g. adequate toilet facilities, access and parking for large vehicles);
- potential impacts to water quality;
- visitor safety;
- competence of group leaders;
- the potential damage to sensitive areas and wildlife; and
- the appropriateness of retail concessions in particular natural environments.

Guidance for the general conditions for tour operators in national parks and conservation parks is provided for in the Department's *Tour Operator Handbook*.

33. Commercial Operations

Key Points:

- The Department enters into commercial arrangements to help meet the rising demand for high quality recreation and tourism services, while at the same time ensuring that the financial contributions from tourism assist in meeting the costs of managing the natural environment.
- A commercial concession is a right granted by way of a lease, licence or permit for occupation or use, under appropriate conditions, of an area of land or water managed by the Department. Four leases and numerous licences exist within the planning area.
- Opportunities for tour operators include vehicle-based tours, horse-riding, white-water rafting, abseiling, canoeing and boat hire, guided walks, provision of and/or management of accommodation, camping and nature study tours.

The objective is to ensure that commercial tourism activities are compatible with other management objectives and to extend the range of services and recreational experiences available through the involvement of private enterprise.

This will be achieved by:

1. evaluating proposals for licences and commercial tourism leases according to the CALM Act, Department policy and other relevant legislation, and permit their establishment where appropriate;
2. ensuring all commercial operations operate under a lease, licence or permit agreement with appropriate conditions that:
   - are consistent with other management objectives;
   - facilitate park management;
   - provide a service or facility to visitors that the Department would not otherwise be able to provide; and
   - are reviewed as appropriate.
3. not providing concessions within the planning area if adequate facilities or services exist, or they can be developed outside the planning area that meet visitor needs ;
4. ensuring any commercial operations are cost-neutral to the Department;
5. encouraging and providing incentives for tour operators to acquire quality assurance through industry accreditation and qualification programs. This will be facilitated, in part, by promoting the *Tour Operator Handbook* to operators;
6. identifying the sustainable level of operator use and monitoring the impact of these activities. The collection of data as part of the licence conditions of commercial operators should provide sufficient detail to enable thorough evaluation of environmental and social issues; and
7. encouraging the participation of local Aboriginal people in commercial activities.

34. VISITOR SAFETY

In addition to a genuine concern for visitor welfare, the Department has a moral and legal responsibility to consider the personal safety of visitors to the planning area. The Department manages the risks presented to visitors by their activities and by the natural, cultural, and developed environments through a visitor risk management program. The program involves the identification of hazards, assessment of the risks posed by these hazards, implementation of risk mitigation measures and ongoing monitoring. As part of the program, all designated recreation sites are routinely audited to identify visitor risks. The visitor risk management program is guided by Policy Statement No. 53 *Visitor risk management*.

However, many visitors deliberately seek out activities because they involve risk, not despite them. These activities include rock climbing and abseiling, mountain biking and white-water rafting. Opportunities for risk taking are essential to many people's attraction to the outdoors and visitors are expected to take responsibility for their own safety. The Department and Conservation Commission seek to encourage appropriate visitor behaviour whilst undertaking recreational activities that involve risk.

The most common risks to visitor safety relate to slipping and tripping on uneven ground, stolen hazard signs and damaged recreation structures. Department staff usually attend to these risks during daily maintenance of facilities.

Falling trees or limbs, and collision with submerged obstacles while swimming can pose more serious risks to visitor safety. The latter is important given that fluctuating water levels can vary the water depth over obstacles such as sunken trees and stumps, and river floods can move obstacles to new locations. These risks are managed by:

- removing hazardous trees and lopping limbs in and around all designated recreation areas. This has been undertaken within the planning area and will be an ongoing requirement in the future. Monitoring will determine the need for future tree or limb removal; and
- divers periodically surveying popular swimming holes within designated recreation areas and, where possible, removing submerged obstacles presenting a risk to swimmers. More commonly, appropriate hazard and 'No Diving' signs are placed near swimming holes.

In the event of an incident, the coordination of search, rescue or recovery operations is the responsibility of the Western Australian Police Service. However, where these occur on lands managed by the Department, it is often the Department that organises the initial response.

34. Visitor Safety

Key Points:

- The Department has a moral and legal responsibility to minimise visitor risk.
- The Department manages the risks presented to visitors by implementation of Policy Statement No. 53 *Visitor risk management* and the visitor risk program. As part of this program, designated recreation sites are routinely audited to identify visitor risks.
- The most common risks to visitor safety relate to slipping and tripping on uneven ground, stolen hazard signs and damaged recreation structures. Falling trees or limbs, and collision with submerged obstacles while swimming can pose more serious risks to visitor safety.

The objective is to maintain visitor experiences by minimising risks to public safety wherever possible.

This will be achieved by:

1. continuing to undertake formal risk assessment of all recreation sites and facilities as part of the visitor risk management program and in addition to that which occurs on a day to day basis;
2. continuing to provide information (including signs where those hazards associated with structures, facilities or natural attractions that are not reasonably obvious) to enable visitors to consider risks and to highlight potentially hazardous areas and activities;
3. adopting codes of safe conduct for popular activities (such as hiking, swimming, canoeing and abseiling) and promoting and publicising them as appropriate; and
4. applying industry standards and utilising appropriate expertise and quality of materials in the design and construction of facilities and structures.

Key Performance Indicator (see also Appendix 1):		
Performance Measure	**Target**	**Reporting Requirements**
34.1 Percentage of accidents/incidents and visitor injuries per visit reported annually to the Department	34.1 Maintenance or reduction in the percentage of accidents/incidents and visitor injuries per visit reported annually to the Department from 2008 levels	Every 5 years

35. DOMESTIC ANIMALS

Domestic animals such as dogs and cats are important companions for many people and are often considered part of the family. Dogs are frequently taken on day trips and overnight stays, including trips through the planning area. Adjoining landholders also exercise their dogs in forest areas bordering their property.

Domestic animals are not usually permitted in national parks or conservation parks although, under the *CALM Regulations*, dogs are allowed in designated areas. The exception to this is guide dogs for visually impaired people and dogs for management/security purposes (e.g. specially trained dogs for search and rescue operations), which are permitted on all Department-managed lands and waters. Domestic animals may also be permitted in special cases as determined by the Coordinator, Park Policy and Services.

Dogs are considered undesirable in the planning area. It is important to keep dogs out of areas such as Honeymoon Pool, where they pose a risk to threatened fauna species, such as the western ringtail possum. Dogs in this area have also been known to conflict with other visitors, create noise problems, cause personal injury to staff and interfere with the enjoyment of the area by other users. There may also be dangers to dogs arising from the presence of poison baits in areas where feral animals are controlled for conservation purposes. Opportunities for dog use may exist on recreation reserves vested in local Shires. Within the Wellington District, dogs are permitted on the beach at the western side of the Leschenault Peninsula Conservation Park and there is the potential to permit dogs at Lake Kepwari.

35. Domestic Animals

Key Points:

- Domestic animals are not permitted within the planning area. Exceptions may be granted for guide dogs for visually impaired people and dogs for management/security purposes (e.g. specially trained dogs for search and rescue operations), which are permitted on all Department-managed lands and waters.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:

1. prohibiting domestic animals within the planning area, except for guide dogs for visually impaired people and dogs for management/security purposes; and
2. providing information explaining Departmental policy on domestic animals and enforcing it as necessary.

Key Performance Indicator (see also Appendix 1):		
Performance Measure	**Target**	**Reporting Requirements**
35.1 Number of dogs recorded that are not guide dogs for visually impaired people or dogs required for management/security purposes	35.1 No dogs recorded that are not guide dogs for visually impaired people or dogs required for management/security purposes	Every 5 years

36. VISUAL LANDSCAPE

Visual landscape management is based on the premise that the visual quality of any landscape is a resource in its own right and can be assessed and managed in much the same way as other resource values, such as fauna, flora, water and recreation. The role of visual landscape management is to ensure that all uses and activities are planned and implemented to complement rather than detract from the inherent visual quality of the environments in which they occur.

The Department's visual landscape management method is based on a systematic broad-scale inventory and analysis of landscape character, visual quality, the level of visibility (seen area) and the level of public sensitivity to landscape values. This information enables a number of visual landscape management zones to be identified so as to guide management at the broad-scale. Specific site-scale projects may require additional assessment.

Landscape Character Type

Landscape character is the combination of natural (e.g. geomorphology, hydrology, soils, vegetation and land-use) and cultural characteristics that allow people to differentiate one place from another. According to these features, landscapes in the south of Western Australia have been broadly identified and described as landscape character types in order to assess their visual landscape values (CALM 1994). The planning area lies within the Darling Uplands subtype of the Darling Plateau landscape character type. Visually, the most significant landscape elements of this subtype are:

- granite domes and outcrops;
- undulating and steeply sloping escarpment;
- well defined and steeply incised valleys;
- isolated peaks or hills;
- permanent watercourses, lakes and reservoirs;
- areas of remnant native vegetation; and
- distinctive stands of remnant vegetation.

Visual Quality

Visual landscape quality refers to the characteristics (qualities) of a landscape or the degree of excellence it entails in terms of naturalness, distinction and public perception. Within each landscape character type, visual landscape quality has been classed as high, moderate or low. This is typically based on diversity, uniqueness, prominence and naturalness of landform, vegetation and waterform within each type (CALM 1994).

The portion of the planning area deemed to have the highest visual quality is the lower Collie River valley. Its mature forests, thick riparian vegetation and stream sections with rapids and massive rock outcrops are a prominent feature. Other areas of high scenic quality include exposed water or water edge, valleys, steep slopes and isolated hilltops and areas where these elements combine with mature vegetation that offers scenic landscape viewing.

The area around the Reservoir is particularly notable for scenic diversity with long open views across the Reservoir and overviews of the Reservoir's massive concrete wall and the valley below. The waterbody itself is changeable in character and from the shores there are views across the water and of the steep, forested background. The long views of the waterbody and forested background are attractive to visitors and their attributes could be incorporated into scenic walking routes. The number of unseen areas around the waters edge also lends itself to development, especially where there may be minimal visual impacts on the landscape.

Pine plantations located at the southern end of the Reservoir also provide a different character to the native forest. The Forest Products Commission will consider the impact of plantation operations on the visual quality of the landscape in these areas. Where reasonable and practicable, operations will be conducted in a manner that seeks to reduce or negate impacts.

Isolated hilltops that offer elements such as panoramic views, steeply sloping areas, water surfaces and granite outcrops offer the greatest scenic quality. However, within the planning area, only two hilltops have been made accessible with developed walking tracks. These are the Kurliny Tjenangitj Track and the Sika Circuit. Hilltops north and west of the Reservoir potentially offer these qualities and the promise of great scenic views but are constrained by informal or no access. Whilst hilltops in the vicinity of these areas provide quality viewpoints, it is also recognised that the deeply incised landscape and erodible soils make track design of paramount importance.

Some areas of high visual landscape quality within the planning area are under-exposed to current visitor routes.

Impacts on Visual Quality

Changes to landscapes occur continually. Natural changes are generally subtle and harmonious and complement perceived visual qualities of the land. Human-imposed alterations to naturally established landscapes could have a positive or negative effect on visual landscape quality. Undesirable impacts may include transmission lines, pipelines, communication towers, railways, buildings, structures, boat moorings and ramps, roads, paths and parking, signs, fences, timber harvesting in State forest, quarries, mining and extractive industries. Usually these can be avoided or minimised by careful location and design. In the planning area, there are several utility corridors (e.g. transmission lines and railways) and other cultural features (e.g. gravel pits), have a negative impact on visual quality (Muench unpubl. 2001). This is particularly so where they are visible from tourist routes or destinations and where they are dominant features of the landscape, such as along the Coalfields Road. Access routes absent of these features should be considered for promotion as scenic drives.

Several roads adjoining the planning area are proposed for upgrading (road widening) under the *Roads 2020 Regional Road Development Strategy*. In these circumstances, the Department and Conservation Commission should provide advice to the Main Roads Western Australia, with the aim of minimising the impact on visual landscape values. Timber harvesting activities in adjoining State forest may also cause negative impacts upon scenic quality in the short to medium term. Sites that are potentially exposed to these visual impacts occur along King Tree Road and areas east of Wellington National Park.

Rehabilitation can be used to enhance visual landscape values. Former gravel pits, previous disturbance at recreational sites and along sensitive travel routes are priorities in terms of visual landscape management.

Public Sensitivity

Public sensitivity to the visual landscape is based on the degree of public exposure, which can

be assessed by examining travel routes[16], the number of visitors, distance of the route, duration of visit, and the level of visibility. Public sensitivity is also based on the value placed on a site, feature or area.

Visual Landscape Management Zones

An assessment of the inherent visual landscape qualities, the level of visibility or seen area and public sensitivity within the planning area enables it to be classified into management priority zones (see Table 12 and Map 8). Such zones help identify areas of greatest and least visual concern and the appropriate level of management and potential modification.

Table 12. Visual Landscape Management Zones

Zone	Description	Management Priority
Zone A	Areas of high scenic quality and rare landscape character which have moderate to high public exposure/sensitivity and some areas not assessed with moderate scenic quality but with very high public exposure/sensitivity.	High
Zone B	Areas of low to moderate scenic quality and high public exposure/sensitivity and areas of high scenic quality or rare landscape character which have low public exposure/sensitivity.	Medium
Zone C	All remaining areas with few or no elements of particular scenic quality and only low to moderate public exposure/sensitivity.	Low

Visual Landscape Management

Visual landscape values of the planning area are managed in accordance with the Department's Policy Statement No. 34 *Visual resource management of lands and waters managed by CALM*. For adjoining lands managed by the Department, the provisions of the FMP apply.

Visual landscape management zones provide an indication of the relative level of concern for the visual landscape, with zone A having greatest concern for the landscape values and the highest priority for management (e.g. the lower Collie River valley). Specific guidelines for each zone are included in Appendix 7. As a general guideline, management operations or planning proposals which may affect Zone A landscapes require more detailed assessment, projects in Zone B may require additional study, while proposed changes to Zone C landscapes are unlikely to require additional assessment. Visual landscape management zones guide recreation planning (e.g. development of new facilities, recreation sites, signage and built infrastructure), resource use and management operations.

36. Visual Landscape

Key Points:

- The planning area is representative of the Darling Uplands subtype of the Darling Plateau Landscape Character Type.
- The highest visual landscape quality is along the lower Collie River valley and where mature vegetation is combined with areas that include exposed water or water edge, valleys, steep slopes and isolated hilltops.
- Several isolated hilltops exist within the planning area that offer the potential for rewarding panoramic views, but only two, the Kurliny Tjenangitj Track and the Sika Circuit, have formal access.
- The Department manages visual landscapes according to management priority zones.

[16] Travel routes may include roads, railway lines, navigable rivers, walk/cycle tracks or places where people live or gather and are viewed and experienced by other people.

The objective is to protect and enhance visual landscape values and to provide opportunities for visitors to appreciate aspects of the landscape.

This will be achieved by:

1. managing visual landscape values according to Department policy and following the landscape guidelines set out in Appendix 7 for each visual landscape management zone;
2. ensuring that visual landscape management is considered for all proposed management activities and developments in the planning area and for timber harvesting operations on adjacent State forest (including plantations);
3. encouraging sensitive management of visual resources along access corridors to tourist destinations, prominent natural features and areas of high scenic viewing;
4. rehabilitating former gravel pits and other disturbed sites where appropriate;
5. encouraging telephone and powerlines to be located underground where cost permits;
6. providing access and recreational opportunities in areas of high visual quality where this is environmentally sustainable, compatible with other values and in accordance with visitor management settings;
7. liaising with neighbouring landowners, industry, local and State government agencies to ensure visual landscape management guidelines are considered in any development or operations they may undertake, and provide advice upon request; and
8. seeking environmental offsets from external agencies for activities or developments that could permanently impact on the landscape values.

PART F. MANAGING RESOURCE USE

The use of natural resources involves the consumption of such resources to provide economic and social benefit, and usually requires the determination of sustainable yield or allocation limits to ensure the resources aren't consumed beyond acceptable means (WA Government 2006). Using the natural resources of the planning area sustainably is critical to the long-term management, conservation and protection of such resources.

37. TRADITIONAL HUNTING AND GATHERING

The hunting and gathering of traditional foods by Aboriginal people is an important part of their culture, enabling them to maintain or re-establish their links with the land, share knowledge and partake in traditional practices. Aboriginal people in the region accessed lakes, rivers, estuaries, swamps and forest areas for a range food that included fish, birds, reptiles, frogs and invertebrates (Goode and Rundin 2002).

Section 23 of the Wildlife Conservation Act allows Aboriginal people to hunt for food on lands and waters managed by the Department, excluding nature reserves, with the consent of the Conservation Commission and the Department's Director General. Conditions associated with approval include:

- that the use of wildlife is sustainable;
- food is only taken by a cultural group associated with the planning area;
- special provisions for the taking of some species (e.g. specially protected species);
- the activity does not impinge upon the safety of visitors to the planning area and the hunters themselves;
- food taken is not sold; and
- the activity is consistent with other land management objectives.

It is possible that over the life of this plan the rights of Aboriginal people may change, including hunting and gathering. The Department will ensure conformity with any changes to legislation or Government policy during the life of the plan.

37. Traditional Hunting and Gathering

Key Points:

- As part of their culture, Aboriginal people may seek to hunt or gather from within the planning area.
- The Wildlife Conservation Act allows these customary activities to occur provided certain conditions are in place.
- Legislation and Government policy may change during the life of this plan.

The objective is to enable the collection of traditional foods by Aboriginal people where it is sustainable and does not pose a threat to the safety of other users.

This will be achieved by:

1. allowing Aboriginal people to hunt and/or gather in the planning area, provided they are from a cultural group associated with the planning area, meet the conditions of approval and have authorisation from the Conservation Commission and the Department's

Director General; and
2. ensuring that management adapts to and conforms to any legislative or policy changes during the life of this plan.

38. MINERAL AND PETROLEUM EXPLORATION AND DEVELOPMENT

Mineral and petroleum exploration and development on Department-managed lands and waters is subject to the Mining Act, the Petroleum Act, the Environmental Protection Act, the Wildlife Conservation Act and various State Agreement Acts.

State Agreements between developers and the State are generally enacted for major resource projects (such as bauxite, coal and iron ore) that require large capital investments and usually significant infrastructure. These agreements are ratified by Parliament as State Agreement Acts. Two such acts apply to the planning area: the Alumina Refinery (Wagerup) Agreement and Acts Amendment Act and the Collie Coal (Western Collieries) Agreement Act. Under these Acts, tenements have been granted to Alcoa of Australia Ltd and Wes farmers Coal Ltd (see *Mineral Resources and Prospectivity*).

Under the Mining Act, mining[17] may be carried out in national parks with the consent of the Minister for Resources, subject to the concurrence of the Minister for the Environment and the consent of both Houses of Parliament. Exploration within national parks can be carried out under the same conditions except that the consent of both houses of Parliament is not required. Mining and exploration in conservation parks and CALM Act section 5(1)(h) reserves may be carried out with the consent of the Minister for Resources, subject to the recommendations of the Minister for the Environment and the Conservation Commission. Mining and exploration in State forest requires the consent of the Minister for Resources and the concurrence of the Minister for the Environment. The Petroleum Act requires that petroleum exploration/production will not be approved until the Minister for Resources obtains the recommendations of the Minister for Environment.

Mining and petroleum exploration and production is also subject to State Government policy applicable at the time. At the time of publication, the State Government's policy is to prohibit mineral and petroleum exploration and development in national parks and class A nature reserves. More specifically, the Government's position is that applications for access to these areas will only be considered if they are lodged prior to 10 February 2001. If considered, there would be no presumption for approval and if approved, these applications may be subject to the 'environmental offsets' principle[18]. Overarching advice about the intent and appropriate use of environmental offsets is provided by the EPA's *Position Statement No. 9 – Environmental Offsets*.

The Department of Industry and Resources (DoIR), who administer mining and petroleum tenements throughout the State, refers projects that may potentially cause significant environmental impacts to the EPA under section 38 of the Environmental Protection Act. The Environmental Protection Act takes precedence over most other acts. Under the memorandum of understanding between DoIR and the EPA, all mining proposals wholly or partly within two kilometres of a national park, nature reserve, State forest, timber reserve or proposed conservation reserve must also be referred to the EPA for assessment. The Conservation Commission, the Department and individuals can also refer proposals for assessment. During the assessment process, the Department has the opportunity to comment on the impact of the

[17] Mining includes exploration, fossicking, prospecting and mining operations.

[18] Environmental offsets aim to ensure that significant and unavoidable adverse environmental impacts are counterbalanced by a positive environmental gain, with a goal of achieving a 'net environmental benefit' (EPA 2006).

proposals. In addition, actions which may have a significant impact on matters of national environmental significance[19], may also require approval under the EPBC Act.

The Conservation Commission may provide advice to the Minister for the Environment on proposals to extract mineral or petroleum resources.

Mineral Resources and Prospectivity

Mining is the largest industry in the region and has continued to be the major contributor towards economic development. In the 2006/07 financial year, mineral extraction and processing in the region and associated manufacturing was worth approximately $2.1 billion or 4% of the State's mineral worth (DoIR 2007). The major mineral commodities produced in the region are bauxite, coal and mineral sands (including zircon).

The Worsley Alumina Refinery, situated near Collie, processes bauxite mined in the Shire of Boddington. Bauxite processed at the Refinery in 2006/07 was worth approximately $1.4 billion (DoIR 2007). Worsley is planning to expand its refinery from its current capacity of 3.7 million tonnes per annum to 4.4 million tonnes per annum (DLGRD and SWDC 2006).

Mining for coal currently takes place in the Shire of Collie at the Premier, Muja and Ewington mine sites, which produce all the State's coal supplies. Whilst there are three other significant coal deposits in the south-west, the Collie Basin contains the only operating mines. The vast majority of coal is used for power generation, with the remainder used in the production of synthetic rutile, cement and other minor uses. In 2006/07, approximately 6 million tonnes of coal were mined at a value of $267 million (DoIR 2007).

Not all of the region has been extensively explored for its mineral resources. However, the Collie Basin has been well explored for coal and there is untested potential for coal seam methane (gas). Within the planning area, exploration has focused on the Westralia Conservation Park and proposed Westralia Forest Conservation Area, while exploration within the Wellington National Park has been limited. Current exploration activities indicate potential for medium-term development in the gold, bauxite and coal sectors. The geological setting of the planning area is also considered to have moderate to high potential for other elements such as tin, tantalum, lithium, niobium, beryllium and Rare Earth Elements, as well as moderate to low potential for nickel, copper, chromium and platinum group elements (RFA 1998).

Due to the apparent abundance of bauxite, intensive exploration of all areas with a high potential for bauxite mineralisation has not been necessary and exploration has not been sufficient to identify mineral potential in many areas.

At the time of printing, four granted and five applications for mining tenements, and one application for a petroleum tenement exists in the planning area (see Map 9 and Table 13). There is no mineral extraction, although gravel extraction, and some underground coal mining near Collie, has been carried out in the past.

Table 13. Mining Tenements of the Planning Area

Tenement	Lease holder	Lease Status	Lease Area (ha)	Target Resource
State Agreement Act				
ML 1SA (AML 70/1)	Alcoa of Australia Ltd	Granted/live	4334	Bauxite
M 262SA (AM 70/262)	Wesfarmers Coal Ltd	Granted/live	12	Coal

[19] Under the EPBC Act matters of national environmental significance include (for example), National Heritage Places, nationally listed threatened species and ecological communities and migratory species protected under international agreements.

Coal Mining				
CML 12/890	Griffin Coal Mining Company	Granted/live	26	Coal
CML 12/891	Griffin Coal Mining Company	Granted/live	12	Coal
Mining				
M 12/28	Wesfarmers Premier Coal Ltd	Pending	766	Coal
Exploration				
E 12/2	Bauxite Resources Limited	Pending	123	Bauxite
E 70/3302	Billiton Aluminium (Raa) Pty Ltd Billiton Aluminium (Worsley) Pty Ltd Japan Alumina Associates (Australia) Pty Ltd Sojitz Alumina Pty Ltd	Pending	343	Bauxite
E 70/3400	Ord River Diamonds Pty Ltd	Pending	444	
E 70/3102	Bauxite Resources Ltd	Pending		
Petroleum				
Appl 2/05-6 DR	Red Mountain Energy Pty Ltd Flamestar Corporation Pty Ltd	Pending	1391	Coal seam methane

Former mining tenement M70/271, an enclave within the Wellington National Park, has been shut down and no further mining will occur. This small area of State forest (5 ha) will be included in Wellington National Park once rehabilitation is completed.

