Beeliar Regional Park

Draft Management Plan

2001-2011

Conservation Commission of Western Australia

Department of Conservation and Land Management

City of Melville

City of Cockburn

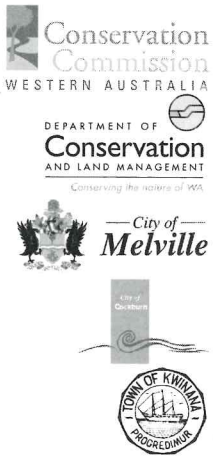
Town of Kwinana

Government of Western Australia

Beeliar Regional Park

Draft Management Plan

2001 - 2011



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PLANNING TEAM

This plan was co-ordinated by a consultancy team led by Thompson Palmer Pty Ltd working closely with the managers of Beeliar Regional Park – the Department of Conservation and Land Management, the City of Melville, the City of Cockburn and the Town of Kwinana. The Planning Team prepared the plan for the Conservation Commission of Western Australia.

Brendan Dooley	Department of Conservation and Land Management
Tim Bowra	Department of Conservation and Land Management
Allen Blood	City of Cockburn
Ian Davis	City of Melville
Rosalind Murray	Town of Kwinana

What Do You Think?

We would like to know what you think of the proposals in this Draft Management Plan and encourage you to make a submission.

Why write a submission?

It is an opportunity to provide information, express your opinion, suggest alternatives and have a say on how we are proposing to manage the Beeliar Regional Park over the next 10 years.

If you prefer not to make your own submission, you could make a joint submission with others.

What makes an effective submission?

To ensure that your submission is as effective as possible:

- make it concise and clear;
- list your points according to the subject sections and page numbers in the Plan;
- say whether you agree or disagree with any or all of the objectives or recommendations, giving your reasons and sources of information;
- suggest alternatives to deal with any issue with which you may disagree.

It is important to indicate those strategies and recommendations you agree with as well as those with which you disagree.

Give reasons for your concerns and give support where appropriate. Information and constructive suggestions relating to your submission are most useful.

What criteria will be used in assessing your submission?

1. The draft management plan <u>will</u> be amended if a submission-
   - provides additional resource information of direct relevance to management;
   - provides additional information on affected user groups of direct relevance to management;
   - indicates a change in or clarifies government legislation, management commitment or management policy;
   - proposes strategies that would better achieve management goals and objectives; or
   - indicates omissions, inaccuracies or a lack of clarity.

2. The management plan <u>will not</u> be amended if a submission-
   - clearly supports the draft proposals;
   - offers a neutral statement or no change is sought;
   - addresses issues beyond the scope of the plan;
   - makes points which are already in the plan or were considered during plan preparation;
   - *is one of amongst several widely divergent viewpoints received on the topic and the recommendations of the draft plan is still considered the best option; or*
   - contributes options which are not feasible (generally due to some aspect of existing legislation or government policy).

What Happens To Your Submission?

All submissions will be summarised according to the topics discussed. The draft management plan will then be reviewed in the light of the submissions, according to criteria mentioned above. A summary of the submissions will be published along with the Final Management Plan, including an indication of how the plan will be amended or not in response to the submission. If a submission is marked "CONFIDENTIAL" then the author will remain anonymous in the analysis of public submissions document.

Deadline

Submissions are welcome for three months after the date of release. For enquiries please ring the Department of Conservation and Land Management on (08) 9431 6500

Where to send your submission?

Written submissions should be sent to:

Executive Director
Department of Conservation and Land Management
PO Box 1535
FREMANTLE WA 6959

Attention: Regional Parks Coordinator;
Beeliar Regional Park Management Plan

Where to obtain or view additional copies of this plan?

Department of Conservation and Land Management
17 Dick Perry Avenue
Technology Park, Western Precinct
KENSINGTON WA 6151
(08) 9334 0333

Department of Conservation and Land Management
19-21 Phillimore Street
FREMANTLE WA 6160
(08) 9431 6500
(viewing only)

Department of Conservation and Land Management
5 Dundebar Road
WANNEROO WA 6065
(08) 9364 0666

The City of Melville
Almondbury Road
ARDROSS WA 6153
(08) 9364 0666
(viewing only)

The City of Cockburn
Cnr. Rockingham Rd & Coleville Crescent
SPEARWOOD WA 6163
(08) 9411 3444
(viewing only)

The Town of Kwinana
Gilmore Avenue
KWINANA WA 6167
(08) 9419 2222
(viewing only)

Or visit the Department of Conservation and Land Management's NatureBase website at -

http://www.naturebase.net/national_parks/regional_parks_splash.html

How to Use This Plan.

This plan is divided into sections as set out in the table of contents. A goal is stated at the beginning of each section. Within each section are subsections. Each subsection begins with the objectives to be achieved by management, followed by a discussion of the main issues and then strategies, accompanied by the agencies responsible for achieving each objective and a priority rating. Priority ratings provide an indication of the relative importance of a strategy. The management agencies names have been abbreviated and a list of all abbreviations used and their meaning is listed in Appendix A. Key Performance Indicators are listed in the Plan and a Performance Audit Table outlining proposed timelines of key strategies is stated.

ACKNOWLEDGMENTS

Numerous individuals and groups have contributed valuable ideas and information in the preparation of this plan and their efforts are gratefully acknowledged. In particular the contribution of those individuals who were involved in the preparation of the draft plan is sincerely appreciated. This includes Brendan Dooley, Tim Bowra, Jim Williamson, Leon Griffiths (Department of Conservation and Land Management), Mark Street, Ian Davis (City of Melville), Darren Walsh, Allen Blood, Paddy Strano, Kirsty Stratford (City of Cockburn), Rosalind Murray (Town of Kwinana), and Brian Foley from Alcoa.

The contribution of the Beeliar Regional Park Community Advisory Committee chaired by Associate Professor Philip Jennings and the following members, Jeff Spencer, Diana Corbyn, Deirdre Napier, Clive Robartson, Wilma Vincent, Siddhartha Jha , Mark Armstrong, Brian Foley, Dr Brian Smith and Robyn Pickering is appreciated.

NOMENCLATURE

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

THE CONSERVATION COMMISSION OF WESTERN AUSTRALIA AND THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT.

All national parks, conservation parks, nature reserves, and other similar reserves are placed in the care, control and management of the Conservation Commission of Western Australia. These reserves are managed on behalf of the Conservation Commission of Western Australia by the Department of Conservation and Land Management.

As a controlling body, the Conservation Commission of Western Australia is responsible for having management plans prepared for all lands that are vested in it. This plan is prepared by the Department of Conservation and Land Management and issued as a draft plan by the Conservation Commission of Western Australia for public comment prior to final approval by the Minister for the Environment.

Preface

Regional parks are areas of Region Open Space which are identified by planning procedures as having outstanding conservation, landscape and recreation values. Regional parks are a new land management category that provide the opportunity for a coordinated planning approach by different land management agencies and private land owners.

Regional parks were first proposed in the Stephenson - Hepburn Report of 1955, which later formed the basis of the Perth Metropolitan Region Scheme in 1963. Since then, State planning agencies have been acquiring suitable private land in anticipation of the time when regional parks would be formally created.

In 1997, the State government announced a commitment to introduce legislation to give regional parks legal standing and vesting in the Conservation Commission of Western Australia. Eight regional parks were recognised as formal identities with the coordination of their management progressively transferred to the Department of Conservation and Land Management. Regional park management plans are a commitment of the State and local governments to coordinate the management of regional parks.

The role of the