Basic Raw Materials

In general, there is a presumption against accessing basic raw materials[20] (BRM) from the conservation estate, and any such application will be assessed on a case-by-case basis. To minimise disturbance to conservation areas, alternative sources of BRM, located outside the planning area, are preferred. Extraction will be permitted from the planning area where a more environmentally acceptable alternative is not available, where the BRM is for use within the reserve boundaries and extraction is consistent with the relevant management plan and the purpose, class and tenure of the area (see Section 10 *Existing and Proposed Reserves*).

Applications to access BRM from the planning area requires referral to the Conservation Commission, who consider all proposals and make recommendations. If supported in principle, proposals may be referred to the EPA to determine the level of assessment. Should proposals be approved, access to BRM may occur using notice of intended entry procedures under the *Local Government Act 1995*. Access to BRM for use on road reserves that are within the boundaries of the conservation estate will be considered provided no better alternatives are available. Where extraction of BRM does occur, the impact on natural values can be minimised by:

- siting pits only in vegetation communities that are adequately represented and in areas with the lowest natural values;
- siting pits in areas that limit the introduction and spread of the disease known as dieback;
- applying best practice hygiene management in accordance with the Department's Manual: *Phytophthora cinnamomi and disease caused by it* (2000); and
- applying best practice rehabilitation following extraction.

BRM, principally gravel, have previously been extracted from the planning area and several gravel pits now require rehabilitation. Over the life of this management plan, BRM may be further required to support activities consistent with the reserve purpose and management objective (e.g. the construction and maintenance of recreation areas, trails, other built infrastructure and the access network). However, it is likely that these demands can be met off the conservation estate or by purchase from suppliers.

[20] Basic raw materials include earth, sand, stone and gravel.

The need for extracting BRM for use in the planning area can be reduced by sealing major access roads, such as Pile, Mungalup and Falcon roads. The decreasing availability of gravel within the region also suggests that the use of alternative materials and techniques, such as crushed rock/laterite, may be more appropriate and aid in reducing costs.

The removal of gravel and other raw materials from Department-managed lands in the planning area considers the *State Gravel Supply Strategy*.

38. Mineral and Petroleum Exploration and Development

Key Points:

- Mining in the planning area is subject to the Mining Act, the Petroleum Act, the Wildlife Conservation Act, Environmental Protection Act, State Agreement Acts and approval by the relevant Ministers.
- Mining can have considerable impacts upon natural values. Since February 2001, the State Government's policy is to prohibit mineral and petroleum exploration and extraction in national parks and class A nature reserves.
- At the time of printing, there are four granted and five applications for mining tenements over the planning area. There is also an application for a petroleum tenement.
- Mining tenement (M70/271), an enclave within the Wellington National Park, has been shut down and will be incorporated into the park once rehabilitation is completed.
- BRM, particularly gravel, have previously been sourced from within the planning area. There has also previously been some underground mining of coal near Collie.

The objective is to minimise the impacts of mineral, BRM and petroleum exploration and development on key values.

This will be achieved by:

1. evaluating proposals for mineral and petroleum exploration and development within the planning area (and external areas that may impact upon it), and make recommendations/ submissions to relevant agencies/authorities with a view to minimising impacts on key values;
2. monitoring, with DoIR, existing mineral and petroleum exploration and development activities that impact directly or indirectly on the planning area and requesting DoIR take any necessary action where conditions are breached;
3. referring proposals that may adversely impact on the planning area to the EPA for their consideration and assessment under the Environmental Protection Act;
4. seeking direct and complementary offsets to counterbalance any adverse environmental impact due to mineral and petroleum exploration and development activities to achieve no net environmental loss or, preferably, a net environmental benefit outcome;
5. considering access to the planning area for BRM where (1) its use is within the planning area boundaries and is consistent with the management objective for each reserve and (2) no alternatives are available. Applications to access BRM on the conservation estate requires referral to the Conservation Commission and, if supported, may require referral to the EPA;
6. incorporating former mining tenement M70/271 into Wellington National Park;
7. ensuring that all sites in which any mining activity occurs are rehabilitated according to the conditions of the mining lease and Department rehabilitation standards and guidelines; and
8. closing and rehabilitating exhausted quarries/pits in accordance with the Department's *Guidelines for the Management and Rehabilitation of Gravel Pits*.

39. REHABILITATION

The Department's Policy Statement No. 10 *Rehabilitation of disturbed land* provides guidelines for the rehabilitation of lands managed by the Department, and is based on the following principles:

- land should be managed as far as possible to avoid disturbance;
- rehabilitation should be the last option in a series of management decisions designed to protect environmental values; and
- rehabilitation should aim to restore original values and help to enhance all potential uses provided the priority uses are not adversely affected.

In cases where other agencies/organisations have been responsible for disturbance within the planning area, it is the Department's policy that the agency is responsible for rehabilitation of these areas to a suitable standard. In such cases, the cost of rehabilitation should also be borne by the agency.

Rehabilitation within the planning area may be required for mined gravel pits, other mining activities, road works, previous silviculture activities, track closure, recreation site closure or redevelopment, or activities associated with fire suppression. To ensure that rehabilitation works have the greatest degree of success as well as limiting the introduction of exotic (non-local) plants, local native species should be used.

39. Rehabilitation

Key Points:

- Rehabilitation may be required for mined gravel pits, other mining activities, road works, previous silviculture activities, track closure, recreation site closure or redevelopment, or activities associated with fire suppression.
- Use of local native species during rehabilitation ensures the greatest degree of success, and preserves the biodiversity and landscape values of the area.

The objective is to restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function.

This will be achieved by:

1. managing the planning area, as far as practicable, to avoid disturbance;
2. other than for natural erosional processes, developing and implementing a priority-based rehabilitation plan based on:
   - existing and potential impacts on conservation and visual landscape values;
   - type and extent of the disturbance;
   - likelihood of natural regeneration;
   - availability of resources;
   - level of participation of stakeholders; and
   - the capacity for long-term monitoring.
3. rehabilitating, closing or relocating roads and tracks that have the potential to erode or impact on visual amenity;
4. ensuring that, whenever possible, the cost of rehabilitation is borne by those responsible for the disturbance;
5. actively involving volunteers and local Aboriginal people in rehabilitation programs;
6. ensuring local plant species are used in rehabilitation schemes wherever possible; and
7. monitoring, evaluating and recording progress of rehabilitation programs/projects.

40. DEFENCE, EMERGENCY AND OTHER TRAINING

Defence force, emergency service and other types of training are an acceptable use of some lands and waters managed by the Department. Defence force training is most commonly undertaken by the Australian Army, but can also include occasional Air Force and Navy activity. Activities can range from movements by individual soldiers or small groups practising survival techniques, to major operations involving one or more battalions (in excess of 800 troops). Activities within the planning area have previously included survival and navigation exercises, military training, driver training, leadership and search and rescue training.

In general, the following activities are not acceptable in the planning area:

- camping involving digging or soil disturbance, use of fire, rubbish disposal or construction of temporary toilets;
- group manoeuvres involving large numbers of personnel;
- damaging, cutting or destroying vegetation (e.g. for camouflage or concealment of personnel and equipment);
- carrying and use of firearms, ammunition or pyrotechnics;
- taking vehicles off roads and tracks (e.g. in deployment procedures);
- use of roads and tracks by heavy vehicles;
- use of support or transport aircraft or power boats;
- survival training involving collecting and consuming native plants and animals regarded as bush tucker;
- use of domestic animals (e.g. dogs or pack animals);
- activities that adversely impact on cultural values;
- activities that disturb or pose a risk to visitors; and
- building fortifications, weapons pits or other structures.

A written application has to be made to the Department before any training exercise can be carried out within the planning area. Such activities will be assessed on a case-by-case basis, so that the particular requirements of each exercise can be considered, impacts assessed and appropriate conditions applied. Some activity types may not appropriate in certain categories of Department-managed lands and waters, such as national parks.

Guidance for the management of defence force and emergence service training within the planning area is provided for by Policy Statement No. 54 *Defence force training on CALM managed lands and waters*.

40. Defence, Emergency and Other Training

Key Points:

- Defence force and emergency services training is an acceptable use of lands and waters managed by the Department but can sometimes have impacts on biodiversity, cultural and recreation values and need to be assessed accordingly.
- Not all defence force and emergency services training activities will be appropriate in the planning area.

The objective is to minimise the impact of defence force, emergency services and other training on key values.

This will be achieved by:

1. ensuring that activities are carried out in accordance with relevant Department policies and guidelines;
2. assessing impacts of specific proposals for undertaking defence force and emergency

services training and providing conditional approvals as appropriate;
3. prohibiting training exercises in areas likely to cause unacceptable damage or risk to key values;
4. continuing to liaise with the defence forces, Government Departments and other organisations likely to conduct training exercises in the planning area to:
   - ensure minimal impact techniques are adopted during training exercises;
   - encourage them to seek alternative suitable venues outside the planning area; and
5. maintaining a map or record of areas suitable for training exercises within the planning area so that advice can be given on the sustainability of areas and advice as to alternative areas given.

41. PUBLIC UTILITIES AND SERVICES

Existing Utilities and Services

Public utilities and services of the planning area are significant to the State, and are strategically located to supply power, water, communications and rail services to regional population centres of the south-west, and in some cases, the Perth metropolitan area. Several utility corridors traverse the planning area, ensuring the shortest route for these services to other nearby lands, towns and infrastructure (see Map 9).

A telecommunication tower occupying an area of 1.5 ha is located on River Road and utilises one of few high points in the landscape to supply television to the region. An adjacent tower was previously used by the Department as a fire tower but is now used by Telstra for communications purposes. A radio communications tower owned by the Department is located further west along Lennard Road. This tower is used in park management, search and rescue operations and fire management, and is considered compatible with the purpose of a national park.

Several powerlines dissect the area, including the Picton-Collie line along the Coalfields Road, the Muja-Bunbury line near Pile Road, and the Muja-Southern Terminal, which cuts across the western edge of the Westralia Conservation Park. These power supplies are important to the region as they connect the coal-fuelled Collie and Muja power stations to Bunbury and the Perth metropolitan area. In doing so, they make a significant contribution to the State electricity grid. Power is also provided to the kiosk near the Reservoir wall, Wellington Mill Cottages (also known as Wellington Forest Cottages) and the Wellington Discovery Forest. Underground telephone lines also service these areas from the Collie and Ferguson exchanges. A public telephone is to be located in the kiosk precinct near the Reservoir wall. A railway also crosses Wellington National Park to the north of Coalfields Road.

The Wellington-Harris pipeline (which connects Wellington and Harris reservoirs) and its associated powerline dissect Wellington National Park. This pipeline enables water to be distributed for use in the Collie and Muja power stations as well as for the GSTWSS. The Reservoir is also the location of a disused hydro-electric power station, which has been in place since the 1960s. At the time of writing, the National Trust own the facility and are seeking to preserve the site and maintain its historic value, with the long-term intention of restoring the facility to an operational state. The Department will consider proposals put forward by the National Trust for the management of the building in line with its legislative responsibility.

Where the scale of existing water supply infrastructure/utilities is clearly incompatible with the purpose of existing reserves (e.g. major works such as the Reservoir wall and water pumping stations which involve clearing of the site and the injection of many tonnes of concrete), consideration will be given to excising these areas of land from the national park and reserving the land under an appropriate tenure which facilitates their purpose and management. The

communication tower on River Road and infrastructure that traverses the planning area (e.g. powerlines, pipelines and telephone lines) may also be incompatible with the purpose of reserves within the planning area either on the basis of the type of activity or the scale of the construction. These works may pose several issues for management in terms of wildfire risk, the spread of disease, weed invasion, soil erosion, unauthorised access and a reduction in landscape amenity. Consideration should be given to options that facilitate the operation of the utility but also meets the Department's requirements.

Proposed Utilities and Services

In the future, it is possible that the planning area may come under pressure to provide essential infrastructure to supply potable water (e.g. a treatment plant and associated facilities), distribute electricity and/or to provide communication services to private agencies or the public.

It is the Department's and the Conservation Commission's preference that utility infrastructure not servicing the planning area itself, is accommodated outside of the planning area. The initial response in considering proposals for utility service developments is to ensure the proposal is consistent with purpose of the reserve and the management objective of the land, as defined in the CALM Act. In instances where accommodating utility service developments within or adjacent to the planning area is acceptable, or undesirable but nonetheless unavoidable, negotiation and liaison are important to ensure that adverse impacts on key values and Department operations are minimised. Use of already degraded areas, pre-existing corridors or co-location with existing infrastructure (i.e. clustering facilities), is preferred.

The Department and Conservation Commission play an important role in identifying, assessing and monitoring any future developments/proposals that may impact on the values of the planning area. Where proposals are likely to have a significant adverse impact on the environment, they will be referred to the EPA for formal environmental impact assessment (and the imposition and monitoring of environmental conditions) under the Environmental Protection Act. Actions that may have a significant impact on matters of national environmental significance will also require approval (but not necessarily assessment) under the EPBC Act.

41. Public Utilities and Services

Key Points:

- Public utilities and services of the planning area are significant to the State, and are strategically located to supply power, water and communications to regional population centres of the south-west, and in some cases, the Perth metropolitan area.
- Impacts of establishment, operation and maintenance of these utilities include loss of visual amenity, soil erosion, weed introduction and spread, disease spread and associated access problems.
- In the future, it is possible that the planning area may come under pressure to provide essential infrastructure to supply potable water, distribute electricity and/or to provide telecommunication services.

The objective is to minimise the impacts of utilities and services on key values.

This will be achieved by:

1. permitting new utilities and services within the planning area where they are consistent with the CALM Act, there are no viable alternatives, they are consistent with Government policy and where they minimise adverse impacts on Department operations and key values. Where possible, new services and utilities should be located outside the planning area;
2. referring development proposals to the EPA for assessment if/as necessary;

3. encouraging new utilities and services to be developed using existing utility corridors and sites;
4. permitting the co-location of structures provided Department operations are not impeded and there are no ancillary equipment shelters or ground works associated with the proposal;
5. considering the excision of major infrastructure from Wellington National Park that is clearly incompatible with the purpose of a national park and reserving the land under an appropriate tenure;
6. investigating and considering appropriate management options that meet both the Department's and utility provider requirements for the operation of the communication tower on River Road and utilities and services that traverse the planning area (e.g. powerlines, pipelines and rail);
7. considering proposals put forward by the National Trust for the management of the disused hydro-electric power station where this is consistent with the CALM Act;
8. encouraging new powerlines to be developed underground to minimise visual impacts;
9. ensuring that land disturbed by utility service development and maintenance is adequately rehabilitated using appropriate local species, and at the expense of the parties responsible for the development;
10. encouraging the prime users of infrastructure and utility corridors to be responsible for management of environmental problems (e.g. weed and disease management);
11. liaising with utility and service providers to ensure that development proposals and subsequent establishment, operation and maintenance is in accordance with Department policy and minimises environmental and other impacts (e.g. visual landscape);
12. seeking direct and complementary offsets to counterbalance any adverse environmental impact in accordance with environmental offset principles; and
13. providing an appropriate level of wildfire protection for public utilities and services.

42. BEEKEEPING

Commercial beekeeping is a small but significant industry in Western Australia. Apiarists have traditionally relied on large areas of native vegetation for honey production, and are increasingly dependent on lands managed by the Department. All beekeeping sites on Crown land in Western Australia (including land not managed by the Department), require a permit from the Department. At the time of publication, there are 10 registered sites within the planning area, most of which are located within the Wellington National Park. There are a further three sites within the planning area that are currently vacant. These sites were cancelled by apiarists and have been placed into a pool of sites to offer to beekeepers that may need to be relocated from other areas.

Department Policy

General guidance for the management of beekeeping on Crown land is provided for by the Department's Policy Statement No. 41 *Beekeeping on public land*, which is under review after a public comment period. Under the draft policy, the Department will maintain (and renew) current beekeeping site permits on all classes (tenures) of land, but permit no additional beekeeping sites on land which is currently reserved, or proposed to be reserved, primarily for nature conservation purposes[21], until a management plan has been prepared. In this instance, the Department, through the management planning process, will consider whether access for beekeeping is either retained at the current level, increased, decreased or phased out, based on appropriate ecological and management criteria (Appendix 8). Thus the management planning process will identify suitable areas for beekeeping whilst minimising the potential impacts of managed honeybees.

[21] Lands reserved primarily for nature conservation includes national parks, conservation parks, nature reserves and 5(1)(g) and (h) reserves.

Applying Department Policy to the Planning Area

While it is recognised that feral honeybees are more of a threat to the values of conservation reserves than managed honeybees, there is little knowledge about the range of conditions under which honeybees leave the hive, and become feral. Consequently, the Department will take a precautionary approach with regard to allowing beekeeping in conservation reserves.

When allowing an introduced pollinator to persist within a conservation reserve, the dynamics between the native pollinators (which include mammals, birds and insects) and the native flora and dependent fauna need to be considered. The planning area will be assessed using environmental and management criteria, adapted from the draft policy, in terms of the values that may be impacted by honeybees (Appendix 8). Visitation by honeybees and any predicted impact on declared rare and Priority flora and significant habitats and communities within the planning area will be assessed by Department specialists. As a result, the planning area can be categorised as either:

- 'suitable' for beekeeping sites;
- 'suitable but conditional'; or
- 'highly constrained'.

The Department's management approach for each category and an assessment of the planning area is shown in Appendix 8. This identified one site as suitable and nine that were suitable but conditional (Appendix 8). No sites were highly constrained. Appendix 8 shows additional conditions that should be placed on each permit.

Sites adjoining the planning area may also impact on its environmental values. Where these are located on lands managed by the Department the criteria in Appendix 8 should be applied.

The methodology of categorising the planning area into classes of suitability will have to be adaptive over the life of this plan to ensure that the best available knowledge is used to apply the criteria of Appendix 8. Any change in the categories for beekeeping, criteria or values of the planning area should ideally coincide with the review of beekeeping permits. Further research is also required to quantify the impacts of managed honeybees on the natural environment.

42. Beekeeping

Key Points:

- Commercial beekeepers have traditionally relied heavily on large areas of native vegetation, and are increasingly dependent on lands managed by the Department.
- At the time of writing, there are 10 registered beekeeping sites within the planning area.
- The planning area has been assessed as being either suitable, suitable but conditional or highly constrained for beekeeping sites as per the environmental and management criteria in Appendix 8.

The objective is to minimise the impact of commercial honeybees on natural values and park visitors whilst supporting the beekeeping industry.

This will be achieved by:

1. managing beekeeping in accordance with Department policy;
2. renewing, with standard conditions, permits for beekeeping sites in areas deemed 'suitable';
3. renewing, with additional conditions, permits for beekeeping sites in areas deemed 'suitable but conditional';
4. allowing new beekeeping sites or the transfer of sites to areas deemed 'suitable' or

'suitable but conditional', subject to the appropriate conditions;
5. prohibiting beekeeping sites in areas deemed to be 'highly constrained'. Where possible, cancelled sites should be relocated;
6. reviewing the beekeeping analysis for the planning area every 5 years to determine whether access for beekeeping is appropriate, and adapt management accordingly;
7. supporting Department research on the impact of beekeeping on native flora and fauna within natural ecosystems of the south-west and adapting management accordingly; and
8. liaising with beekeepers, the Beekeepers Consultative Committee, and the Department of Agriculture and Food to ensure the most efficient and sustainable use of sites.

43. FOREST PRODUCE

The management and extraction of forest produce[22] varies depending on the CALM Act category of land and the purpose of the reserve. The CALM Act categories of land included in this management plan are national park, conservation park, State forest (with a proposed land classification of forest conservation area) and CALM Act section 5(1)(h) reserve.

National Parks and Conservation Parks

Section 99A of the CALM Act enables the Chief Executive Officer to grant a licence to take and sell forest produce (including trees) from national parks and conservation parks (e.g. Wellington National Park and Westralia Conservation Park) provided it is:

- to remove exotic trees (e.g. pines or exotic eucalypt species), honey, beeswax or pollen (by beekeeping site permit);
- used for therapeutic, scientific or horticultural purposes; or
- as a result of essential works.

'Essential works' are defined in section 99A(2) of the CALM Act as works that are required to establish or re-establish access to land or to provide a firebreak (for example, after a storm with fallen trees blocking access). The Forest Products Commission can not remove forest produce from national parks and conservation parks.

State Forest

State forest of the planning area is proposed to be classified as forest conservation area (i.e. proposed Westralia Forest Conservation Area) until impediments to its reservation as conservation park are lifted (see Sections 9 *Land Tenure and Classification* and 10 *Existing and Proposed Reserves*). As identified in the FMP, the priority for managing forest conservation areas is the maintenance of biodiversity, and therefore they will not be available for timber production, but may be available for other State forest uses such as beekeeping, wildflower picking or craftwood.

Forest Products Commission tree harvesting operations within State forest adjacent to the planning area (which are not forest conservation areas) will need to be compatible with the FMP and silvicultural practice in the jarrah forest–S*ilvicultural guidelines 1/02*. Visual landscape management in particular, should be carefully considered in timber harvesting proposals and, where possible, incorporated into management prescriptions. To minimise soil erosion, reduce unnecessary visitor access and maintain the visual amenity of the forest environment, roads no longer used for timber harvesting should be closed and rehabilitated.

[22] 'Forest produce' includes trees, parts of trees, timber, sawdust, chips, firewood, charcoal, gum, kino, resin, sap, honey, seed, bees-wax, rocks, stone and soil, as defined in section 3 of the CALM Act.

CALM Act Section 5(1)(h) Reserves

The Wellington Discovery Forest, located in the south-west corner of the planning area, is a CALM Act section 5(1)(h) reserve with a purpose of 'Scientific Research and Education'. Silvicultural treatments that involve the removal/harvesting of some trees for the purpose of demonstrating the response of the forest to disturbance is consistent with the purpose of the reserve, and therefore will be permitted. As is the case for national parks and conservation parks, forest produce can also be taken from the Wellington Discovery Forest as a result of essential works, to remove exotic trees and for therapeutic, scientific or horticultural purposes.

The Forest Products Commission is prohibited from harvesting timber for commercial purposes from CALM Act section 5(1)(h) reserves such as the Wellington Discovery Forest.

Utilisation of Forest Produce

Forest produce taken in the course of carrying out Departmental operations can be used for making improvements to any land to which the CALM Act applies. This includes forest produce taken as a result of silvicultural treatments within the Wellington Discovery Forest. Forest produce taken in connection with essential works can also be sold, or used by the Department. Additionally, exotic tree species can be selectively logged and sold by the Department.

Firewood

State forests have traditionally provided the main source of firewood. Section 128 (1)(d) of the CALM Act and Part 15 of the *Forest Management Regulations 1993* provides for the taking of firewood from designated public firewood areas within State forest and timber reserves. Firewood collection is not permitted within national parks, conservation parks and CALM Act section 5(1)(h) reserves, except for campfires and barbeques in the immediate vicinity of recreation areas and only where they have been signposted for such use, and for section 5(1)(h) reserves, where it is consistent with the purpose of the reserve. Illegal firewood collection will be an ongoing issue within the planning area due to recent tenure changes and the proximity to Collie.

As part of its management obligations, the Department will seek to designate or gazette 'Firewood Collection Areas' outside the planning area but within the Wellington District and these will be clearly signposted and marked on park literature. Areas for firewood collection can be obtained from District and Regional offices of the Department.

The Department may source firewood from residue as a result of management operations, product sourced from harvesting operations by licensed contractors (e.g. the removal of trees as a result of 'essential works'), or from the removal of exotic trees.

43. Forest Produce

Key Points:

- The management of forest produce varies depending on the category of land and the purpose of the reserve.
- Silvicultural treatments that involve the removal/harvesting of some trees from the Wellington Discovery Forest is consistent with the purpose of the reserve, and therefore will be permitted.
- Firewood can not be removed from the planning area, unless areas are signposted for such use. The Department will gazette Firewood Collection Areas in State forest and timber reserves outside the planning area but within the region.

The objective is to prohibit the removal of forest produce except where it is in accordance with the CALM Act and this management plan.

This will be achieved by:

1. prohibiting forest produce to be taken from the planning area unless it is in accordance with the CALM Act and the provisions of this management plan;
2. permitting silvicultural treatments in the Wellington Discovery Forest that involve the removal of some trees (i.e. taking of forest produce);
3. using forest produce that becomes available for use from the carrying out of operations to which section 33(1)(cb)(iii) of the CALM Act applies for the purposes of making improvements to any land to which the CALM Act applies;
4. designating or gazetting 'Firewood Collection Areas' in State forest and timber reserves within the Department's Wellington District and prohibiting this activity within the planning area; and
5. removing trees that pose a threat to the public or facilities, or that obstruct designated access tracks and using the timber within the conservation estate wherever possible.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
43.1 Incidence of unauthorised firewood collection	43.1 A declining trend in the reported incidence of unauthorised firewood collection	Every 5 years

44. WATER RESOURCES

Legislative Framework

The responsibility for the regulation, protection and management of water resources in the planning area rests with the Minister for Water Resources (or delegated authority such as DoW), and the Department.

Water Protection

Sections 33(1)(dc) and (dd) of the CALM Act state that a function of the Chief Executive Officer is to promote the conservation of water (both quality and quantity), and to develop policies that provide for water to be taken from lands to which the CALM Act applies. Section 33(4) of the CALM Act states that these specific functions related to water are to be carried out, where there is a management plan for the relevant land to which the paragraph applies, in accordance with that plan, and without limiting the operation of the RIWI Act.

The DoW also protects water resources (see Appendix 2 for information about DoW's approach to water source protection and the future use of the Reservoir).

Water Extraction and Abstraction

The taking of water from catchments of the planning area is regulated under the *Rights in Water and Irrigation Act 1914* (RIWI Act), which is administered by DoW. Under the RIWI Act, a licence is required to take water in proclaimed areas or non-artesian groundwater areas proclaimed or prescribed under the Act. Such licences specify the amounts and conditions under which water may be taken. Conditions typically cover measurement and monitoring responsibilities of the licensee and specify constraints on the amount taken to ensure environmental impacts are acceptable and downstream flow regimes are maintained to meet environmental and social water needs.

Proponents seeking to extract water from the planning area also require approval from the land manager (in this case the Department) to access the land for the purpose of extracting water. The Department may issue a water removal permit under section 97A(2) and (6) of the CALM Act for State forest and timber reserves and section 101 (1a) and (1e) of the CALM Act for other CALM Act land (e.g. national parks and conservation parks) for this to occur. These permits require approval by the Minister for the Environment and are subject to consideration by the Conservation Commission and the recommendation of the Department's Director General. The permits cannot limit the operation of the RIWI Act and need to be in accord with a CALM Act management plan. A water removal permit can place conditions on the proposed extraction (e.g. on the quantity of water extracted). Where infrastructure is required, a lease may also be issued. An assessment by the EPA may be required for projects with potentially significant environmental impacts.

Under the *Water Agencies (Powers) Act 1984*, the Water Corporation (as the proponent) is also required to acquire an interest in the land for major works, such as dams or groundwater extraction schemes. In the case of the planning area, a water removal permit issued by the Department would classify as an 'interest' needed to undertake major works.

The planning area lies within a proclaimed irrigation district under the RIWI Act. Westralia Conservation Park and the majority of the proposed Westralia Forest Conservation Area are also proclaimed under the Act as a groundwater catchment, whilst the Ferguson River, in the south-western part of the planning area, is a proclaimed river.

Surface Water Supply

Wellington Reservoir

The Reservoir is a 1611 ha expanse of open water that has a maximum supply of 186 GL. It has the largest capacity of any reservoir in the south-west, and is the fourth largest in the State. Water has been extracted from the Reservoir since 1933 and until 1990 was used to supply potable water to the GSTWSS, including the Collie townsite. At the time of writing, the Reservoir is used primarily for irrigation of the Collie River Irrigation District, which stretches from Benger to Dardanup, comprises 267 km of channels over an area of 16 000 ha, and supplies water to over 470 farms. In the future, the Reservoir could potentially be used as potable water for the GSTWSS and/or as part of the IWSS for the south-west of the State. This may have significant implications for management of the planning area and may require changes to the strategies presented in this plan, especially with regard to public access and recreational use (see Appendix 2). Any assessment of the worth of the Reservoir needs to consider the social, economic and environmental values of the resource. Transportation of water from the Reservoir is via the Wellington–Harris pipeline (see Map 9).

At the time of writing, the WC holds a licence to store water in the Reservoir for commercial purposes. The South West Irrigation Management Co-operative Ltd. holds a licence to extract 68 GL of water from Burekup Weir, which obtains its supply from the Reservoir.

In the past, a by-product of water extraction at the Reservoir has been a source of hydro electricity, although the hydro-electric power station located downstream of the Reservoir wall is not currently in operation.

Other Water Supply

Treated water is supplied to the kiosk near the Reservoir wall and to the Potters Gorge recreation site via the Wellington-Harris pipeline. At Honeymoon Pool, Wellington Discovery Forest and Wellington Mill Cottages (also known as Wellington Forest Cottages), water is supplied from nearby creeklines and river systems. The latter it is untreated and should be boiled before consumption. This applies to other campsites developed in the planning area.

Groundwater Supply

In 1999, a study prepared by the Collie Water Advisory Group found groundwater flow patterns in the Collie Basin to be highly disturbed because of large-scale groundwater abstraction for mine dewatering and power generation (Collie Water Advisory Group 1999). The study concluded that continued abstraction to the current allocation would adversely affect the recovery of groundwater levels in river pools, albeit to varying degrees. In response to this, DoW have prepared an environmental water provisions plan to guide long-term pool supplementation schemes. It is possible under these schemes that future demands for water supply to power stations will be met by mine dewatering and surface water from Wellington or Harris reservoirs. This may require upgrading the infrastructure associated with the Reservoir.

No groundwater abstraction currently occurs in the planning area, although it may be affected by active abstraction in nearby areas.

44. Water Resources

Key Points:

- A licence, administered by DoW, is required to take water in proclaimed areas or non-artesian groundwater areas proclaimed or prescribed under the RIWI Act. The entire planning area is proclaimed as an irrigation district. It also contains a proclaimed groundwater catchment and a proclaimed river.
- A permit under the CALM Act is also required to extract water from the planning area.
- The Reservoir is the largest dam in the south-west and is used primarily for irrigation of the Collie River Irrigation District. The Reservoir is a potential potable drinking water supply for the GSTWSS or for the IWSS for south-west of Western Australia.
- Groundwater abstraction is undertaken within the Collie Basin, primarily to dewater underground and open cut mines and for power generation. As a result, groundwater flow patterns in the Collie Basin have become highly disturbed.
- DoW will prepare an environmental water provisions plan to guide long-term pool supplementation schemes to manage the effects of groundwater abstraction.

The objective is to protect the water resource of the Reservoir whilst minimising the impact of water extraction.

This will be achieved by:

1. liaising with DoW to ensure that environmental water requirements for the Collie River and its tributaries are maintained and that this is supported by an appropriate level of monitoring;
2. subjecting all new infrastructure supporting water extraction on adjoining lands to the strategies of Section 41 *Public Utilities and Services*;
3. requesting that the EPA formally assess any proposals for water extraction where this may adversely affect the values of the planning area;
4. issuing a water removal permit, after consultation with the Conservation Commission and approval by the Minister for the Environment, approval by DoW and an appropriate level of assessment, for the extraction (taking) of water from the planning area. Where a CALM Act water removal permit is not issued, or DoW does not grant a licence, water may not be extracted from the planning area;
5. ensuring that water used by the Department is appropriately licensed under the RIWI Act; and
6. testing untreated water at recreation sites to ensure it meets health requirements.

PART G. INVOLVING THE COMMUNITY

The planning area provides a valuable opportunity for the community to experience and learn about forested environments. An effective communication program to involve the community is vital to achieving the vision and objectives of this management plan. It informs the public of the attractions, facilities, opportunities and interpretive services available, and assists in increasing appreciation and understanding of the natural and cultural environment. It also fosters a sense of community ownership of the planning area, engenders support for management and encourages appropriate behaviour. Communication is also vital to managing visitor risk so that visitors have safe, enjoyable experiences in the planning area.

A range of communication strategies targeting different audiences is required, and should comprise the following:

- information (embracing publicity, promotions and marketing);
- education (for schools and special interest groups);
- interpretation of visitor experiences;
- community involvement (public participation, volunteers, friends and advisory groups); and
- liaison, consultation and advisory services to stakeholder groups.

Communication strategies presented in this management plan were prepared in conjunction with planning for visitor use (see Part E *Managing Visitor Use*).

45. INFORMATION, EDUCATION AND INTERPRETATION

Information

Information provided by the Department is available through park signage, print media (e.g. pre-visit information brochures such as *Recreation sites in the Wellington District*, *Munda Biddi Trail – A forest cycling adventure* and *Walk the Bibbulmun Track*) the Department's NatureBase website and park rangers. Information is also widely available from many external sources, including tour operators and the tourism industry. The delivery of consistent and accurate information by both internal and external providers is important in achieving effective communication. To that end, the Department will provide advice, resources and training to tour operators and other information providers to assist them in reinforcing the Department's messages to visitors. It is a requirement for tour operators to actively promote the values of the planning area, which are the subject of their operations and to attend training workshops if requested (conditions 5.10 (d) and (e) of the Department's *Tour Operator Handbook*). The Department will incorporate these requirements into future commercial lease agreements at major sites (e.g. the kiosk at the Reservoir). This will greatly assist the Department in directing and managing visitors within the planning area.

There is also a need to develop specific brochures and pamphlets to provide further information about park orientation as well as the values, history and regulations within the planning area. Completion of an information bay along Wellington Dam Road will provide initial information to visitors entering the planning area. Linking to interpretive signage outside the planning area should also be considered as visitors rarely see a park as an entity on its own but rather as part of a larger region. A communication strategy regarding unauthorised firewood collection should be incorporated as part of this program.

Education and Interpretation

Educational and interpretive opportunities of the planning area are well developed at the Wellington Discovery Forest (see Section 47 *Wellington Discovery Forest*) and are also available in the kiosk precinct near the Reservoir wall. Interpretative information portraying the biology of the jarrah is also available at the King Jarrah recreation site.

An interpretation plan for the planning area is being written to direct the implementation of interpretive projects and tourism initiatives. This will focus on the topics of rivers, forests, cultural heritage, biodiversity conservation, water quality protection, encouraging family use (including low impact recreation) and the evolution of land-use change in the south-west. The interpretation plan will ensure integration and coordination of messages and themes across the various sites and tracks. This may include directional signage, entry statements, information shelters, interpretive signs, exhibits, publications and facilities. In particular, the planning area is suited to the concept of interpretive walk and drive tracks, especially where these involve scenic drive routes (such as Lennard Drive) or where walk tracks link to accommodation facilities or recreation sites (such as at Honeymoon Pool).

At present there is no visitor centre within the planning area and thus no focal point for information, interpretation and education. In the long-term, the kiosk precinct would appear to be an ideal location for a visitor centre where information could be displayed, questions answered and visitors motivated to learn more about the area and other nature-based opportunities within the region. This area is particularly suitable as it is centrally located within the planning area, has well developed access, lies on main scenic travel routes through the forest and is the most highly visited site within the planning area, especially when the Reservoir overflows.

Aboriginal people have a long and established involvement with the area and interpretation should reflect their culture and values. The Collie River, a primary attraction to the area, is a registered Aboriginal Heritage site and presents an ideal opportunity to communicate local Noongar culture. This can be achieved by completion of the interpretive walk track from Honeymoon Pool to the bridge at River Road. Furthermore, a bush tucker garden will be developed in the Wellington Discovery Forest as part of the education program for school children and other educational groups.

45. Information, Education and Interpretation

Key Points:

- Without an effective communication program that considers information, interpretation and education, achieving management objectives for the planning area becomes increasingly difficult.
- An effective communication program enriches the visitor experiences and fosters an appreciation of the planning area's values and the need for their protection.

The objective is to promote community understanding and awareness of the key values of the planning area and engender support for its effective management.

This will be achieved by:

1. developing and implementing an interpretation and communication plan for the planning area;
2. developing a range of information, interpretation and education programs, facilities and media that highlight key values and management issues;
3. developing information shelters at key access points to orientate and introduce visitors

to the planning area and installing signs to inform them of one-way roads and safety hazards;
4. ensuring that external providers such as volunteers, commercial operators and the tourism industry, have relevant and factual information and interpretive material about the planning area;
5. incorporating the promotion of key values into future commercial lease agreements at major interpretive sites;
6. monitoring tour operator compliance with licence and lease conditions, and encourage tourism industry/business accreditation and guide certification to assure quality product and service delivery;
7. liaising closely with other agencies, organisations and individuals (such as tourism agencies, tour operators, schools and museums) to ensure integration of education and interpretation programs, facilitate mutually beneficial partnerships and expand the range of eco tourism experiences offered; and
8. considering the impact of proposed management activities on educational programs.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
45.1 Level of visitor satisfaction with education and interpretation opportunities offered in the planning area	45.1 Level of visitor satisfaction with education and interpretation opportunities remains stable or increases over the life of the plan	Every 3 years

46. COMMUNITY INVOLVEMENT AND LIAISON

Key functions of the Conservation Commission and the Department are to promote and facilitate active community involvement in the management of conservation lands. The community, as groups or individuals, are encouraged to be involved in both the planning and management of many of the Department's activities, including volunteer programs.

The community have been involved in drafting this management plan through written submissions to the draft management plan and participation in issues gathering workshops, public meetings and public displays. The Wellington National Park Community Advisory Committee has also provided advice to the Department throughout the preparation of this management plan. This committee will continue to advise the Department on matters relating to the plans implementation.

Ongoing community support is essential for the successful implementation of this management plan. Community members currently take part in volunteer activities such as walk trail development, rehabilitation and campground hosting. They are also encouraged to be involved in visitor surveys, clean up days and assistance with maintenance, such as erosion control, weed removal, track maintenance, and data collection. Volunteer activities not only increase the Department's work capabilities and skills base, but also foster communication links and understanding with the community. Local bushfire brigades, campground hosts, Friends of the Bibbulmun Track, are examples of independent volunteers, working cooperatively in a well-established relationship with the Department, to the mutual benefit of both parties and the community.

The CALM Act also provides for the appointment of Honorary Conservation and Land Management officers. Selected volunteers may be appointed under the Act and, after appropriate training, invested with certain powers to enable them to carry out certain functions for the Department. Volunteers may work in areas of land management, heritage, as facilitators of volunteer groups or assist in emergency situations.

The involvement and support of Aboriginal people, adjacent landowners and managers, planning area users, tour operators and interest groups is important to the conservation of the planning area's key values and to provide more effective and integrated management of cross-boundary issues. To this end, the Department released its *Good Neighbour Policy* (DEC 2007), which is aimed at building mutually beneficial relationships with neighbours to deal with a range of cross-boundary management issues such as fencing, fire management, natural resource management and weed and feral animal control.

Working together with Aboriginal people to 'care for country' will assist heritage preservation and conservation of the environment, as well as enrich cross-cultural awareness. The future involvement of Aboriginal people in management of the planning area will be considered in light of the Government determining a policy position (see Section 8 *Management Arrangements with Aboriginal People*).

46. Community Involvement and Liaison

Key Points:

- Community involvement and support is an integral part of the Department's operations and critical to the successful implementation of this management plan.
- The Department supports voluntary activities, which contribute to achieving conservation and management objectives, and which build community awareness, understanding and commitments to these objectives.

The objective is to facilitate effective community involvement and support in planning and management.

This will be achieved by:

1. continuing to provide and promote opportunities for the involvement of interested community members in management of the planning area (e.g. the Wellington National Park Community Advisory Committee and volunteer programs);
2. continuing to work with the Wellington National Park Community Advisory Committee to implement the strategies of this plan;
3. continuing to liaise with local Aboriginal people, neighbours, land managers, local authorities, relevant Government agencies and other stakeholders to enhance management;
4. ensuring that Aboriginal people have an active role in communication relating to Indigenous cultural heritage; and
5. continuing to support volunteer involvement in the Departmental programs and the maintenance of the Department's volunteer database.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
46.1 Changes in the number of registered volunteers and the level of volunteer hours contributed within the planning area	46.1 An increase in the number of registered volunteers and the level of volunteer hours contributed within the planning area	Every 5 years

47. WELLINGTON DISCOVERY FOREST

The Wellington Discovery Forest concept was conceived in 1990 with the aim of raising community awareness and understanding of the natural values and management of the jarrah forest. It was believed that the area would provide a platform for engaging the community in

informed discussions on current and future uses of the jarrah forest across all tenures. Its relatively small and compact size means that it could operate and be visited as an open air classroom or meeting ground, where trials and demonstrations can be accommodated, documented and interpreted. It was envisaged that Wellington Discovery Forest would comprise three zones, each with different objectives and methods of communication (Figure 9):

- an Ecology Zone – This zone concentrates on introducing visitors to the jarrah forest environment, its main flora and fauna species, structural components, growth and distribution patterns. The aim is to develop and refine visitor's observational skills and conceptual understanding of the forest ecosystem. This will be achieved by use of both 'ranger' led and self-guided interpretive trails, which will interpret the main themes of the forest (e.g. flora, fauna, soils, geology, fire, water, landscape and cultural values). With this background knowledge, visitors will be equipped with the basic skills and confidence to explore other aspects of the forest and its management in the other zones;
- a Research Zone – This zone provides an area for tertiary institutions, schools, community groups and professional researchers to establish forest research and monitoring programs. It provides the opportunity for education groups to initiate long-term projects over successive years. This continuity will enable teachers and students to gain an appreciation of the response of the forest over time; and
- a Management Zone – This zone aims to (1) demonstrate the response of the forest to disturbance (including a variety of silvicultural treatments) (2) illustrate and monitor the impact of this disturbance over time and (3) to demonstrate and interpret modern integrated forest management practices.

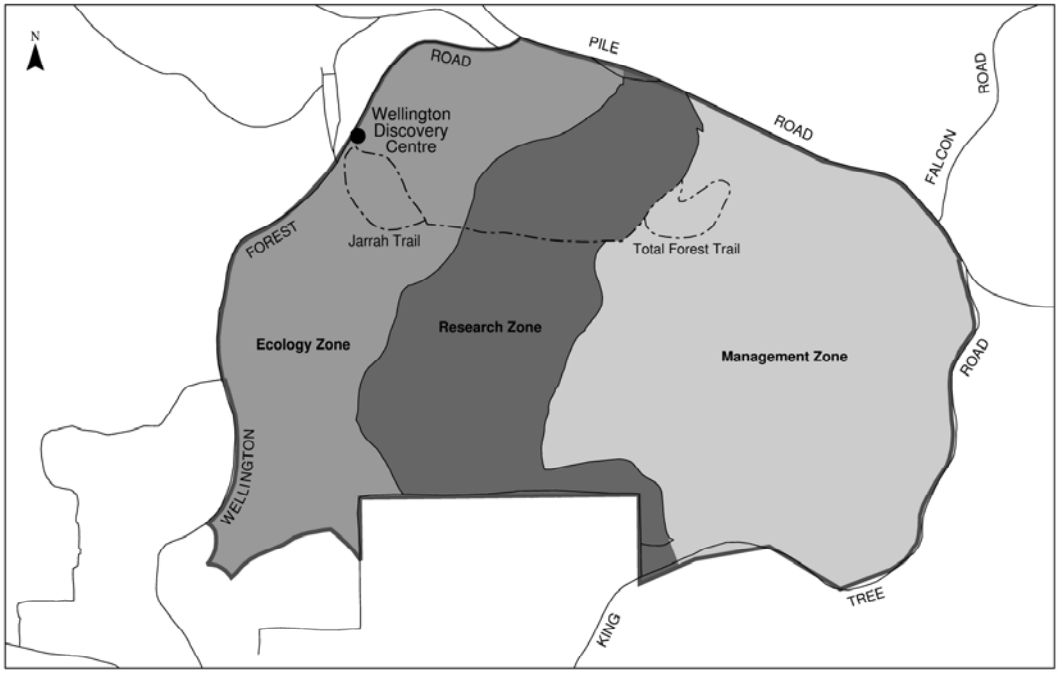

Figure 9. Zones of the Wellington Discovery Forest

It was intended that silvicultural treatments that involve the removal/harvesting of some trees would be applied over 10 ha sections of the Management Zone every 10 years over a 200-year rotation. The reason for repeating the demonstration every 10 years is that there is sufficient area in the Management Zone to allow at least 20 such demonstrations, after which time the initial area treated would be 200 years old and the current trees that presently form the upper canopy will be over 300 years of age. The concept was also to repeat a minor area of disturbance (removal or harvesting of trees) every 10 years so as to always have an area of recent disturbance available for comparison purposes. To obtain this comparison in the broader forest environment would require extensive travel to a multitude of sites. In 1992, 15ha of the

then State forest was treated as the part of this concept. However, no further silviculture activities have been undertaken since.

The Wellington Discovery Forest, and in particular the Management and Research zones, were never intended to promote timber harvesting or a demonstration of harvesting practices, but rather as a means of demonstrating the response of the forest to disturbance. A range of management activities including prescribed burning, disease control and fox baiting were intended to be demonstrated and interpreted in the Management Zone. The advantage of having different types and sequences of disturbances on the same site and within close proximity is unique, and invaluable for demonstration and research purposes. However, the Research and Management zones are not well utilised at present. The Department has developed and implemented successful community education programs, particularly for schools, in the Ecology Zone.

The Wellington Discovery Forest concept was proposed before there was consideration of making the area a national park. The area was originally part of State forest No. 25 but was later identified in the FMP in the proposal to expand Wellington National Park. Debate arose over the potential to use the area for demonstrating silvicultural activities including harvesting of trees. This would not have been compatible with the proposed national park purpose. If the Wellington Discovery Forest was included in the Wellington National Park, silvicultural treatments, including the removal or harvesting of some trees, would not be permitted.

After extensive consultation, the Wellington Discovery Forest was included in the *Reserves (National Parks, Conservation Parks and Nature Reserves) Bill 2004* that was introduced to Parliament in November 2004, as part of the expansion of Wellington National Park. The Bill was subsequently amended in Parliament to exclude an area of 684 ha that comprised the Wellington Discovery Forest from the proposed national park expansion, and instead proposed to reserve it as a CALM Act section 5(1)(h) reserve for the purposes of 'Scientific Research and Education'. The Parliamentary Hansard shows that there was support and agreement for this amendment to the Reserves Bill. The Bill also resulted in the creation of the expanded Wellington National Park and other important national parks, conservation parks and nature reserves. Legislation to create the Wellington Discovery Forest reserve was passed on 8 December 2004, providing the area with a security of purpose and continuity of management over time. This management plan will provide management direction for the new reserve, giving due consideration to its purpose and the intent of Parliament.

Current Use and Management

At the time of publication, the Wellington Discovery Forest is used primarily for community education, providing an excellent opportunity for the community to learn first hand about the complexities of managing the jarrah forest.

The focal point of the area is the Wellington Discovery Forest information centre, which contains four interpretative panels, murals and facilities to cater for large groups. Radiating from the centre is a number of interpretative self-guiding walk tracks such as the Jarrah Trail, Total Forest Trail and the Sense-ational Trail. Opportunities exist to link walk tracks to interpretative sites such as the King Jarrah. There is also the opportunity to expand the centre and provide accommodation/interpretative facilities by incorporating two nearby cottages that are currently leased out by the Department. This would only be considered if the lease was discontinued.

Most visits to the Wellington Discovery Forest are by tertiary, secondary and primary educational institutions (including teacher professional development programs) although visitors pass through the centre on weekends. Since 2000, when the eco-education programs were implemented at the Reserve, approximately 16 800 people have visited this area, including 1677 visits in 2007. Department staff conduct educational programs designed to offer young

people a hands-on experience in learning about the forest environment. At the time of writing, 18 eco-education programs are offered. New programs are to be developed to cater for Aboriginal studies incorporating the bush tucker garden. In the long-term, guided programs may also be offered elsewhere within the planning area.

In addition to school-based education, the Wellington Discovery Forest is also utilised by Trees South West who conduct workshops with private landowners seeking information on options for managing their native forest. The Forest Products Commission has also used the area for staff training purposes.

Future Management

The future management of the Wellington Discovery Forest will be in accordance with the intent of Parliament and the reserves purpose of 'Scientific Research and Education'. The area will operate as originally envisaged with three zones – an Ecology Zone, a Research Zone and a Management Zone (see above text). To facilitate the co-ordination of activities within the area and guide ongoing development, research and management, an operational plan will be prepared. This plan will be prepared in close consultation with interested parties and advice provided to the Wellington National Park Community Advisory Committee to ensure management is integrated with the adjoining Wellington National Park.

Research and monitoring will be permitted within the Wellington Discovery Forest, although some types of research (e.g. FORESTCHECK) may not be suited to the Management Zone at present as only a small area is proposed to be treated every 10 years over a 200-year period. However, it is possible that once fully operational, part of the untreated forest could be used as a reference site to compare with treated areas of the Management Zone, or that in several decades time, research/monitoring could be undertaken simultaneously over the range of treated areas then available. The value of such research/monitoring would be assessed at this stage. However, this does not prevent independent researchers from utilising the site, and the Department encourages a 'citizen science' approach to research and monitoring where programs are undertaken by community groups. In this instance, the Department could offer a training role. It is important that knowledge on how best to manage the Wellington Discovery Forest is improved by research findings and that these findings are communicated to the community. Thus interpretation of all zones will be an important part of management.

Section 43 *Forest Produce* further identifies how forest produce (including trees) can be taken from the Wellington Discovery Forest and used. Access to the area will be improved to facilitate group activities, although standard hygiene practices will apply and vehicle access only allowed for management and/or approved purposes, through the issue of a Disease Risk Area permit (see also Section 24 *Disease*). Visual landscape management techniques will be used to conserve scenic quality (see Section 36 *Visual Landscape*).

47. Wellington Discovery Forest

Key Points:

- The Wellington Discovery Forest provides an excellent opportunity for the community to learn first hand about the complexities of managing the jarrah forest.
- The Wellington Discovery Forest concept was proposed before there was consideration of making the area a national park. The area was originally part of State forest No. 25 but was later identified in the FMP in the proposal to expand Wellington National Park.
- It was envisaged that the Wellington Discovery Forest would comprise of three zones – an Ecology Zone, a Research Zone and a Management Zone.
- It was intended that silvicultural treatments that involve the removal/harvesting of some trees would be applied over 10 ha sections of the Management Zone every 10 years over a 200-year rotation. This would not have been permitted under national park tenure.

- The Wellington Discovery Forest was included in the *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Bill 2004* as part of the expansion of Wellington National Park. However, the Bill was subsequently amended in Parliament and a separate CALM Act section 5(1)(h) reserve created for the purposes of 'Scientific Research and Education' to facilitate the removal/harvesting of trees. The Parliamentary Hansard shows that there was support for the Wellington Discovery Forest concept.

The objective is to promote community awareness, appreciation and understanding of the natural values and management of the jarrah forest while being consistent with the purpose of the Wellington Discovery Forest reserve and the provisions of the CALM Act.

This will be achieved by:

1. managing the Wellington Discovery Forest for the purpose of 'Scientific Research and Education' in accordance with the CALM Act, Department policy and the original Wellington Discovery Forest concept (see also Figure 9);
2. developing an operational plan for managing the Wellington Discovery Forest in consultation with interested parties;
3. continuing to implement community education programs within the Ecology Zone and give consideration to expanding this program to other zones as appropriate;
4. informing schools about the function of, and opportunities available in, all zones of the Wellington Discovery Forest;
5. permitting the removal of some trees within 10ha sections of the Management Zone every 10 years, and over a 200-year rotation, to demonstrate the effects of forest disturbance;
6. permitting research and monitoring activities and encouraging a 'citizen science' approach to monitoring where programs are undertaken by community groups;
7. documenting research and monitoring undertaken in the Wellington Discovery Forest and storing this information in the Department's South West Region library;
8. communicating the results of research and monitoring in the Wellington Discovery Forest to the public;
9. maintaining an appropriate level of access to the Research and Management zones;
10. applying standard hygiene practices to minimise the spread of *P. cinnamomi*;
11. providing information and interpretation relevant to all forest tenures and, where necessary and appropriate, enhance interpretation within the Research and Management zones;
12. increasing community awareness of the role of the Wellington Discovery Forest; and
13. liaising closely with other agencies, organisations and individuals to ensure integration of education and interpretation programs, facilitate mutually beneficial partnerships and to expand the range of educational experiences offered (e.g. management options for private owners of jarrah forest).

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
47.1 Changes in the number of participants in education programs offered within the Wellington Discovery Forest	47.1 An increase at least 10% in participation, including recurrent participation, in education programs offered within the Wellington Discovery Forest from 2008 levels	Annually
47.2 Changes in visitation to the Research and	47.2 An increasing trend in visitation to the	Every 5 years

Management zones of the Wellington Discovery Forest	Research and Management zones of the Wellington Discovery Forest from 2008 levels	

PART H. RESEARCH

48. RESEARCH

Research is an essential component of management, and is required to successfully implement this management plan. It can lead to a better understanding of the values of the planning area, increase knowledge, aid in performance assessment and provide a scientific basis for improving and adapting future management to achieve the best outcomes.

It is appropriate that research involves a wide range of organisations and groups. The involvement of volunteers, educational institutions and individual researchers can reduce research costs, thereby helping to provide quality information for the benefit of the broader community.

Research Requirements

The Department's research activities are subject to a prioritisation process for research across the entire conservation estate. Priorities are given to:

- describing and documenting Western Australia's biological diversity;
- providing knowledge on how best to conserve the State's biodiversity; and
- increasing knowledge of visitor use patterns and profiles (e.g. demographics, level of use of recreation sites, visitor expectations and perceptions).

This statewide prioritisation process may result in the implementation of programs that have relatively little direct management application to the planning area but that may have significant application to the broader conservation estate and species or communities as a whole. Research requirements for the planning area will be considered as part of this broader statewide research prioritisation process.

In the case of this management plan, specific research projects should also assist in meeting the requirements of KPIs. This will include gaining a better understanding of those values identified as being most at risk (sensitive to disturbance) and to management practices most likely to have adverse social and ecological impacts. Consideration of research projects that examine the impacts of unanticipated changes to conditions, such as adjoining land use, should also be given priority. The research requirements identified throughout the plan include:

- fire management, including research into the fire ecology of flora and fauna, fire ecology of rock outcrops and riparian zones, fire behaviour in riparian zones and social science that is aimed at improving community awareness strategies.
- continuing social research is required to increase current knowledge of visitor profiles, the level of use of recreation sites, patterns of usage and visitor perceptions for future management.
- the impact of recreation on the environment. The need for additional facilities will also need to be monitored, taking into consideration population changes in nearby areas, visitor management settings and access.
- social research projects should determine if recreation, environmental education and interpretation activities are meeting visitor needs. A particular focus will be on activities within the Wellington Discovery Forest. The impacts of all activities should be monitored, and changes made if any impacts are unacceptable.

Research itself, if not properly managed, has the potential to adversely impact upon the values of the planning area, and proposals should therefore be assessed for their suitability.

48. Research

Key Points:

- Research and monitoring are important components of management, and are required to effectively implement and measure the success of this management plan.
- Future management of the planning area will have to be adaptive and will be based on increased understanding of key values and natural processes through research.

The objective is to increase the knowledge and understanding of key values and threats to these so as to provide for better management and to allow for the assessment of this management plan.

This will be achieved by:

1. identifying and initiating integrated research programs, as resources permit and according to priority, that facilitate management of the planning area. Research will focus on key issues and values identified in this management plan, the establishment of baseline information for future auditing, and other Departmental research priorities;
2. ensuring relevant information gained through broader Departmental research, monitoring and experience is stored in Regional and District office libraries/databases, updated when required and used, if necessary, to modify management practices;
3. developing and maintaining a database of historical, current and required research;
4. incorporating research findings into interpretive and educational material where appropriate;
5. encouraging and supporting, wherever possible, external agencies and individuals to carry out research projects where their research contributes directly to the Department's corporate strategies or the implementation and assessment of this management plan;
6. ensuring that research activities do not adversely impact on key values; and
7. pursuing external funding sources to assist in achieving research and monitoring objectives.

49. SCIENTIFIC AND RESEARCH USE

Scientific knowledge to inform management of the planning area is generally insufficient. Consequently, research activities by or in partnership with external parties is supported and encouraged where they contribute to the understanding of natural and social processes within the planning area, and where such activities will not unduly impact on key values, or if the benefit of that research is such that potential/actual impacts are sufficiently justified.

Scientific research activity involving disturbance of flora or fauna requires a licence issued under the Wildlife Conservation Act. Similarly, a licence is required to remove or cause significant damage or disturbance to any naturally occurring feature on lands managed by the Department. Such licences will generally be subject to conditions, including that results are forwarded to the Department.

The Department has built relationships with universities to conduct social research in parks and reserves, principally through the Nature-Based Tourism Research Reference Group. The group comprises representatives from the Department and all Western Australian universities. The group assists the Department by identifying suitable student university researchers to investigate possible management solutions to visitor issues. Projects are usually identified by field staff and listed on the Department's Naturebase webpage. Something similar for conservation-based research would also be useful.

Within the planning area, the Wellington Discovery Forest has been specifically set aside for the purpose of 'Scientific Research and Education' (see Section 47 *Wellington Discovery Forest*).

Research has also been undertaken in several tree species trial plots, all located within the Wellington National Park. These plots trialled the resistance of various tree species to the disease caused by *Phytophthora*. This research is now complete and rehabilitation with native species is required.

For more information on scientific research to be undertaken by the Department see Section 48 *Research*.

49. Scientific and Research Use

Key Points:

- Protected areas are a valuable resource for a wide range of research projects.
- Wildlife research requires a permit from the Department's Nature Protection Branch.
- The Nature-based Tourism Research Reference Group provides a link between students and the Department in carrying out social research.
- The Wellington Discovery Forest has the purpose of 'Scientific Research and Education'.

The objective is to provide for scientific research where it will not have significant adverse impacts on the values of the planning area and where it will assist in achieving the objectives of this management plan or other Departmental objectives.

This will be achieved by:

1. assisting, wherever possible, external agencies and individuals where their research contributes directly to an understanding of ecosystems and social values of the planning area, Departmental objectives and strategies and the assessment of this plan;
2. applying a permit/licence system for research proposals from outside the Department, which specifies conditions under which work may be undertaken and results distributed;
3. continuing to issue permits for research on wildlife as appropriate;
4. proposing nature-based tourism research projects through the Nature-based Tourism Research Group for listing on Nature Base; and
5. investigating the possibility of having a reference group for conservation projects.

ACRONYMS

ARRP Act	*Agriculture and Related Resources Protection Act 1976*.
DEC	Department of Environment and Conservation.
DoW	Department of Water.
CAR	Comprehensive, adequate and representative.
CALM Act	*Conservation and Land Management Act 1984*.
CAWS Act	*Country Areas Water Supply Act 1947*.
CSIRO	Commonwealth Scientific and Industrial Research Organisation.
DoIR	Department of Industry and Resources.
DWSPP	Drinking water source protection plan.
EPA	Environmental Protection Authority.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*.
EWS	Environmental Weed Strategy for Western Australia.
FESA	Fire and Emergency Services Authority.
GSTWSS	Great Southern Towns Water Supply Scheme.
IWSS	Integrated Water Supply System.
KPI	Key performance indicator.
LCU	Landscape conservation unit.
MWSSD Act	*Metropolitan Water Supply, Sewerage and Drainage Act 1909*.
NRM	Natural resource management.
RATIS	Recreation and Tourism Information System.
RFA	Regional forest agreement for the south-west forest region of Western Australia.
RIWI Act	*Rights in Water and Irrigation Act 1914*.
WAPC	Western Australian Planning Commission.
WC	Water Corporation.

GLOSSARY

1080	A naturally occurring toxin (sodium fluoroacetate) found in many native south-west Western Australian plants known as 'poison peas' (*Gastrolobium* spp.).
Adaptive management	A process of responding positively to change. The term adaptive management is used to describe an approach to managing complex natural systems that builds on common sense and learning from experience, experimenting, monitoring and adjusting practices based on what was learnt.
Alluvial	Deposits of earth, sand, gravel, and other transported matter, made by flood or flow events.
Aquatic	Living or growing in or on water.
Aquifer	A layer of rock that holds and allows water to move through it, and from which water can be extracted.
Autonomous	Existing or capable of existing independently.
Biodiversity	The variety of all life forms: the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form; often considered at three levels: genetic diversity, species diversity and ecosystem diversity.
Biogeography	The study of both geography and biology including the relationships between plants, animals, soils, water, climate and humans.
Biotic	Of, or relating to living things; caused or produced by living organisms.
CAR (Comprehensive, Adequate and Representative) Reserve System	The terms comprehensive, adequate and representative together describe the attributes of an ideal reserve system. These terms are defined in the Australian and New Zealand Environment and Conservation Council's *Guidelines for Establishing the National Reserve System* as: ❖ comprehensiveness – inclusion of the full range of ecosystems recognised at an appropriate scale within and across each bioregion; ❖ adequacy – the maintenance of the ecological viability and integrity of populations, species and communities; and ❖ representativeness – the principle that those areas that are selected for inclusion in

	reserves reasonably reflect the biotic diversity of the ecosystems from which they derive. In addition to using the scientifically-based CAR criteria, spectacular landforms and scenery as well as natural areas of high public use are also commonly included in parks and reserves.
Catchment	The surface area from which water runs off to a river or collecting reservoir.
Conservation	The protection, maintenance, management, sustainable use, restoration and enhancement of the natural environment.
Critical Weight Range Mammals	Mammals weighing between 35 g and 5.5 kg.
Declared rare flora	Threatened flora gazetted under the Wildlife Conservation Act.
Declared species	Either plants that are declared as weeds or animals that are declared as pests. A list of declared species, with their levels of declaration in various areas of the State is published annually in the Government Gazette pursuant to section 37 of the ARRP Act.
Dieback	A disease of plants caused by the infection by the soil-borne fungi of the genus *Phytophthora.*
Ecological community	An integrated assemblage of species that inhabit a particular area.
Ecologically mature forest	Mature forest where the effects of unnatural disturbance are now negligible. The definition focuses on forest in which the upper stratum or overstorey is in a late mature to senescent growth stage.
Ecosystem	A community or an assemblage of communities of organisms, interacting with one another and the environment in which they live.
Eco-tourism	Ecologically sustainable tourism with a primary focus on experiencing and interpreting natural areas that fosters environmental and cultural understanding, appreciation and conservation.
Endemic	Flora or fauna that is confined in its natural occurrence to a particular region.
Environmental Offsets	Environmental offsets aim to ensure that significant and unavoidable adverse environmental impacts are counterbalanced by a positive environmental gain, with a goal of achieving a 'net environmental benefit'.
Exotic	A species occurring in an area outside its historically known natural range as a result of intentional or accidental dispersal by human activities.
Extant	Still existing.
Fauna	The animals inhabiting an area, including mammals, birds, reptiles, amphibians and invertebrates. Usually restricted to animals occurring naturally and excluding feral or introduced animals.
Feral	A domesticated species that has become wild.
Fire regime	The combination of season, intensity, interval, extent and patchiness of fire in a given area over a period of time.
Flora	The plants growing in an area, including flowering and non-flowering plants, ferns, mosses, lichens, algae and fungi (although fungi are strictly speaking not plants). Usually restricted to species occurring naturally and excluding weeds.
Floristic diversity	Diversity relating to plants.
Fungus	Saprophytic and parasitic spore-producing organisms usually referred to as plants that lack chlorophyll but actually a separate kingdom to plants and animals and include moulds, rusts, mildews, smuts, mushrooms, and yeasts.
Genetic	To do with the hereditary units that is composed of sequences of DNA.
Geography	The science of the Earth's form, physical features, climate and population.
Geology	The study the history of the earth and its life especially as recorded in rocks.
Geomorphology	The study of the earth surface features and their formation.
Great Southern Towns Water Supply Scheme	Originates at Collie (source is Harris Dam) and supplies water to farmlands and towns in the Great Southern area of the State. Approximately 4 million m3 of water is supplied annually to about 40 000 people and 1.6 million ha of farmlands via 2,100 km of water mains, 13 pumping stations and 38 integrated reservoirs/tanks.
Groundwater	All free water below the surface in the layers of the Earth's crust.
Habitat	The place where an animal or plant normally lives and reproduces.
Heritage	Something inherited from past generation that is valued.
Host	The organism from which a parasite obtains its nutrition or shelter.

Hydrology	The scientific study of the characteristics of water, especially of its movement in relation to the land.
Indigenous	Native or belonging naturally (to a place).
Integrated Water Supply System	Supplies water to Perth, Mandurah and the Goldfields and Agricultural Scheme.
Introduced species	see Exotic.
Invertebrate	Animals without backbones, for example, insects, worms, spiders and crustaceans.
Key performance indicators	The minimum set, which if properly monitored, provides rigorous data describing the major trends in, and impacts on, Australian biodiversity.
Landform	All the physical, recognisable, naturally formed features of land having a characteristic shape; includes major forms such as a plain, mountain or plateau, and minor forms such as a hill, valley or alluvial fan.
Landscape	A mosaic where the mix of local ecosystems and landforms is repeated in a similar form over a kilometres-wide area.
Landscape character type	A broad scale area of land with common visual characteristics based on landscape.
Lithology	The study and description of the general, gross physical characteristics of a rock, especially sediments composed mainly of broken fragments of pre-existing minerals or rocks that have been transported from their places of origin, including colour, grain size, and composition
Mesic	Of, or adapted to, a temperate, moderately moist habitat.
Microbes	Micro-organisms, especially bacteria that cause disease
Microbial	Involving or caused by microbes
Native flora	Under the Wildlife Conservation Act, native flora is defined as any plant that is native to the State, including any parts of flora, seed and spores
Nature-based tourism	Tourism that is dependent upon the resources of the natural environment and incorporates a range of tourism experiences including adventure tourism, eco-tourism and aspects of cultural and rural tourism
Obligate	Restricted to a single mode of behaviour or environmental condition, such as an obligate aerobe that is dependent on the presence of molecular oxygen to breathe
Pathogen	Any organism (bacterium or virus) or factor that causes disease within a host
Physiographic unit	A prominent landform as considered in relation to its origin, cause, or history.
Potable	Suitable for drinking
Priority species	A Departmental term for flora and fauna species that may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status. Priority species also include rare species that are currently not threatened. Species are grouped from P1 to P4 (flora) and P5 (fauna) according to the perceived urgency for further survey
Protectable area	An area within the vulnerable zone (predominantly the south-west) that is free of P. cinnamomi, of sufficient size (greater than 4 ha and an axis of 100 m), is positioned in the landscape so that it will not be engulfed by P. cinnamomi in the short term (a period of a few decades) and where human vectors of this disease are controllable.
Public Road	Public roads are dedicated roads managed by Main Roads Western Australia or local government and DEC-managed roads open to the public
Recovery plan	A plan that describes the actions required to achieve the recovery of threatened species or ecological communities from the current threat of extinction or destruction.
Recreation	Generally considered in this management plan to be the use of the planning area by local and regional visitors as well as visitors from Perth.
Rehabilitation	The process necessary to return disturbed land to a predetermined state, in terms of surface, vegetation cover, land-use and/or productivity
Relict species	The existence of an archaic form in an otherwise extinct taxon.
Riparian	Relating to or growing on the bank of a natural watercourse.
Seral stage	Any stage in the development of a vegetation type between denudation and the stabilisation of a habitat.
Silviculture	Silviculture is defined as the theory and practice of managing forest establishment, composition and growth to achieve specified management objectives.
Soil erosion	A combination of processes in which soil is loosened, dissolved, or worn away, and transported from one place to another by climatic, biological or physical agents
Sustainability	An aspirational goal to meet the needs of current and future generations through

	integration of environmental protection, social advancement and economic prosperity.
Swamp	A wetland often partially or intermittently covered with water
Taxa	A defined unit (for example, species or genus) in the classification of plants and animals
Temperate	Of mild temperature, the Temperate Zone is the area or region between the Tropic of Cancer and the Arctic Circle in the Northern Hemisphere or between the Tropic of Capricorn and the Antarctic Circle in the Southern Hemisphere
Tourism	Generally considered in this management plan to be visitors from outside the region staying overnight in or adjacent to the planning area
Understorey	The shrubs and plants that grow beneath the main canopy of a forest
Vascular plants	Plants having a specialised conducting system that includes xylem and phloem
Vertebrate	Animals that have a spinal column which includes fish, amphibians, reptiles, birds and mammals
Visual Landscape	Appearance or visual quality of an area determined by its geology, soils, landforms, vegetation, water features and land use history.
Wetland	Land or areas (as tidal flats or swamps) containing much soil moisture

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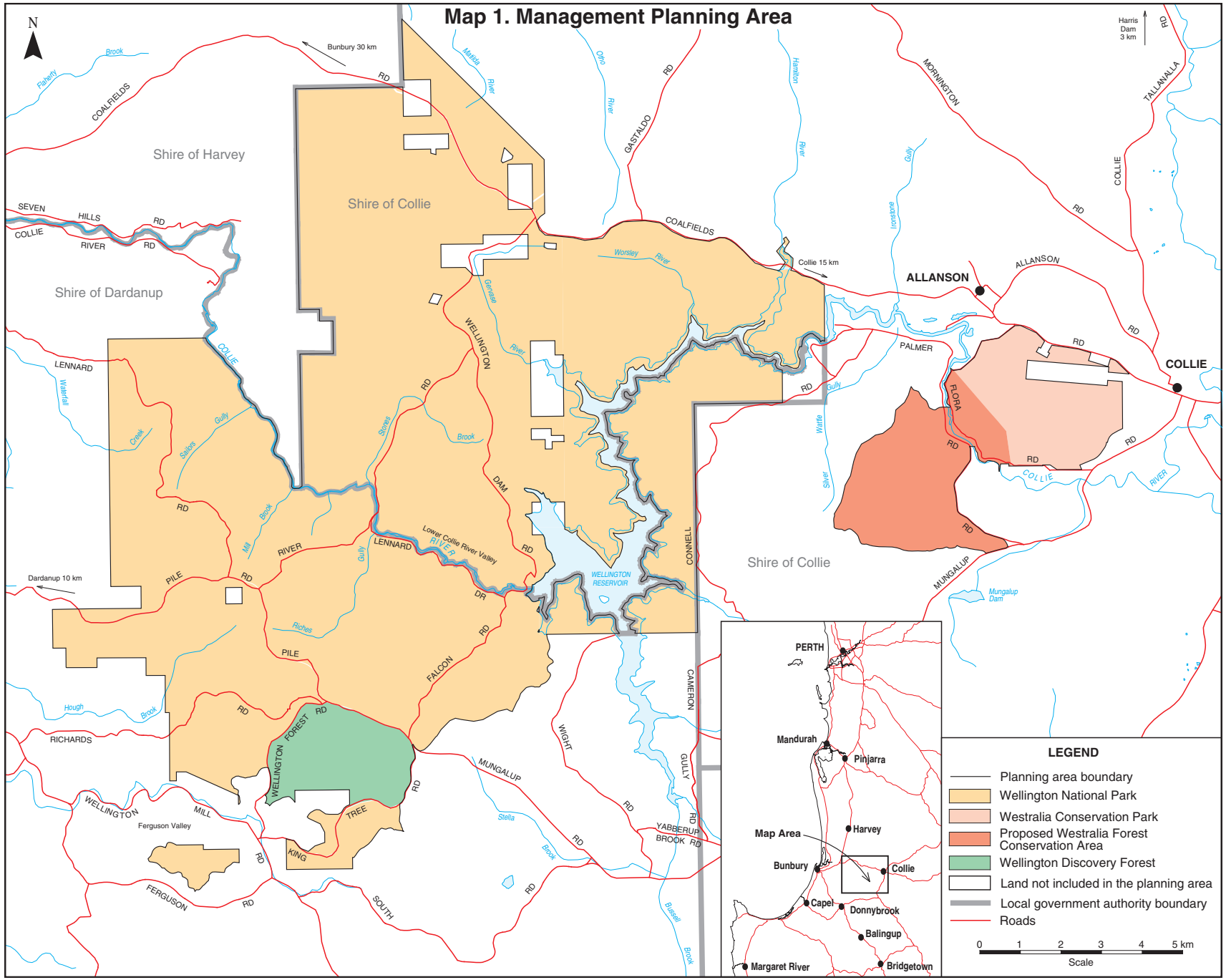
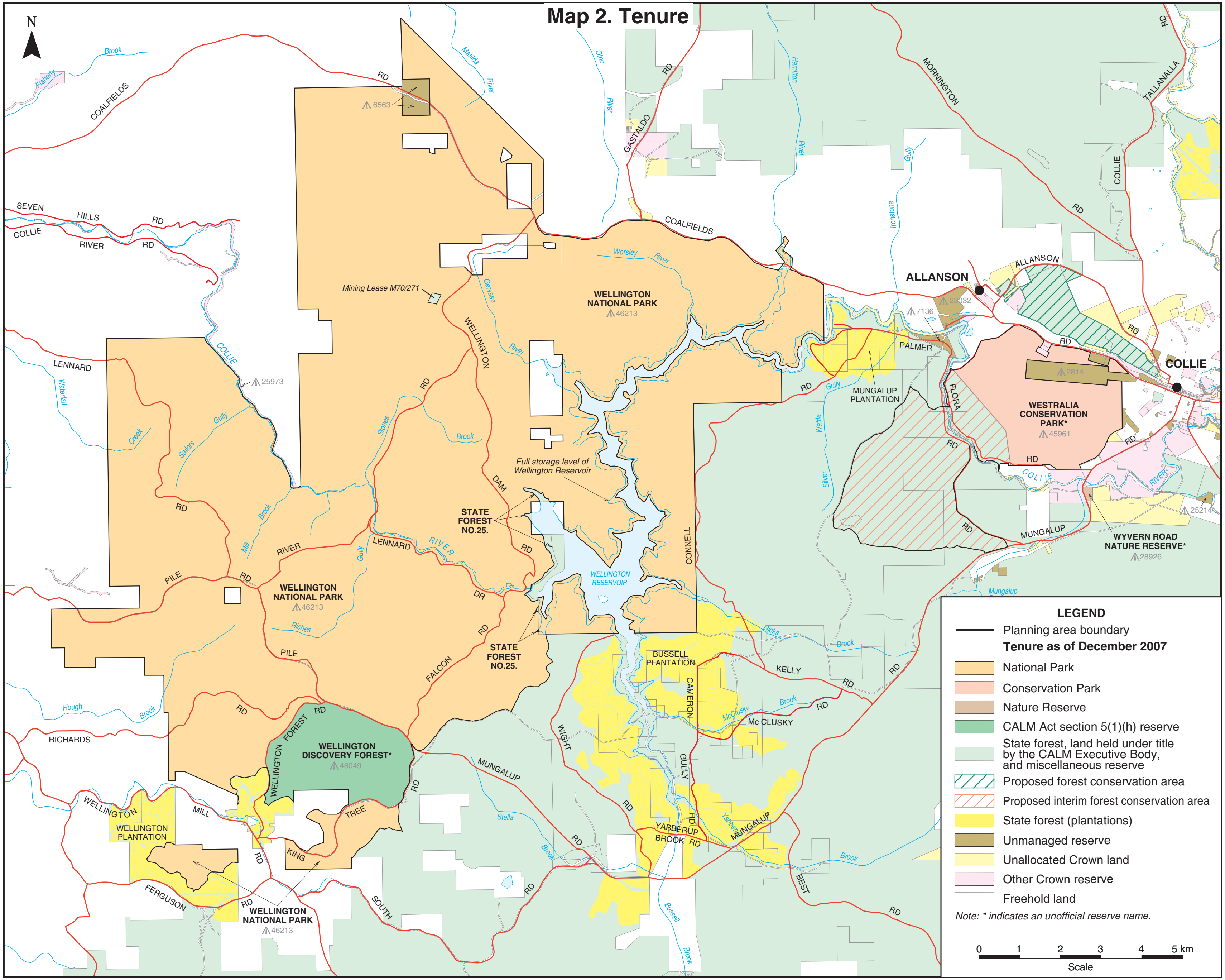

Map 1. Management Planning Area
N
Shire of Harvey
Shire of Dardanup
Shire of Collie
Shire of Collie
Bunbury 30 km
Dardanup 10 km
Collie 15 km
Harris Dam 3 km
ALLANSON
COLLIE
COALFIELDS RD
SEVEN HILLS RD
COLLIE RIVER RD
LENNARD RD
PILE RD
RICHARDS RD
WELLINGTON FOREST RD
TREE RD
KING RD
FERGUSON RD
WELLINGTON MILL
Ferguson Valley
SOUTH RD
MUNGALUP RD
YABBERUP BROOK RD
WIGHT RD
CAMERON GULLY RD
WELLINGTON DAM RD
Lower Collie River Valley
WELLINGTON RESERVOIR
CONNELL DR
FALCON RD
PALMER RD
FLORA RD
MORNINGTON RD
TALLANALLA RD
COLLIE RIVER
MUNGALUP Dam
Markita River
Otho River
Hamilton River
Gastaldo River
Worsley River
Ironstone Gully
Garnage River
Waitle Gully
Silver Gully
Stokes Brook
Sailors Gully
Waterfall Creek
Mill Brook
Riches Gully
Hough Brook
Stella Brook
Buswell Brook
PERTH
Mandurah
Pinjarra
Map Area
Harvey
Bunbury
Collie
Capel
Donnybrook
Balingup
Margaret River
Bridgetown
LEGEND
Planning area boundary
Wellington National Park
Westralia Conservation Park
Proposed Westralia Forest Conservation Area
Wellington Discovery Forest
Land not included in the planning area
Local government authority boundary
Roads
0 1 2 3 4 5 km
Scale

Map 2. Tenure



LEGEND

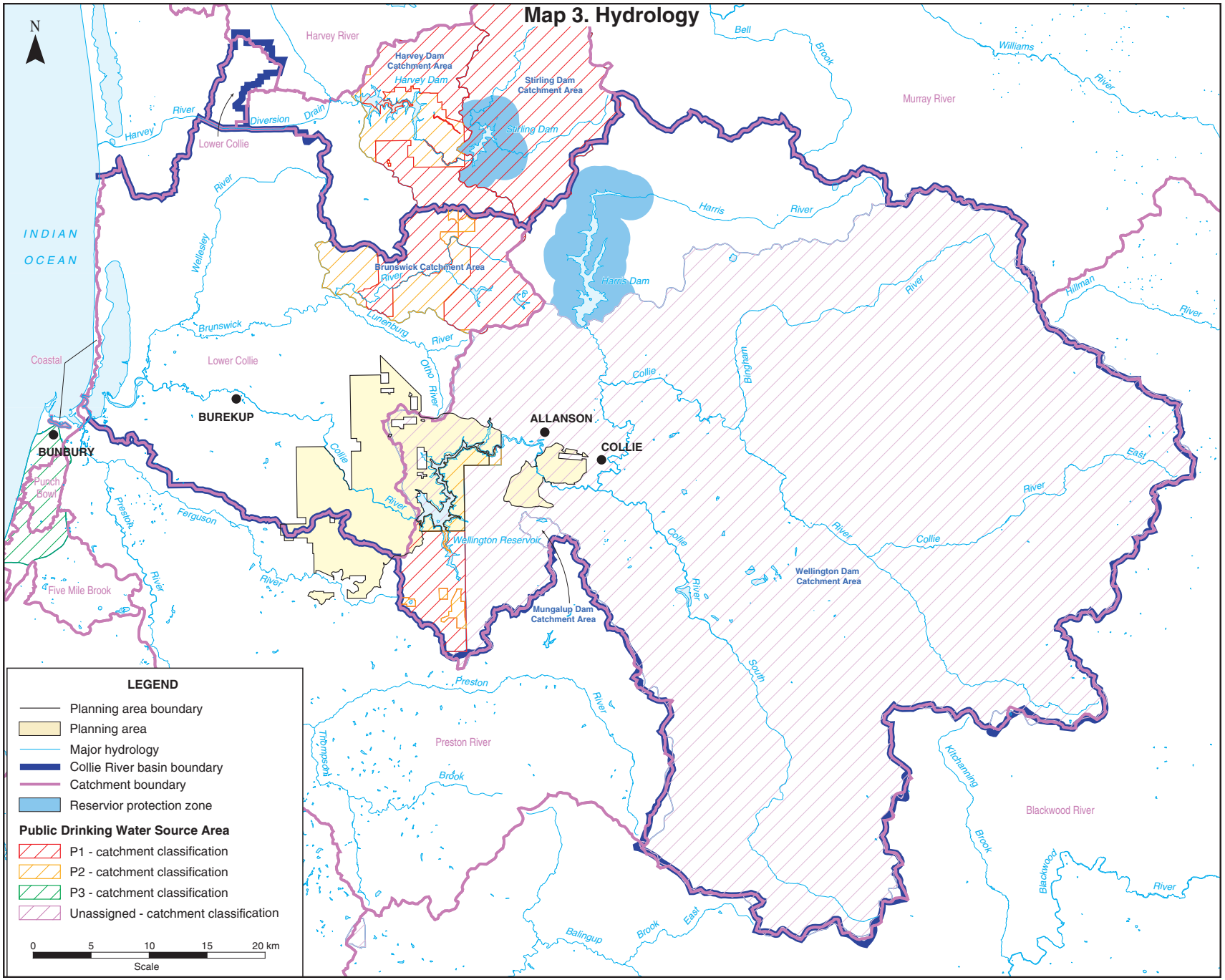
Planning area boundary

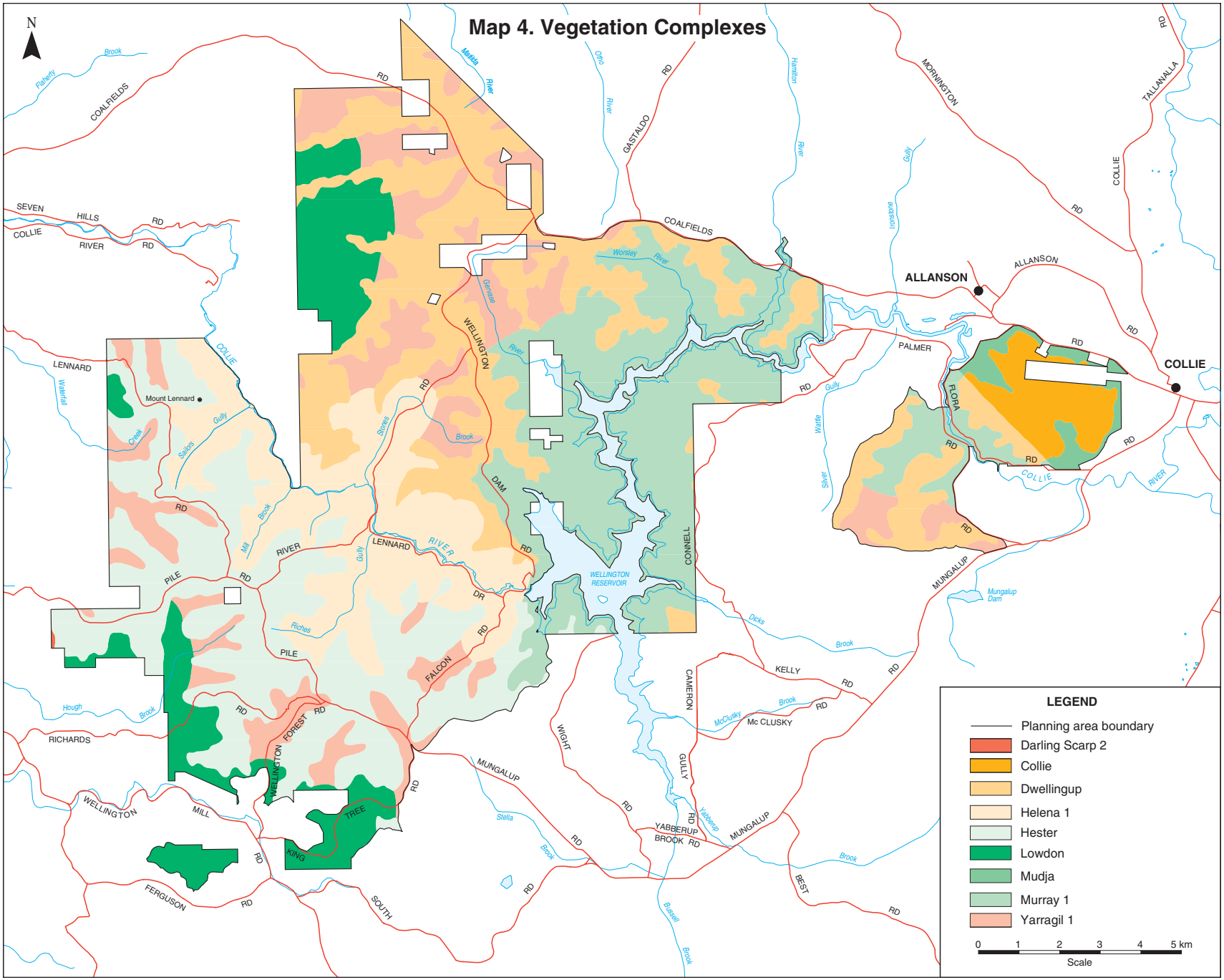
Tenure as of December 2007

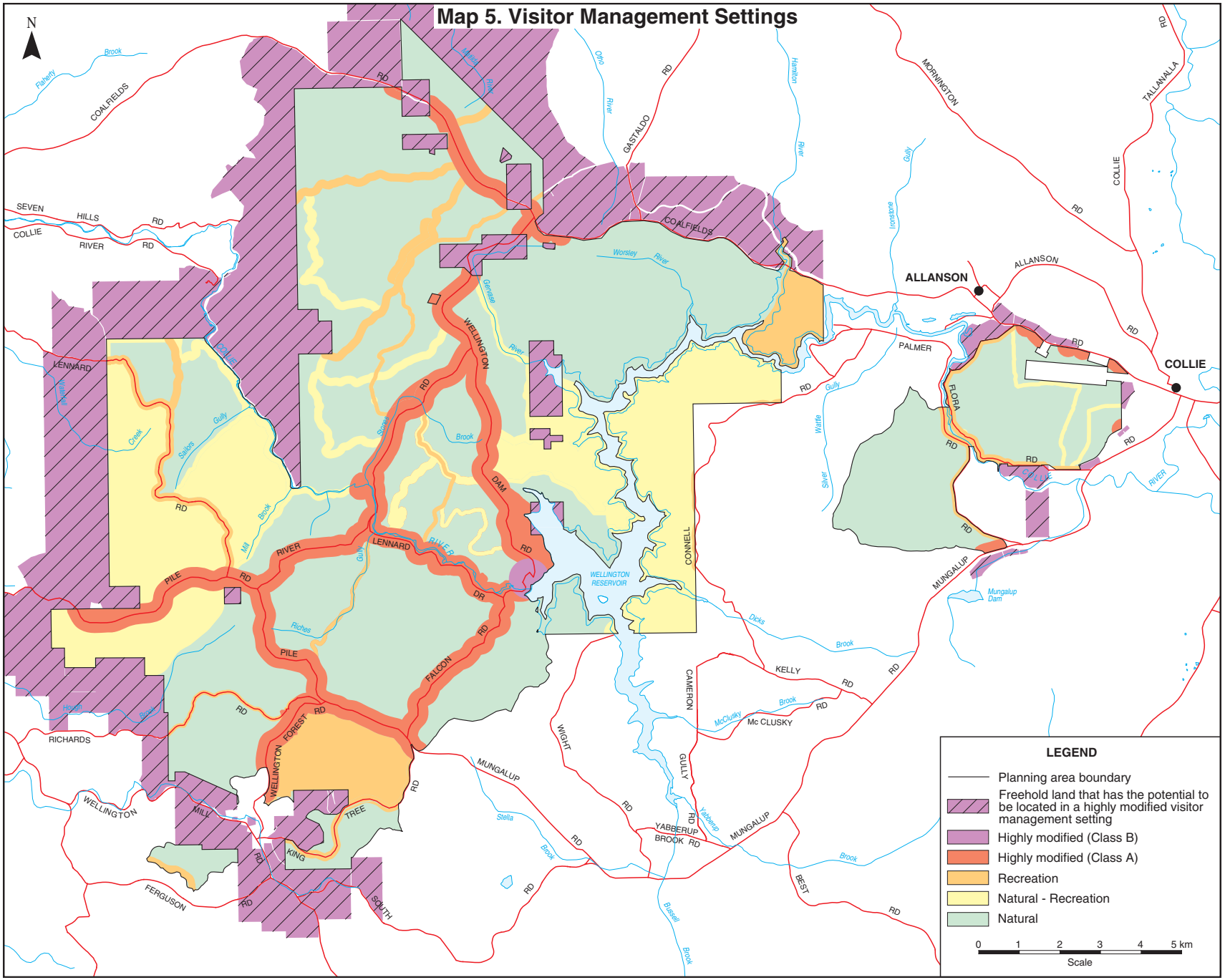
- National Park
- Conservation Park
- Nature Reserve
- CALM Act section 5(1)(h) reserve
- State forest, land held under title by the CALM Executive Body, and miscellaneous reserve
- Proposed forest conservation area
- Proposed interim forest conservation area
- State forest (plantations)
- Unmanaged reserve
- Unallocated Crown land
- Other Crown reserve
- Freehold land

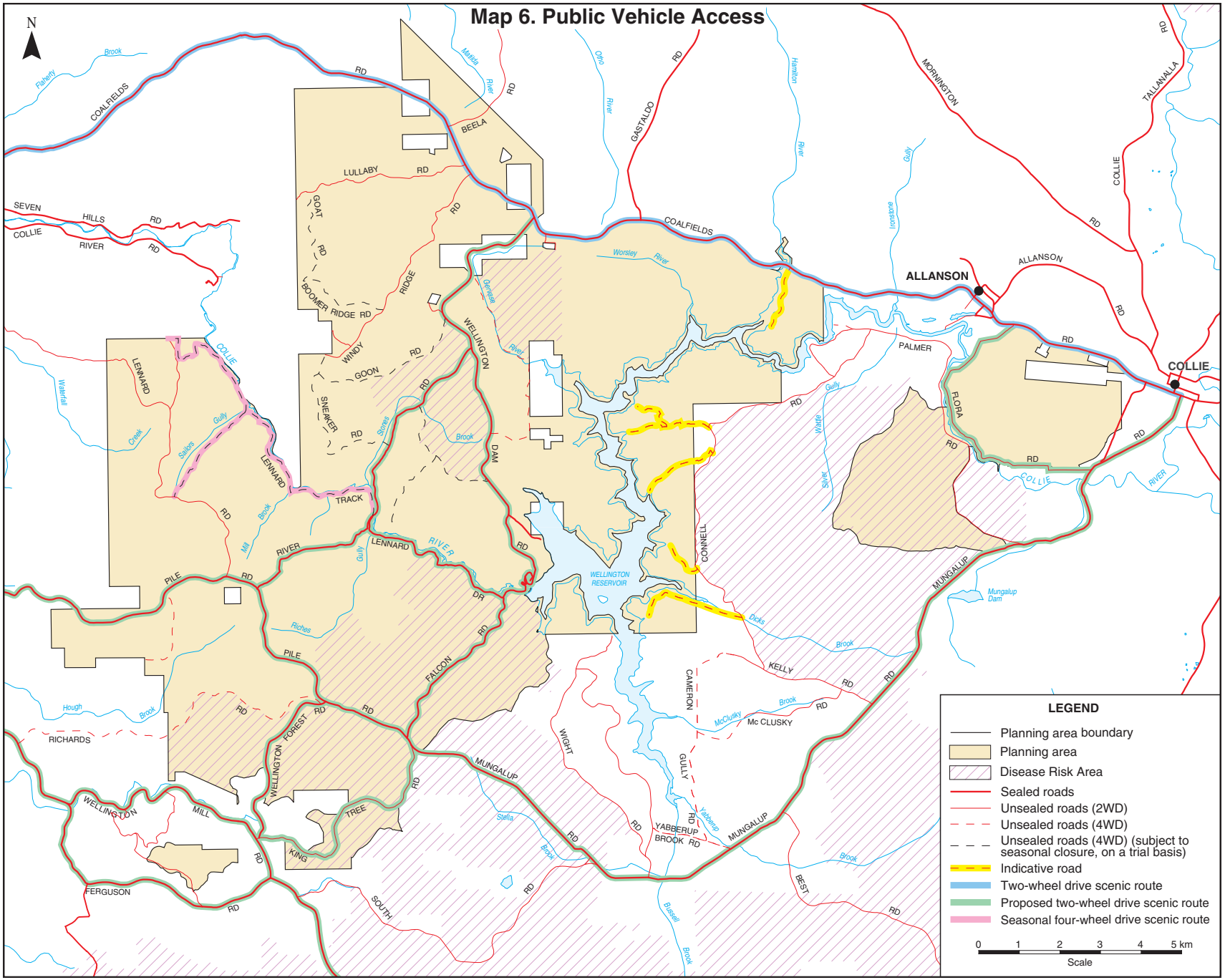
*Note: * indicates an unofficial reserve name.*

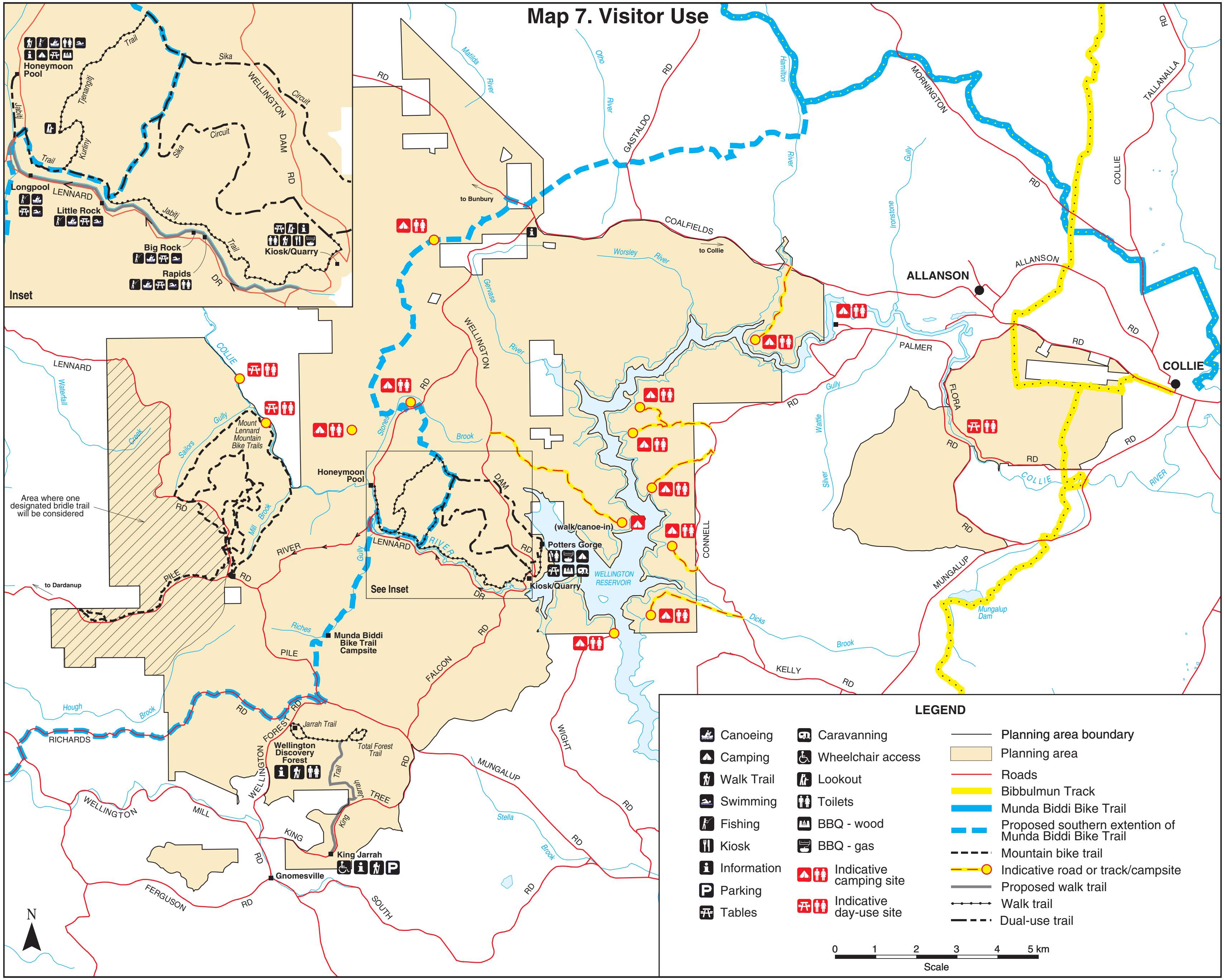
0 1 2 3 4 5 km
Scale


Map 3. Hydrology
N
INDIAN OCEAN
Harvey River
Harvey Dam Catchment Area
Harvey Dam
Stirling Dam Catchment Area
Stirling Dam
Harvey River
Diversion Drain
Lower Collie
Bell Brook
Williams River
Murray River
Wellesley River
Brunswick Catchment Area
Harris River
Harris Dam
Lunenburg River
Brunswick
Coastal
Lower Collie
Otho River
Collie
Bingham River
Hillman River
BUREKUP
ALLANSON
COLLIE
BUNBURY
Punch Bowl
Preston River
Ferguson River
Collie River
Wellington Reservoir
Wellington Dam Catchment Area
Five Mile Brook
Mungalup Dam Catchment Area
East River
Collie River
South Collie River
Preston River
Thompson Brook
Preston River
Kirkhanning Brook
Blackwood River
Blackwood River
Balingup Brook
East
LEGEND
Planning area boundary
Planning area
Major hydrology
Collie River basin boundary
Catchment boundary
Reservoir protection zone
Public Drinking Water Source Area
P1 - catchment classification
P2 - catchment classification
P3 - catchment classification
Unassigned - catchment classification
0 5 10 15 20 km
Scale

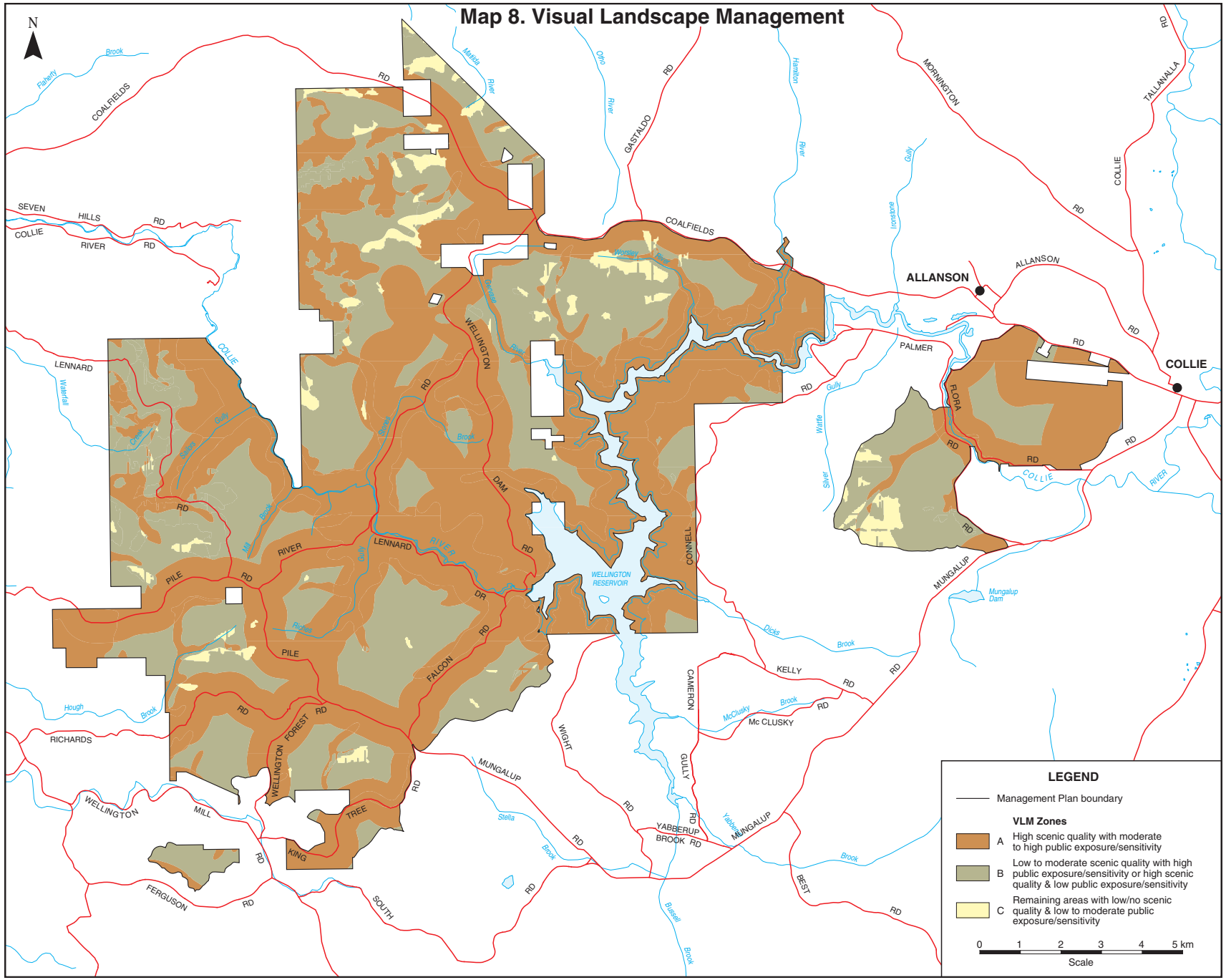

Map 4. Vegetation Complexes
N
ALLANSON
COLLIE
Mount Lennard
WELLINGTON RESERVOIR
Mungalup Dam
Mc CLUSKY
LEGEND
Planning area boundary
Darling Scarp 2
Collie
Dwellingup
Helena 1
Hester
Lowdon
Mudja
Murray 1
Yarragil 1
0 1 2 3 4 5 km
Scale

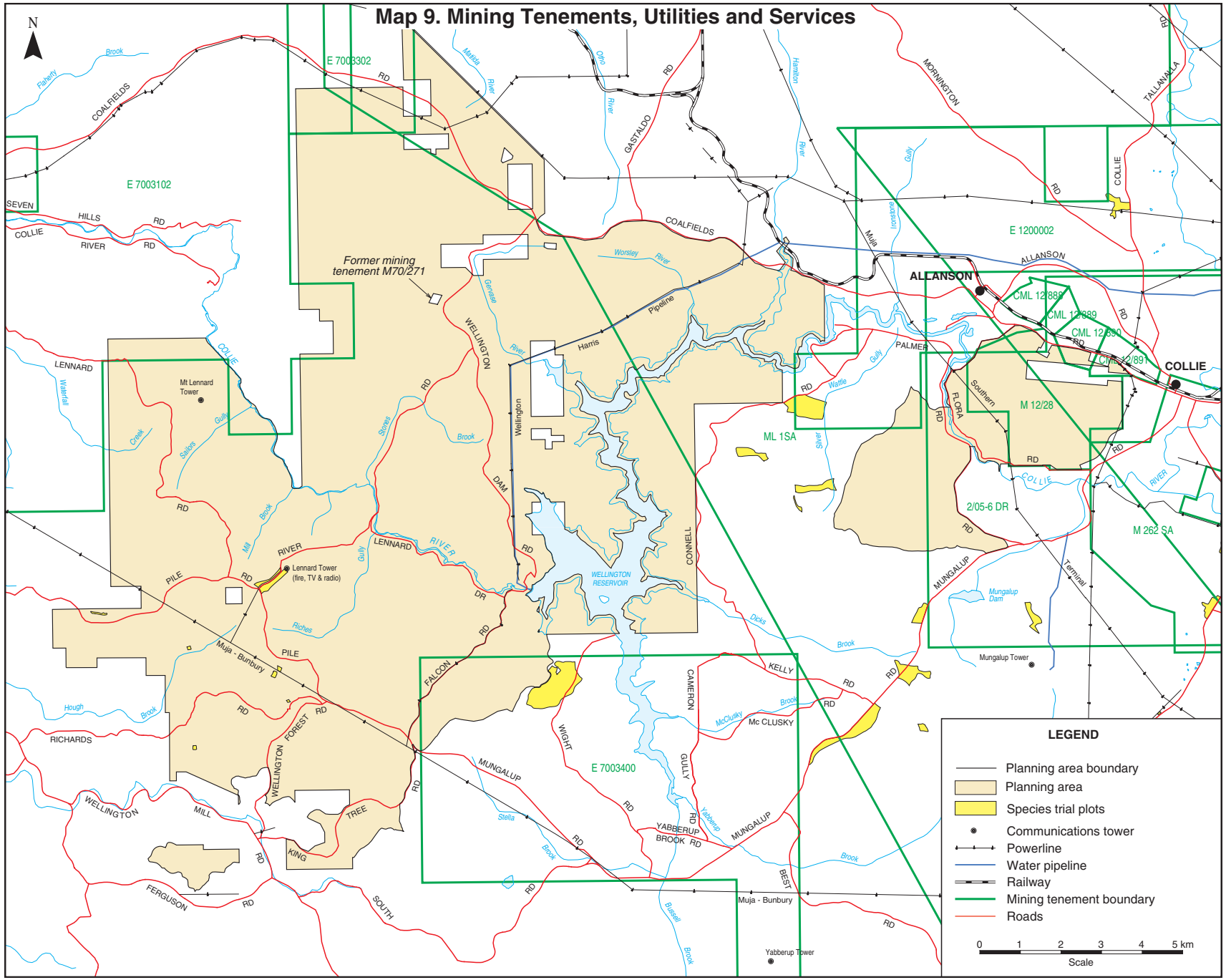

Map 5. Visitor Management Settings
N
ALLANSON
COLLIE
WELLINGTON RESERVOIR
LEGEND
Planning area boundary
Freehold land that has the potential to be located in a highly modified visitor management setting
Highly modified (Class B)
Highly modified (Class A)
Recreation
Natural - Recreation
Natural
0 1 2 3 4 5 km
Scale


Map 6. Public Vehicle Access
N
ALLANSON
COLLIE
WELLINGTON RESERVOIR
LEGEND
Planning area boundary
Planning area
Disease Risk Area
Sealed roads
Unsealed roads (2WD)
Unsealed roads (4WD)
Unsealed roads (4WD) (subject to seasonal closure, on a trial basis)
Indicative road
Two-wheel drive scenic route
Proposed two-wheel drive scenic route
Seasonal four-wheel drive scenic route
0 1 2 3 4 5 km
Scale


Map 7. Visitor Use
Inset
Honeymoon Pool
Longpool
Little Rock
Big Rock
Rapids
Kiosk/Quarry
See Inset
Potters Gorge
(walk/canoe-in)
WELLINGTON RESERVOIR
Munda Biddi Bike Trail Campsite
Wellington Discovery Forest
King Jarrah
Gnomesville
ALLANSON
COLLIE
Area where one designated bridle trail will be considered
Mount Lennard Mountain Bike Trails
to Bunbury
to Collie
to Dardanup
LEGEND
Canoeing
Camping
Walk Trail
Swimming
Fishing
Kiosk
Information
Parking
Tables
Caravanning
Wheelchair access
Lookout
Toilets
BBQ - wood
BBQ - gas
Indicative camping site
Indicative day-use site
Planning area boundary
Planning area
Roads
Bibbulmun Track
Munda Biddi Bike Trail
Proposed southern extention of Munda Biddi Bike Trail
Mountain bike trail
Indicative road or track/campsite
Proposed walk trail
Walk trail
Dual-use trail
0 1 2 3 4 5 km
Scale
N

Map 8. Visual Landscape Management




Map 9. Mining Tenements, Utilities and Services
N
E 7003302
E 7003102
E 1200002
E 7003400
Former mining tenement M70/271
ALLANSON
COLLIE
Mc CLUSKY
Muja - Bunbury
Yabberup Tower
Mt Lennard Tower
Lennard Tower (fire, TV & radio)
Mungalup Tower
WELLINGTON RESERVOIR
Mungalup Dam
CML 12/888
CML 12/889
CML 12/890
CML 12/891
M 12/28
M 262 SA
ML 1SA
2/05-6 DR
COALFIELDS
WELLINGTON
MUNGALUP
YABBERUP
LENNARD
PILE
RICHARDS
FERGUSON
MORNINGTON
TALLANALLA
PALMER
FLORA
CONNELL
GULLY
CAMERON
FALCON
WIGHT
KELLY
BEST
SOUTH
KING
TREE
MILL
FOREST
HILLS
SEVEN
RIVER
Pipeline
Harris
Worsley River
Wellington
Ferguson
Muja
Ironstone
Hamilton
Ohto River
Marlida River
Gastaldo River
Lennard River
Wattle Gully
Southern
Terminal
Dicks Brook
McClusky Brook
Stella Brook
Yabberup Brook
Bussell Brook
Hough Brook
Riches
Stokes Brook
Sailors Gully
Waterfall Creek
Mill Brook
Fishery Brook
Garnage
LEGEND
Planning area boundary
Planning area
Species trial plots
Communications tower
Powerline
Water pipeline
Railway
Mining tenement boundary
Roads
0 1 2 3 4 5 km
Scale

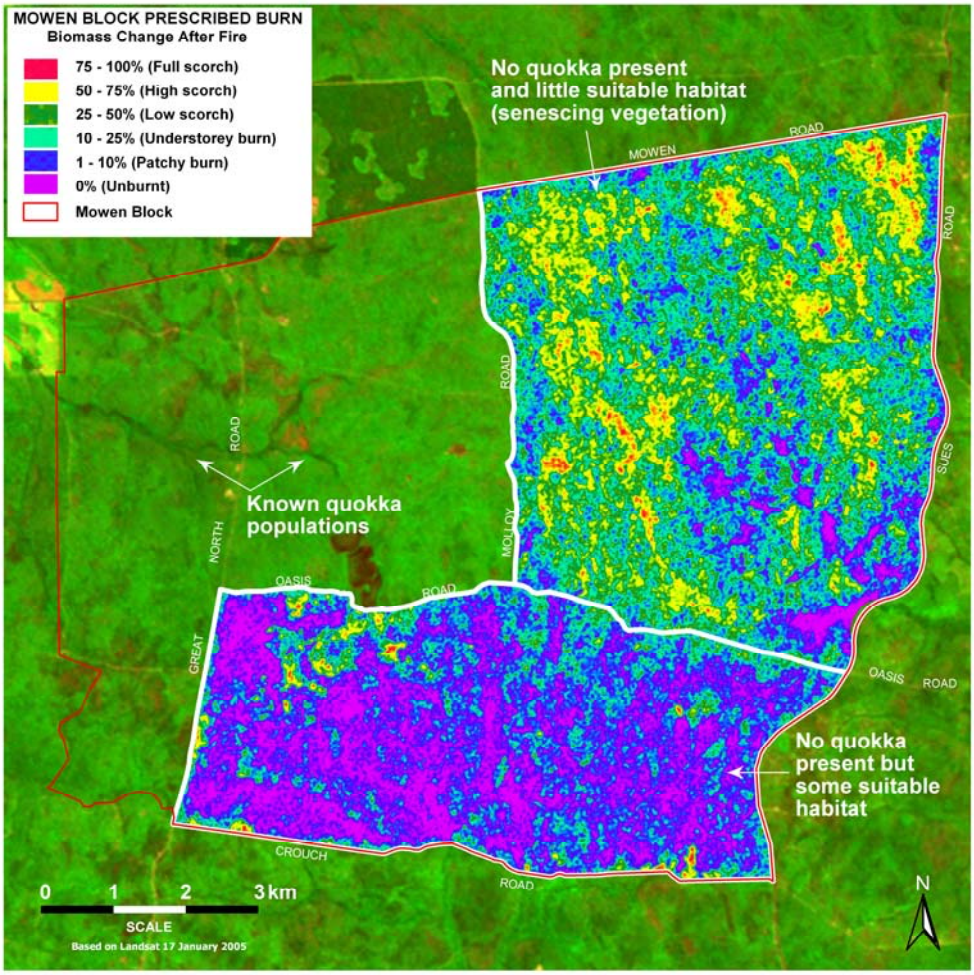


Figure 10. Satellite Imagery of Prescribed Burning in Mowen Block

The primary purpose of the prescribed burn in Figure 9 was to protect, maintain and enhance biological values and ecological processes within the precinct of Mowen Block, approximately 23km east of Margaret River. A secondary purpose of this burn was to provide strategic protection against damaging wildfire to Mowen Tower, Milesi plantation and the adjoining Butler and Blackwood River national parks.

Pre-burn desktop surveys and subsequent field investigations found that Mowen Block had a number of issues in relation quokka management. In this respect, objectives for prescribed burning in Mowen Block incorporated (1) protection of known quokka populations and 'healthy' quokka habitat from fire and (2) regeneration of unsuitable (senescing) and unoccupied quokka habitat.

The burn was conducted in spring 2004 and achieved the above objectives for management of the various quokka habitat by incorporating the following strategies into the burn prescription:

- excluding, by physical separation, the area west of Great North Road;
- excluding, by physical separation, suitable healthy vegetation for quokkas north of Oasis Road and west of Molloy Road;
- regenerating habitat by applying fire to senescing vegetation north of Oasis Road and east of Molloy Road. At the time of printing, this area does not contain quokkas because of the age, and consequently the structure, of the vegetation; and
- excluding habitat south of Oasis Road by using moisture differentials in fuels between suitable habitat and upland areas. This area does not currently contain quokkas but provides suitable healthy habitat.

The satellite imagery also shows that, by applying different ignition techniques on day of the burn and planning to exclude some areas from fire, a mosaic or patchiness of burnt and unburnt areas was achieved across the landscape and at a local scale (i.e. treatment area), thereby enhancing biodiversity. In the longer term, both burnt and adjoining exclusion areas within Mowen Block will be monitored for quokka activity. When sufficient activity is recorded in the treatment area, current habitat to the west can be prescribed for burning at a point when this habitat needs regeneration.

APPENDICES

APPENDIX 1. KEY PERFORMANCE INDICATORS

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
Part B. Management Directions and Purpose	Section 10 Existing and Proposed Reserves			
Key values indicated throughout this table	Protect reserves of the planning area with the maximum security of tenure, class and their gazetted purpose	10.1 Changes in land tenure and purpose	10.1 To formally change the land tenure and purpose of the proposed Westralia Forest Conservation Area to conservation park (Class A) , within 2 years of impediments to its reservation being lifted	After 2 years of impediments to reservation being lifted
Part C. Managing the Natural Environment	Section 19 Native Plants and Vegetation Communities			
A rich mosaic of vegetation communities, some which are poorly represented within the conservation estate	Identify, protect and conserve native plants and vegetation communities	19.1 Changes in species composition and structure within granite outcrops of the lower Collie River valley	19.1 Subject to natural variations, maintaining species composition and structure within granite outcrops of the lower Collie River valley	Every 5 years, or as per recovery plans if applicable

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
		19.2 The persistence and condition of populations of declared rare flora	19.2 No loss or decline as a result of management actions	
	Section 20 Native Animals and Habitats			
	Protect and conserve native animals and their habitats	20.1 Range and population size of critical weight range mammals	20.1 Subject to natural variation, recovery and maintenance of populations of critical weight range mammals	As per recovery plans for individual species or in their absence, annually
		20.2 Evidence of second generation progeny from translocated species	20.2 The successful establishment of translocated species	
	Section 22 Environmental Weeds			
	Minimise the impacts of environmental weeds on key values	22.1 Number and cover of environmental weed species rated as 'High' in the EWS or considered as a local priority	22.1 Decrease in the number and cover of species rated as 'High' in the EWS or considered as a local priority	Every 5 years
	Section 23 Introduced and Other Problem Animals			
	Minimise the impacts of introduced and other problem animals and their control on key values.	23.1 Populations and area impacted by feral pigs	23.1 A decrease in the number of populations or area impacted by feral pigs from 2008 levels	Every 5 years
	Section 24 Diseases			
	Ameliorate the impact, and minimise the further spread, of *P. cinnamomi* and other diseases	24.1 The identification and establishment of protectable areas that are a priority for protection	24.1 Protectable areas that are a priority for protection have been identified and established	After 5 years
	Section 25 Fire			
	Conserve biodiversity across the landscape and to protect life and community assets in and near the planning area	25.1 The extent of fire diversity measured by the diversity and scale of post-fire (seral) stages within a LCU	25.1 The distribution of post-fire fuel ages (time since fire) for each LCU approximates a negative-exponential distribution	Annually
		25.2 The impact of wildfire on life and community assets	25.2 No loss of life or significant community assets, or serious injury, attributable to the Department's fire management	

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
		25.3 The persistence of threatened species/ ecological communities within each LCU	25.3 No permanent loss or significant decline, due to fire, of threatened species/ecological communities in the planning area	Every 5 years
Part D. Managing Cultural Heritage	Section 26 Indigenous Heritage			
An important area for use by local Aboriginal people for the continuation of cultural activities (and ceremonies) Aboriginal sites and landscapes of mythological, ceremonial, cultural and spiritual significance, particularly the Collie River An important site for non-Indigenous cultural heritage, with evidence of former forestry workers settlements, old cottages, spot mills, formations and built structures such as the Reservoir wall and hydro-electric power station Significant site to consider the changing perspectives on forests, forestry and protected areas	Identify, protect and conserve Indigenous cultural heritage and cultural resources in consultation with Aboriginal people	26.1 Disturbance of known or identifiable Aboriginal heritage sites	26.1 No disturbance of a registered place as a result of Department operations without formal approval	Annually
Part E. Managing Visitor Use	Section 29 Visitor Use Planning			
An important and popular recreation area, with a diverse array of nature-based recreational opportunities	Provide visitors with a wide range of nature-based experiences whilst ensuring the impacts on key values are minimised	29.1 The range of visitor management settings	29.1 Maintain visitor management settings over the life of the plan	Every 3 years

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
A reservoir that is intrinsically linked to the lifestyle of local people and a tourist attraction to visitors Historical links to the Reservoir and Collie River for activities such as fishing, marroning, canoeing, swimming, camping, picnicking and bushwalking, with links to the Reservoir spanning generations of local residents to when the Reservoir was first constructed in the 1930s A sense of seclusion whilst in close proximity to major population centres and travel routes to the south-west of the State	Section 30 Visitor Access			
	Provide and maintain a range of access types consistent with maintaining or enhancing key values	30.1 Changes in the condition of Lennard Track and four-wheel drive tracks designated for seasonal closure	30.1 Track condition is maintained or improved from 2008 levels	Annually
	Section 31.1 Overnight Stays			
	Provide appropriately located and designed built accommodation and a range of sustainable camping opportunities whilst minimising environmental and other impacts	31.1.1 Changes in the area of disturbance zone around campsites	31.1.1 No increase in the disturbance zone around campsites from 2008 levels	Annually
		31.1.2 Number of trees at selected campsites that are damaged	31.1.2 Less than 10% of trees damaged around campsites	
		31.1.3 Number of trees at selected campsites with exposed roots	31.1.3 Less than 10% of trees around campsites with exposed roots	
		31.1.4 Number of wildfires in the planning area attributed to escapes from campfires	31.1.4 Reduction in the percentage of wildfires per visit that is attributed to escapes from campfires	Every 5 years
Long distance walking and cycling opportunities on the Bibbulmun Track and Munda Biddi Bike Trail A varied landscape with areas of high visual quality, including well defined and steeply sloping valleys, granite outcrops, mature forest, rivers and a reservoir Commercial nature-based tourism opportunities	Section 31.2 Day-use			
	Provide opportunities for day-use in appropriate environmental and visitor management settings, which encourage visitor enjoyment and understanding of key values	31.2.1 Satisfaction of the local Aboriginal people	31.2.1 The design of day-use facilities along Lennard Track satisfies the local Aboriginal people	On completion of designs for day-use facilities
	Section 31.5 Bushwalking			
	To provide a range of bushwalking opportunities that meet visitor needs and do not adversely impact on key values	31.5.1 The satisfaction that visitors express with their visit in relation to the use of dual use trails	31.5.1 Bushwalkers continue to be satisfied with tracks designated for dual use	Every 5 years
	Section 31.6 Cycling			
	Provide opportunities for cycling that do not adversely impact on key values	31.6.1 Changes in bicycle track condition	31.6.1 Track condition is maintained or improved from 2008 levels	Every 5 years

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
	Section 34 Visitor Safety			
	Maintain visitor experiences by minimising risks to public safety wherever possible	34.1 Percentage of accidents/incidents and visitor injuries per visit reported annually to the Department	34.1 Maintenance or reduction in the percentage of accidents/incidents and visitor injuries per visit reported annually to the Department from 2008 levels	Every 5 years
	Section 35 Domestic Animals			
	Protect native fauna and visitors from the impacts of domestic animals	35.1 Number of dogs recorded that are not guide dogs for visually impaired people or dogs required for management/security purposes	35.1 No dogs recorded that are not guide dogs for visually impaired people or dogs required for management/security purposes	Every 5 years
Part F. Managing Resource Use	Section 43 Forest Produce			
The largest reservoir in the south-west of the State, with a high social value and an economic value for water use Considerable mineral potential within the Westralia Conservation Park and the proposed Westralia Forest Conservation Area	Prohibit the removal of forest produce except where it is in accordance with the CALM Act and this management plan	43.1 Incidence of unauthorised firewood collection	43.1 A declining trend in the reported incidence of unauthorised firewood collection	Every 5 years
Part H. Involving the Community	Section 45 Information, Education and Interpretation			
Opportunities for community involvement in activities and experiences in nature conservation and visitor services Opportunities for involvement of individuals in various committees associated with the management of parks and reserves	Promote community understanding and awareness of the key values of the planning area and engender support for its effective management	45.1 Level of visitor satisfaction with education and interpretation opportunities offered in the planning area	45.1 Level of visitor satisfaction with education and interpretation opportunities remains stable or increases over the life of the plan	Every 3 years
	Section 46 Community Involvement and Liaison			
	Facilitate effective community involvement and support in planning and management	46.1 Changes in the number of registered volunteers and the level of volunteer hours contributed within the planning area	46.1 An increase in the number of registered volunteers and the level of volunteer hours contributed within the planning area	Every 5 years

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
A research and educational opportunity within the Wellington Discovery Forest, which enables visitors to learn about the natural environment and management of the jarrah forest A diverse array of natural environments, providing research opportunities into the natural, recreation and cultural values of the planning area	Section 47 Wellington Discovery Forest			
	Promote community awareness, appreciation and understanding of the natural values and management of the jarrah forest while being consistent with the purpose of the Wellington Discovery Forest reserve and the provisions of the CALM Act	47.1 Changes in the number of participants in education programs offered within the Wellington Discovery Forest	47.1 An increase at least 10% in participation, including recurrent participation, in education programs offered within the Wellington Discovery Forest from 2008 levels	Annually
		47.2 Changes in visitation to the Research and Management zones of the Wellington Discovery Forest	47.2 An increasing trend in visitation to the Research and Management zones of the Wellington Discovery Forest from 2008 levels	Every 5 years

* Note: where there is a target shortfall for any of the key performance indicators, the Department will investigate the cause and report to the Conservation Commission for action.

APPENDIX 2. WATER SOURCE PROTECTION AND THE FUTURE USE OF WELLINGTON RESERVOIR

Water Source Protection

DoW protects the State's drinking water resources in accordance with the *Australian Drinking Water Guidelines*, which recommends a multiple barrier, risk-based framework approach to management (DoW 2007). This requires the water supply system to be looked at as a whole, that is, from the collection of water in the catchment right through to the consumer's tap. The emphasis of this approach is on preventative management and the need to protect drinking water through a combination of catchment protection and treatment measures. The framework requires all potential hazards to the water supply to be identified and assessed in terms of the level of risk each poses. Preventative measures and operational controls to address the risks (i.e. avoid, minimise or manage) are then put in place and regularly reviewed to ensure continual improvement.

Protection of drinking water catchments is the 'first barrier' in the multiple barrier approach, with subsequent barriers implemented at the water storage, treatment and distribution stages of a water supply system. Drinking water sources and their catchments are protected by proclaiming areas under the CAWS Act and MWSSD Act. These areas are collectively referred to as Public Drinking Water Source Areas (PDWSAs). The Department of Water uses the by-laws of these two Acts to manage activities in PDWSAs as well as various other planning policies and legislation. Areas that have been proclaimed as PDWSAs may have constraints placed on land use, development, public access and land/water-based activities.

In protecting PDWSAs, DoW refers to several key policies, including:

- *Statewide Policy No. 13 – Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land* (WRC 2003);
- *Statement of Planning Policy No. 2.7 – Public Drinking Water Source Policy* (WAPC 2003) which guides State and Local Government land use planning decisions in PDWSAs through provisions in the Metropolitan Region Scheme and Local Planning Schemes;
- *Land Use Compatibility in Public Drinking Water Source Area* – Water Quality Protection Note (DoE 2004) which provides information on the acceptability of land uses and activities within specific catchments that are the water source for schemes supplying cities and towns; and
- *State Planning Policy No. 2.9 – Water Resources* (WAPC 2006) provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning strategies, proposals and applications.

To protect PDWSAs, DoW is responsible for preparing drinking water source protection plans in accordance with the CAWS Act and MWSSD Act. Drinking water source protection plans establish the level of protection required within PDWSAs and identify risks to water quality, establish priority classification areas and set out water quality protection strategies. Water sources and their catchments areas are given a protection classification that applies a level of protection based on the strategic importance of the source. There are three levels of priority classifications:

- Priority 1: risk avoidance, defined to ensure no degradation of the water source and declared over land where the provision of the highest quality public drinking water is the prime beneficial land use; and
- Priority 2: risk minimisation, defined to ensure that there is no increased risk of pollution to the water source and declared over land where low intensity development (such as rural) exists.
- Priority 3: risk management through regulation, defined to manage the risk of pollution to the water source from catchment activities and declared over land where water supply sources co-exist with other land uses such as residential, commercial and light industrial development.

In addition to priority classification, wellhead protection zones and reservoir protection zones can be defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Reservoir protection zones apply over Crown land. They do not extend outside the PDWSA boundaries and apply up to 2 km from the water body. Restrictions such as prohibiting public access and use to prevent contamination (physical, chemical and biological) of the source water apply within these zones. Certain recreational activities, especially those associated with direct human contact with the water, such as swimming, are not supported by DoW, the WC and the Department of Health. Reservoir protection zones are mandatory under the MWSSD Act. At the time of printing, there are no provisions for a similar zone to be created in sources proclaimed under the CAWS Act, although the Act's by-laws are under revision to achieve consistent

by-laws for metropolitan and country sources.

Wellington Reservoir and Catchment

The Reservoir was constructed in 1933 to facilitate the collection and distribution of water from the Collie River. Subsequent infrastructure has been introduced to distribute water supplies including a pipeline to the north that connects to Harris Dam.

The Reservoir is extremely important for its water resource. At the time of writing, the Reservoir is used to supply irrigation water to the Collie Irrigation District. It has a capacity of 186 GL, which makes it the largest water body in the south-west and a potential future drinking water supply. Historically, the Reservoir was used as a supply of potable water for the GSTWSS and is still proclaimed under the CAWS Act. However, it was removed as a drinking water supply due to high salinity levels (approximately twice the potable limit), which meant the water was barely suitable for irrigation and unsuitable for most other high-value forms of use. As such, the Reservoir was made available for non-motorised water sports in 1990, but has been used informally for recreation since its construction. It is now a primary attraction for visitors and a focal point for recreation. Relaxation of these controls was done on the understanding that they would be reintroduced should the Reservoir be reinstated as a source of drinking water. In 1996, the Collie River catchment was designated under the State Salinity Strategy as a recovery catchment, and it is expected that salinity will reduce to a level suitable for drinking purposes by 2015. However, it could be used much sooner if the currently dry climate circumstances worsen and the water is mixed with better quality water.

In 2006, the Minister for Water Resources established the Collie-Wellington Basin Water Source Options Steering Committee to investigate options for the future development of the water resources contained within the Collie Coal Basin and the Reservoir. A report produced by the Steering Committee identified the issues associated with developing the water resource to render it fit for a number of higher forms of use, and in doing so evaluated a range of options, established indicative water costs for each option, made preliminary recommendations as to which options appear to be most promising and, most importantly, recommended a way forward. Key recommendations from the report include:

1. The work carried out in the pre-feasibility study should be extended and refined in order to establish a definitive water resource development plan for the Collie-Wellington Basin.
2. The volume of water diverted from the Collie River east diversion should be increased to 14 GL. However, this recommendation is conditional upon the outcomes of the further work needed to confirm the overall technical, economic, environmental and social feasibility of using the Reservoir as a major source of urban and/or industrial water.
3. The feasibility of using groundwater generated by mine dewatering as a source of drinking water should be subjected to further investigation.
4. The future demand for fit for purpose water for industry and agriculture in the Greater Bunbury area needs to be determined.
5. Managed recreation within the Reservoir catchment should continue, however more stringent control is needed over this. The implications for water quality of activities that involve direct contact with water should be reviewed. Further, any future investigation into the use of the Reservoir as a source of potable water should be required to establish the additional treatment costs which need to be incurred in order to permit recreational activities to occur within the catchment.
6. Given the Water Corporation's role as a purchaser and provider of bulk water it is recommended that high level strategic water source planning is separated from the role of water service provision.
7. Government should encourage the private sector to become involved in the future development of the water resources of the Collie- Wellington Basin.
8. Participation by the private sector in certain aspects of water supply within the Collie-Wellington Basin needs to be accommodated within the integrated plans prepared for the region and care taken to ensure that such participation conforms with other elements such as those applicable to land and water use, economic development, physical and social infrastructure and the environment.
9. Work on the implementation of the Salinity Recovery Plan for the Collie River, including river restoration, reafforestation and diversion of the Collie River east branch in its current form should continue.

The report recognised that balancing recreational needs with the requirement to supply safe drinking water is a complex issue, especially in regard to the Reservoir. It also acknowledged that banning recreation would not entirely eliminate the risk of contamination, as there are other potential sources of contamination within the catchment that can neither be banned nor removed. Examples of these include the towns of Allanson and Collie, major roads that traverse the catchment and significant industrial and farming activities that take place mainly to

the east of the Reservoir. In considering the extent to which recreational activity needed to be restricted, the report identified that it was important to better understand the impacts that quarantining the catchment would have on the on-going development Allanson, Collie and the wider region. This is particularly relevant if consideration is given to the fact that the incremental risk posed by recreation has not been quantified.

Preferred management approaches outlined in the report involve the substitution of groundwater used in power stations with treated Collie River water, and which then use the groundwater so released in combination with treated Reservoir water to supply the IWSS. Development of the preferred options for supply to the IWSS would be carried out in stages. The first of these would involve building a 14GL/A diversion plus reverse osmosis treatment plant, upgrading the existing Harris-Stirling-Serpentine link and directing the 12GL of potable water produced by reverse osmosis to the IWSS. The second stage involves the construction of a treatment plant, and once salinity has achieved the required level, substituting power station water with low salinity untreated Reservoir water, building a new inland 45 GL/A pipeline to Serpentine, and finally commencing to pipe a blend of treated Reservoir water plus groundwater to Serpentine.

Implications of using the Reservoir as a Public Drinking Water Supply

If the Reservoir is to be used as a public drinking water supply it is possible that certain constraints will be placed on land use, development, public access and land/water-based recreational activities. In particular, changes may be required in relation to access to the backwaters of the Reservoir and the type and level of recreational use that may be permissible. Water-based recreation, such as swimming, fishing, marroning and boating, as well as associated activities such as camping and picnicking, are likely to be most affected as these activities pose the greatest risk of microbial contamination (Levy *et al*. 1998). However, other land management activities, such as fire management and weed and feral animal control, may also be impacted.

DoW's Statewide Policy No. 13 – *Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land* and *Land Use Compatibility in Public Drinking Water Source Area* indicates activities and uses that are compatible and incompatible within PDWSAs. Under by-laws of the CAWS Act a reservoir protection zone that excludes public access could be implemented. At the time of publication, these by-laws are under review. Application of these policies and the CAWS Act would significantly affect recreation opportunities within the planning area and wider region, and would trigger the need for a review of recreation opportunities elsewhere within the planning area (i.e. outside the Reservoir catchment).

Modifications to this Management Plan

Modifications to this management plan may be required if the Reservoir is brought online as a public drinking water supply. Such modifications will be triggered by DoW issuing a notice in the Government Gazette, stating the date that the Reservoir will be brought online as a public drinking water supply, the issuing of a licence to the WC under the RIWI Act and the preparation of a publically consulted Drinking Water Source Protection Plan for the Reservoir and catchment.

Modifications to this management plan will give consideration to the Drinking Water Source Protection Plan and will be in accordance with the CALM Act and relevant legislation (e.g. CAWS Act and MWSSD Act) as well as Department policy. Such modifications will require consultation with DoW, the Conservation Commission and the community.

Until such as time as the future use of the Reservoir is determined, the Department will manage the planning area in accordance with the prescriptions outlined in this management plan. The development of recreational facilities and services will be phased in over time to enable management to adapt easily if required.

APPENDIX 3. SPECIALLY PROTECTED AND PRIORITY FAUNA

Species	Common Name	Recovery Plan	Conservation Status in WA	
Specially Protected Fauna			**Schedule / Priority**	**IUCN Category**
Bettongia penicillata ogilbyi	Woylie	Yes*	S1	EN
Dasyurus geoffroii	Chuditch	Yes	S1	VU
Setonix brachyurus	Quokka	Draft in preparation	S1	VU
Pseudocheirus occidentalis	Western ringtail possum	Draft in preparation	S1	VU
Phascogale tapoatafa ssp.	Brush-tail phascogale	No	S1	VU
Calyptorhynchus baudinii	Baudin's Cockatoo	Yes	S1	EN
Calyptorhynchus latirostris	Carnaby's Cockatoo	Yes	S1	EN
Calyptorhynchus banksii naso	Forest red-tailed black cockatoo	Yes	S1	VU
Falco peregrinus	Peregrine Falcon	No	S4	
Morelia spilota imbricata	Carpet python	No	S4	
Austromerope poultoni	Scorpion fly	No	P2	
Tyto novaehollandiae novaehollandiae	Masked Owl	No	P3	
Pachysaga munggai	Cricket	No	P3	
Falsistrellus mackenziei	Western false pipistrelle	No	P4	
Hydromys chrysogaster	Water rat	No	P4	
Macropus irma	Western brush wallaby	No	P4	
Burhinus grallarius	Bush Stonecurlew	No	P4	
Ctenotus delli	Dell's skink	No	P4	
Isoodon obesulus fusciventer	Quenda	No	P5	

* Recovery plan needs to be rewritten in view of specially protected listing on 23 January 2008.

Conservation Code

Scheduled species

Fauna declared under the Western Australian Wildlife Conservation Act as likely to become extinct or rare, or otherwise in need of special protection:

- Schedule 1 (S1): Fauna that is rare or likely to become extinct.
- Schedule 2 (S2): Fauna presumed extinct but might be rediscovered.
- Schedule 3 (S3): Birds protected under an international agreement.
- Schedule 4 (S4): Other specially protected fauna.

P1-5 = Priority Fauna (see *Glossary* for more information).

World Conservation Union (IUCN) Rank

IUCN Red List categories used to rank threatened species in Western Australia.

Extinct (EX): Taxon that is extinct.
Extinct in the Wild (EW): Taxon known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.
Critically endangered (CR): Taxon facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN): Taxon facing a very high risk of extinction in the wild in the near future.
Vulnerable (VU): Taxon facing a high risk of extinction in the wild in the medium-term future.

APPENDIX 4. ENVIRONMENTAL WEEDS

Species*	Common Name	Invasive	Environmental Impacts	EWS Rating
Asparagus asparagoides (WONS)**	Bridal creeper	Yes	Yes	High
Leptospermum laevigatum	Victorian tea-tTree	Yes	Yes	High
*Moraea flaccida***	One-leaf cape tulip	Yes	Yes	High
*Zantedeschia aethiopica***	Arum lily	Yes	Yes	High
Allium triquetrum	Three-cornered garlic	Yes	Yes	Moderate
Anagallis arvensis	Pimpernel	Yes		Moderate
*Gomphocarpus fruticosus***	Narrow leaf cotton bush	Yes		Moderate
Juncus capitatus	Capitate Rush	Yes		Moderate
Pennisetum clandestinum	Kikuyu	Yes		Moderate
Pinus radiata	Monterey pine	Yes		Moderate
Pseudognaphalium luteoalbum	Jersey cudweed	Yes		Moderate
Senecio diaschides	No common name	Yes		Moderate
Solanum linnaenum	No common name	Yes		Moderate
Trifolium subterraneum	Subterranean clover	Yes		Moderate
Watsonia marginata	Watsonia	Yes	Yes	Moderate
Acacia dealbata	Silver wattle		Yes	Mild
Acacia decurrens	Early black wattle		Yes	Mild
Chamaecytisus palmensis	Tagasaste	Yes		Mild
Dittrichia graveolens	Stinkwort			Mild
Ipomoea cairica	Five leaved morning glory	Yes		Mild
Ipomoea indica	Morning glory	Yes		Mild
Phytolacca octandra	Inkweed			Mild
Acaena echinata	Sheep's Burr			Low
Bromus hordeaceus	Soft brome			Low
Centranthus ruber	Red Valerian			Low
Cyperus tenuiflorus	Scaly sedge			Low
Dipogon lignosus	Dolichos Pea			Low
Hypericum perforatum	St John's wort			Low
Lavandula dentata	Lavender			Low
Lotus angustissimus	Slender birdsfoot trefoil			Low
Oxalis incarnata	Climbing oxalis			Low
Populus nigra	Lombardy poplar			Low
Platanus x acerifolia	London plane			Low
*Rubus fruticosus*** (WONS)	Blackberry			Low
*Silybum marianum***	Variegated thistle			Low
Trifolium ligusticum	Ligurian clover			Low
Vinca major	Blue periwinkle			Low
Fraxinus excelsior	European ash			No rating
Freesia alba x leichtlinii	No common name			No rating
Isolepis marginata	No common name			No rating
Liquid amber styraciflua	Liquid amber			No rating
Sporobolus africanus	Parramatta Grass			No rating
Ulmus parvifolia	Chinese elm			No rating

* Several introduced *Eucalypt* species were also planted previously in species trial plots.
** Declared species under the ARRP Act (as of 11 January 2008).
WONS Weeds of National Significance

Environmental Weeds Strategy for Western Australia (EWS) Rating

High Priority for control and/or research
Moderate Control or research efforts should be directed to it if funds are available in addition to reasonably high level of monitoring
Mild Monitoring and control where appropriate
Low Low level of monitoring
Invasiveness Ability to invade bushland in good to excellent condition or ability to invade waterways. (scored as yes or no)
Environmental Impacts Ability to change the structure, composition and function of ecosystems. In particular, an ability to form a monoculture in a vegetation community (scored as yes or no).

Based on the *Environmental Weed Strategy for Western Australia (1999)*

APPENDIX 5. VISITOR MANAGEMENT SETTINGS CRITERIA

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Principle purposes	Maintaining and restoring the integrity of ecological processes and natural landscapes, maintaining and restoring biodiversity, and maintaining opportunities for solitude by maintaining or restoring the highest degree of apparent and biophysical naturalness and remoteness from permanent modern structures (*refer to Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	'Surrounding areas' provide a buffer to wilderness areas and will be managed to support wilderness values. Conservation of significant natural and cultural values, with low level recreation.	Conservation of significant natural and cultural values, with low level recreation.	Conservation of significant natural and cultural values, with low to medium level recreation.	Moderate intensity recreation.	Moderate to high level recreation, education and interpretation. Group activities specifically catered for at many sites.	As per 'A' but with high level recreation, education and interpretation and permanent, commercial structures (e.g. shops, cafes, ecolodges).
Description	Natural areas with an NWI rating of ≥12. Wilderness areas are large, remote areas (8000 ha in temperate areas, 20 000 in arid, semi-arid and tropical areas of the State), with minimal evidence of modern human activity (*refer to Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	Provides a buffer to wilderness areas that will assist in maintaining wilderness values in adjacent areas.	Remote areas with conservation significance. Some evidence of previous development in process of rehabilitation, or existing human activity related to management tracks/trails, designated 4WD tracks and walking tracks.	Modified environment but dominated by natural vegetation and landscapes of conservation significance. Signs of past use evident.	Modified environment but includes areas with 'natural' landscape values. Exotic plants may be present but rarely dominant, recreation facilities present.	Highly modified environments with a moderate to high level of nature-based developments set in a mostly natural landscape. Signs of human activity are a regular feature.	As per 'A' but with a higher level of development, facilities and services set in a modified natural landscape (e.g. exotic plants present). Includes structures for commercial purposes.

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Access (access standards and type of transport used by visitors, resource users and protected area managers)	Vehicles: use of any form of mechanised transport is not permitted within wilderness, except for emergency or essential management operations, or reasons of cultural importance. Walk: constructed walking tracks, signs, track markers and toilets will not be permitted in wilderness, and walking access is via natural routes. AS Walking Track standard 6 only. Existing vehicle tracks and built walking tracks within wilderness, other than those required for emergency and essential management purposes, will be closed. Aircraft: landing of non-fixed wing aircraft is permitted for emergency and essential research purposes only. Flying under 2000 feet for fixed wing aircraft and 1500 feet for helicopters above wilderness is discouraged, except for emergency or essential research purposes.	Vehicles: use of mechanised transport within areas surrounding wilderness will be permitted on designated access routes, and in other areas for emergency or essential management reasons only. Walk: AS Walking Track class 5-6; tracks generally formed (class 6 tracks not formed).	Vehicles: 4WD only. Walk: AS Walking Track class 4 to 6; tracks generally formed (class 6 tracks not formed). Boats: non-motorised boats only. Cycle: types 4 bicycle trail. Horses: no horses permitted. Airstrip: no airstrips permitted.	Vehicles: 4WD, sometimes 2WD seasonal. Walk: AS Walking Track class 3 to 5; tracks formed. Boats: boats, motorised and non-motorised, on designated routes/areas Cycle: types 4 bicycle trail. Horses: designated bridle trails possible. Airstrip: natural earth.	Vehicles: 2WD unsealed. Walk: AS Walking Track class 2 to 4; tracks generally formed. Boats: boats, motorised and non-motorised, on designated routes/areas Cycle: types 2 & 3 bicycle trails. Horses: designated bridle trails possible. Airstrip: unsealed.	Vehicles: 2WD sealed. Walk: AS Walking Track class 1 & 2; tracks well constructed; universal access provided where appropriate and practical Boats: Areas may be open to all types of boats. Cycle: type 1 bicycle trails. Horses: designated bridle trails possible. Airstrip: sealed.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Site modification (Extent, type and design of infrastructure, facilities, amenities and the style of accommodation provided)	No site modification and no facilities or structures, except existing cultural structures that are essential for reasons of visitor safety, resource protection and/or management operations. Any rehabilitation or repair of worn trails or sites is unobtrusive, with no long-term or permanent marking or hardening of trails or sites. Overnight Stays: campsites not defined but includes 'Wild' or 'Remote' camping. Day Use: day use sites not defined. Walk: walking tracks are not defined.	Services and infrastructure adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of such areas should be avoided where possible. Overnight Stays: campsites not defined. Day Use: day use sites not defined.	Minimal modification at sites. 'No Facilities' level of development. Overnight Stays: campsites not defined. Day Use: Car parking not defined. Facilities: No facilities provided.	Minor modifications at specific sites. 'Medium' and 'Low' level of development. Overnight Stays: campsites generally defined. Day Use: Car parking generally defined. Facilities: Basic facilities may be provided such as shade shelters, BBQs, toilets.	Modification of sites evident. 'Medium' level of development. Overnight Stays: campsites generally defined; nature-based built accommodation either single structure (e.g. shack/hut) or semi-permanent multiple structures (e.g. safari camp). Day Use: Car parking area defined. Facilities: Facilities generally provided such as shade and interpretive shelters, gas BBQs, tables, toilets.	Modification of site clearly evident. 'Medium' to 'high' level of development. Overnight Stays: nature-based built accommodation with multiple structures and a moderate level of facilities and services (safari camp, ecolodge). Day Use: Defined car parking areas and bays. Facilities: High level of facilities including shade shelters, gas BBQs, tables, toilets, rubbish collection, visitor information in shelter / building.	Modification of site clearly evident. 'High' level of development. Overnight Stays: built accommodation with a high level of facilities and services (e.g. ecolodge, motel style). Day Use: As per 'A'. Facilities: As per 'A' but visitor centres and/or permanent structures for commercial purposes (shops, café's) may be present.

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Social interaction (Density of users and degree of social interaction and opportunities for solitude)	Interaction between users is minimal, with usually less than two other groups encountered during a day, and no other groups within sight or sound at campsites. Maximum group size of about six to eight people.		Little interaction between users, with small numbers of brief encounters with individuals or small groups only except at campsites.	High likelihood of contact with individuals and small groups along access routes and at campsites.	High level of contact with others at campsites and along access routes. Campsite design allows for group camping.	Constant interaction expected. Group and family activities important part of visitor experience. Interaction with others unavoidable. Natural setting important but in the security of a safe and managed environment.	
Degree of self reliance (level of support services)	Visitors must be totally self-reliant as support services are inappropriate and are not provided (except where necessary to protect wilderness values). Commercial tourism and recreation operators not permitted in wilderness.		Visitors must be totally self-reliant. Support services infrequent or unreliable.	Visitors must still be largely self-reliant. Basic support services provided in specific locations.	Self-reliance requirements are generally low where facilities are provided, but outdoor skills will be important in areas away from roads and tracks.	Minimal self-reliance. High level of support facilities usually present or in close proximity.	
Style of visitor management (level of on-site management, site constraints and regulations)	On-site visitor management is very low with controls primarily off site. All interpretation is off-site; no trail information in brochures. Boundary signage only. Very infrequent ranger presence. Constraints on visitors may apply to areas subject to resource use.	Activities, including services and infrastructure, adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of these areas should be avoided where possible (such activities are not permitted within wilderness).	Infrequent DEC presence. Information principally off-site (e.g. brochures, guides, maps); minimal signs.	Some management presence including visits by DEC staff and signs. Information may be provided on-site.	May be frequent ranger presence. Interpretive material, brochures and track guides available.	Frequent staff presence, on-site manager. Could be interpretative and education focus.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
	Wherever possible, ground disturbing activities required for fire management will be conducted outside of wilderness. This includes construction and maintenance of access roads, fire access tracks, fuel-reduced buffers and water points. Prescribed burning within wilderness may be carried out for the protection and maintenance of ecological values and processes as determined through the preparation of area and regional management plans and interim management guidelines.	Surrounding areas to be managed to complement wilderness and provide a buffer.	Low maintenance.	Permit system may be used to control access; emphasis on establishing appropriate visitor expectations and behaviour.	Moderate on-site management requirements, including signs and barriers; facilities may be common but clustered.	High degree of on-site management including use of physical barriers and on-site staff; vehicle and pedestrian movement heavily controlled.	
Interpretation facilities and services	Signposting not provided on site, although some information provided off-site (e.g. websites, books, DEC offices).	Signposting often not provided but may be at start of pedestrian tracks and/or may be noted on wilderness interpretive signposting (located in 'surrounding area').	Signposting may be provided at trailheads; track markers and signs may occur for public health or safety reasons (e.g. at track junctions). Some guided tours may be permitted (see below).	Signposting may be provided where necessary. Interpretive material off-site or at trailheads; guided tours permitted.	Well signposted at trailheads and along track. Interpretive shelters, displays and leaflets, guided tours may be provided. Primary themes may be expressed at recreation sites. Extensive range of opportunities.	Well signposted at trailheads and along track. Interpretive shelters, displays and leaflets, guided tours may be provided; visitor centre may be present. Primary themes may be expressed at recreation sites. Extensive range of opportunities.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Commercial uses	Commercial recreation and tourism operations are not permitted within wilderness (*see section 4.3 of Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	All tourism management operations will be carried out in a manner consistent with maintaining the qualities of wilderness. CTOs permitted, but may need to consider restricted licences to maintain adjacent wilderness qualities (E class).	CTO licences permitted, but may consider regulating numbers to maintain visitor experiences consistent with setting (E class). Focus on nature-based/cultural activities. Leases generally not permitted, or if allowed then setting revised.	CTO licences permitted with focus on nature-based/cultural activities. Leases permitted in appropriate tenure and subject to strict sustainable conditions.	CTO licences permitted, nature-based/cultural and adventure activities. Leases permitted	CTO licences permitted, nature-based/ cultural and adventure activities. Leases permitted.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Probable recreation experiences	Opportunities for isolation, independence, closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge. Educational and/or recreation expeditions will be permitted within wilderness providing they are consistent with the maintenance of the qualities of the area and operate according to the DEC's code of ethics (*see Attachment 2 of Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	Activities adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of such areas should be avoided where possible, and all recreation and tourism management operations will be carried out in a manner consistent with maintaining the qualities of wilderness.	Opportunities for solitude, independence, closeness to nature, tranquillity and self-reliance in an environment that offers a high degree of challenge. Although the activity may not be based on the use of a motorised vehicle, the influence of vehicles and the safety afforded by them may be significant.	Opportunities for challenging interaction with nature using outdoor skills. Opportunities may have human elements but still high probability that visitors can experience isolation from human influences.	Opportunities to interact with nature while still having access to facilities. Interaction with others expected.	Opportunities for nature appreciation and social interaction in a safe environment. Facilities support group activities. Interaction with others unavoidable.	

*Wilderness areas are classified under section 62(1)(a) of the CALM Act to establish management zones to which specific management prescriptions or regulations apply.
Sources: Policy Statement No. 62 *Identification and Management of Wilderness and Surrounding Areas*, The Recreation Opportunity Spectrum (Clark and Stankey 1979)

APPENDIX 6. VEHICLE ACCESS STRATEGY

The type of access provided effects the level and type of use of an area. This Appendix details the roads and tracks that will remain open for public or management vehicle access (see Map 6). Vehicle-based access to the planning area has been categorised into the following areas:

- 2WD sealed (public access suitable for all motor vehicles);
- 2WD unsealed (public access suitable for all motor vehicles);
- 4WD unsealed (public access suitable only for four-wheel drive motor vehicles and trail motorcycles. Non motor vehicle access for walkers and mountain bikes is permitted);
- Management only (access for management purposes only. Non motor vehicle access for walkers is permitted);
- Seasonal closure (public motor vehicle access may be allowed only during certain periods. Generally these periods will be seasonal, with temporary closures during winter).
- Closed (closed to all vehicles).

Roads and tracks shown in Map 6 will remain open to the public. Any roads or tracks not shown on Map 6 or listed in this Appendix will be temporarily or permanently closed or restricted to management only. Other types of access such as walking, boating and horse-riding are discussed in Section 30 *Visitor Access* and Section 31 *Visitor Activities and Use*. All types of access will be consistent with the designated visitor management setting (Map 5).

Some tracks may be created for fire suppression purposes. In these instances, the values of the planning area must be considered by the fire suppression (incident) management team and tracks created or modified during the suppression must be rehabilitated post fire. Only in special circumstances will tracks not be rehabilitated post fire. Where knew knowledge exists or fire management techniques change, and more appropriate track management is indicated, tracks designated for fire management purposes may be temporarily or permanently closed, restricted to management only or relocated to more suitable areas. Where possible, formal agreements should be sought with adjoining landholders to manage track access for fire management purposes.

Vehicle Access Strategy

Access Road	Current Level of Access	Purpose of Access	Proposals
Wellington Dam Road*	2WD sealed	Northern access to the Reservoir and a scenic tourist route.	2WD sealed, upgrade to Type 5 sealed road standard
River Road (north of the Collie River)	2WD and only sealed for 1 km	Scenic tourist route and access to Honeymoon Pool	2WD and seal
River Road (south of the Collie River)	2WD, sealed and one way	Scenic tourist route and access south from Honeymoon Pool	2WD sealed
Falcon Road*	2WD unsealed	Southern access to the Reservoir and lower Collie River as well as a scenic tourist route	2WD and seal, upgrade to Type 4 sealed road standard
Pile Road*	2WD and sealed between Dardanup and Falcon Road	Access to Collie, Dardanup and the Reservoir via Falcon Road and a scenic tourist route.	2WD sealed, upgrade to Type 4 sealed road standard
Coalfields Road*	2WD sealed	Main access route to Collie and a scenic tourist route	2WD sealed, upgrade to Type 6 sealed road standard
Wellington Forest Road	2WD unsealed	Access to Wellington Mill Cottages (Wellington Forest Cottages) and Wellington Discovery Forest as well as a scenic tourist route	2WD and seal
King Tree Road**	2WD unsealed	Access to King Jarrah and a scenic tourist route	2WD unsealed

Access Road	Current Level of Access	Purpose of Access	Proposals
Mungalup Road*	2WD partially sealed	Access to the Westralia Conservation Park, proposed Westralia Forest Conservation Area and Falcon Road.	2WD sealed, upgrade to Type 4 sealed road standard
Goat Road	4WD unsealed	Management access, recreational four-wheel driving	4WD unsealed subject to seasonal closure on a trial basis
Sika Track (Road)	4WD unsealed and partly management only	Vehicle, walk and bicycle access to the lookout viewpoint	4WD unsealed and partly management only
Dongara Ridge Road	2WD unsealed	Access to plantation and mountain bike meeting place	2WD unsealed
Richards Road	4WD unsealed	Recreational four-wheel drive link to Wansborough wineries.	4WD unsealed
Centre Road	4WD unsealed	Recreational driving	Close
Parkin Road	4WD unsealed	Recreational driving	4WD unsealed south of Pile Road. Closed north of Pile Road
Arcadia Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Devils Elbow Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Lennard Drive	2WD sealed	Access to the Collie River and associated recreation sites as well as a scenic tourist route	2WD sealed
Lennard Track	4WD unsealed	Seasonal four-wheel drive scenic route	4WD unsealed (scenic drive) and subject to seasonal closure on a trial basis
Lennard Road	2WD unsealed	Cycling	2WD unsealed
Riches Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Anzac Form Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Dips Road	4WD unsealed	Recreational driving	Close
Gervasse Drive	Closed	Part of Sika Circuit	Close to vehicles
Sneaker Road	4WD unsealed	Recreational four-wheel driving	4WD unsealed subject to seasonal closure on a trial basis
Polo Road	4WD unsealed	Access to private property	4WD unsealed
Goon Road	4WD unsealed	Recreational four-wheel driving	4WD unsealed subject to seasonal closure on a trial basis
Windy Ridge Road	2WD unsealed	Access to private property	2WD unsealed
Boomer Ridge Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Harnet Road	4WD unsealed	Recreational driving	Close
Potters Road	4WD unsealed	Recreational driving	Close
Lullaby Road	2WD unsealed	Recreational four-wheel driving	2WD unsealed
Halo Road	4WD unsealed	Recreational driving	Close
Sky Road	2WD unsealed and partly closed	Access to quarry/gravel pit	Close
Palmer Road	2WD unsealed	Access to upper Collie River	2WD unsealed
Flora Road	2WD unsealed	Scenic tourist route	2WD sealed, subject to resources
Black Dicks Road**	Closed to vehicles/ Management only	Disease Risk Area	Close to vehicles/ Management only
Connell Road	2WD unsealed	Access to pine plantations, Collie River and the backwaters of the Reservoir.	2WD unsealed
Bullet Road	2WD unsealed	Strategic fire access	Close to vehicles/ Management only

Access Road	Current Level of Access	Purpose of Access	Proposals
Beela Road	2WD unsealed	Access to private property/utilities	2WD unsealed
Tom Jones Drive	2WD sealed	Access to Potters Gorge	2WD sealed and realign
Lookout Road	4WD unsealed	Four-wheel drive road and walk track	4WD unsealed
Indicative tracks on Map 6	2WD and 4WD unsealed	Access to the Reservoir and proposed campsites	2WD and 4WD unsealed. Final access will be determined within two years of commencing the plan.

* Proposed for upgrade in the Roads 2020 Regional Road Development Strategy.
** Shire road for which the Department has management responsibility.

APPENDIX 7. GUIDELINES FOR VISUAL LANDSCAPE MANAGEMENT

Visual landscape management involves maintaining, restoring or enhancing natural and cultural landscape values, as well as planning and designing land use activities and developments to provide diverse views and minimise negative impacts. Human imposed changes to the landscape should be subordinate to the established natural visual character. Guidelines for landscape management are as follows:

Zone A

These areas are a high priority for visual landscape management. The objective in these areas is to retain the maximum amount of visual quality. Guidance for management is as follows:

- Focus on the maximum protection of all existing visual landscape features. These features should be identified and evaluated prior to any management activities.
- Landscape alteration should be low as this zone is the least accommodating to visual change.
- Alterations to landscape character should be subtle, remaining subordinate to natural elements by borrowing extensively from form, line, colour, texture and scale found commonly in the surrounding landscape. Alterations should be visually inevident within one year of project completion.
- Avoid operations that lead to a major change in visual landscape quality in the short-term.
- Prescribed burning should minimise impact on landscape values (i.e. maintaining substantial sections of unburnt areas around sensitive areas).
- Facilities and activities which utilise and yet disturb very little of the natural environment should be encouraged such as walking tracks and small day-use areas.
- Land uses and developments that do not require scenic environments should be excluded (e.g. mining/quarries, large recreation sites, large carparks, telecommunication towers/powerlines).
- Where structures are required they should be small scale, sympathetic in design, materials and colour to complement surrounding landscape elements and be carefully sited away from major natural focal points, out of viewer sight-lines and where vegetation or landform screening can be used.
- Road design and construction should remain subordinate to landscape elements by utilising minimum design standards, limited cuts and fill, minimum clearing widths, undulating edges, sensitive alignment. Roads, recreation sites and tracks should focus views onto distinctive features where possible.
- Previously disturbed areas should be given the highest priority for rehabilitation until the desired standard of visual landscape quality is attained.
- Interpretive and explanatory signing should be utilised before and during operations that alter landscape character (i.e. recreation site development, prescribed burning adjoining sensitive areas).

Zone B

These areas are a moderate priority for visual landscape management. The objective in these areas is to retain a moderate amount of visual landscape quality. Landscape alterations may be visually apparent but the focus should remain on the protection of the dominant existing visual landscape features. In this instance, alterations to the naturally established landscape character should still borrow form, line, colour, texture and scale from natural elements.

Zone C

These areas are a moderate priority for visual landscape management. The objective in these areas is for partial retention/enhancement of visual quality. Guidelines for management are as follows:

- Landscape alterations may be visually dominant (i.e. accommodating to visual change) but should reflect the existing lines, forms, colours and textures of the surrounding landscape.
- Where possible, the Department should seek to optimise and enhance (e.g. through rehabilitation) visual landscape quality over the medium to longer term.
- Essential but visually depreciative facilities not requiring areas of visual amenity should be accommodated in these areas first (e.g. gravel pits, transmission towers and powerlines).
- Views to disturbed landscapes may require landform and vegetation screening.

APPENDIX 8. COMMERCIAL BEEKEEPING SITE ASSESSMENT

Criteria and Approach for Assessing Commercial Beekeeping Sites within the Planning Area[1]

	Suitable	Suitable but Conditional	Highly Constrained
Approach	Maintain or increase numbers of apiary sites in these areas. Standard permit conditions would apply	Maintain or increase numbers of apiary sites in these areas. Additional permit conditions would apply such as increased hygiene control and seasonal, site location and access restrictions. Research and monitoring at these sites may be required	Close, and relocate where possible, any current apiary sites in these areas. Prevent any new apiary sites in these areas
Environmental Criteria			
1. Threatened and other conservation significant flora within a 2 km radius[1]	No rare, priority 1 or 2 flora present that are visited by honey bees	Rare, priority 1 or 2 flora present that are visited by honey bees and impacts are seasonal or undetermined[2]	Rare, priority 1 or 2 flora present that are visited by honey bees and impact is predicted to be year-round[2]
		Rare, priority 1 or 2 flora present that are visited by honey bees but no predicted impact[3]	-
	No priority 3 or 4, endemic, disjunct or relictual flora present that are visited by honey bees	Priority 3 or 4, endemic, disjunct or relictual flora that are visited by honey bees present[4]	
2. Significant communities within a 2 km radius	No threatened ecological communities (TECs) or priority ecological communities (PECs)	TEC or priority 1 or 2 PEC present and impacts are seasonal[2]	A TEC or priority 1 or 2 PEC present and impact is predicted to be year-round[2]
		TEC or priority 1 or 2 PEC present but no predicted impact[3]	
		Priority 3 or 4 PEC present and flora is visited by honey bees[4]	
3. Threatened fauna and other significant habitats (i.e. habitats for fauna adversely impacted by honey bees) within a 2 km radius	No old growth forest or other known habitat of hollow nesting threatened fauna present	Old growth forest or other known habitat of hollow nesting threatened fauna is present[5]	
	No fauna watering points at fauna breeding centres and re-introduction sites present	-	Fauna watering point at fauna breeding centres and re-introduction sites present[6]
	No other significant habitats or communities present	Other significant habitats or communities are present that are seasonally impacted[7]	Other significant habitats or communities are present that are impacted year-round

	Suitable	Suitable but Conditional	Highly Constrained
Management Criteria			
1. Previous use	A conservation reserve that has authorised historic use of commercial beekeeping	-	A conservation reserve that has no authorised historic use of commercial beekeeping
2. Access	Public or suitable management vehicle only access is available	-	There is no public or suitable management vehicle only access or current access is being closed
	No gazetted wilderness present	'Candidate' wilderness only	Gazetted wilderness present
3. Recreation sites or dwellings within a 500 m radius	No built accommodation/ camping/day use site present	-	Built accommodation/ camping/day use site present
4. Tracks and trails within a 200 m radius	No walk trail present (Class 1 or 2)	Walk trail present but only used infrequently or proposed walk trail (Class 1 or 2)	Walk trail present and used frequently (Class 1 or 2)
5. Disease control[8]	Low risk of *P. cinnamomi* spread	*P. cinnamomi* present or area identified as protectable from *P. cinnamomi* spread but there is an existing site	Area identified as protectable from *P. cinnamomi* spread are there are no existing sites
		Disease present or vegetation identified as being susceptible to disease and there is a risk of spread from existing apiary activities	Disease present, or vegetation identified as susceptible to disease and there are no existing sites
6. Apiary sites within 3 km radius	No other apiary sites present		Apiary site present
7. Feral honey bee management within 2 km	-	Feral honey bee control program in place[9]	-
8. Weed management within a 2 km radius	No high or moderate environmental weeds present that are considered to have an increased seedset due to honey bees	High or moderate rated environmental weeds that are considered to have an increased seed set due to honey bees but flower seasonally[10]	High or moderate rated environmental weeds that are considered to have an increased seed set due to honey bees and flower year-round[10]
9. Other management concerns	No impact on Departmental operations or the requirements of other authorities controlling Crown land or Government reserves	An impact on Departmental operations or the requirements of other authorities controlling Crown land or Government reserves that can be managed	An impact on Departmental operations or the requirements of other authorities controlling Crown land or Government reserves that can not be managed

Notes

[1] This process has been based on where there is spatial data for threatened and other conservation significant flora (see Sections 19 and 21). This apiary assessment should be adaptive through the life of the plan and the best data incorporated, for example if during an application for a new site or during a review of an existing site, any new locations of these identified species are found, then this data should be incorporated and the assessment should be rerun for the site.

[2] Impacts are seasonal or undetermined (see Guidance for Additional Conditions – A). Where impacts are predicted to be year-round, the area will be considered to be highly constrained.

[3] Visited by honey bees, but no predicted impact. These flora and TECs/PECs are still of high conservation significance and a precautionary approach is warranted (see Guidance for Additional Conditions – B).

[4] As with note 3 above, priority 3 or 4, endemic, disjunct and relictual flora are of conservation significance and a precautionary approach is warranted. In addition, although populations of these species may be widespread and impacts on these populations may not threaten the existence of the species, there still may be some populations that should be afforded higher protection (e.g. the population may be (1) at the species' range end, (2) the largest viable population or (3) genetically significant) (see Guidance for Additional Conditions – C).

[5] If there is a current apiary site and there are feral honey bees present, then use can continue year-round. However, old growth forest and other significant habitats for hollow nesting fauna will be targeted for feral honey bee control (see Guidance for Additional Conditions – D). For new sites within old growth forest see Guidance for Additional Conditions – E.

[6] Native fauna breeding centres and fauna re-introduction sites often have watering points. Commercial beekeeping in the vicinity may disturb the animals from drinking.

[7] To be determined through the planning process. Other significant habitats may be identified due to: new research/ information; changes in threat status of fauna; and/or changes in resource availability – for example, directly after a fire, when competition between species such as honey possums and honey bees would be at its highest.

[8] Standard disease control conditions will apply. The soil dryness index may be used to restrict vehicle access to the sites. There should be no new sites established in areas that are: protectable from *P. cinnamomi*; designated Disease Risk Areas; or in vegetation associations identified as susceptible to disease).

[9] There may need to be seasonal restrictions (see Guidance for Additional Conditions – D) when a feral honey bee control program is in place.

[10] High or moderate environmental weeds are a high priority for the Department to control (see Guidance for Additional Conditions – F).

Guidance for Additional Conditions

A. Seasonal restriction based on flowering period of flora. Site must be available for a minimum of 1 month. Placement and number of hives also may be restricted.

B. Placement (at least 100 metres from populations) and number of hives may be restricted. Monitoring of representative samples for health of adult populations and seedling recruitment or TEC/PEC to ensure there is no decline due to apiary management, taking into account other factors such as drought, disease, fire, environmental weeds and other disturbances. If unacceptable impacts are shown or observed later, then treatment will be the same as A.

C. There may be a need to review populations within the planning area to determine whether these populations are significant to the conservation of the species. If deemed significant then treatment will be the same as A.

D. When a feral honey bee program is in place, then use of the site will be restricted during periods when the queen is may swarm, such as Spring or a suitable method to restrict the queen should be implemented.

E. For new sites in old growth forest where there are no feral honey bees present, a condition may be that if during the period of the permit, feral honey bee hives are located within 2 kilometres of the site, the site will be temporarily restricted until the feral honey bees are controlled.

F. Seasonal restriction based on flowering period of environmental weed however, only until the environmental weed has been successfully eradicated.

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Assessment of Current Beekeeping Sites within the Planning Area

Beekeeping sites within the planning area were assessed against the environmental and management criteria and categorised as suitable, suitable but conditional or highly constrained. The table below shows the result of the assessment and indicates criteria that require additional conditions. Some of these additional conditions have been included as guidance and should be seen as a minimum set.

	Environmental Criteria								**Management Criteria**							Additional Conditions
Beekeeping Site No.	Rare and Priority 1, 2 Flora Visited			Other Conservation Flora Visited	TEC			Fauna Habitat (e.g. Mature Growth)	Wilderness		Recreation Sites	Class 1 or 2 Walk Trail	Disease Risk	Weed Management		
	Impact Year Round	Impact Seasonal	No Predicted Impact		Impact Year - Round	Impact Seasonal	No Predicted Impact		Candidate	Gazetted				Impact Seasonal	Impact Year - Round	
Suitable																
3858																
Suitable but Conditional																
2654				X				X						X		C, D, F (Jul-Nov)
2655								X					X			D
2656								X					X			D
3009														X		F (Apr - Nov)
3220								X								D
3826				X				X								C, D
4637				X												C
4814								X								D
5346								X								D
Sites within 2 km of Planning Area*																
3010*																
3008*																
5863*																

* Sites located within a 2 km radius of the planning area require a separate assessment as they may affect adjoining conservation estate.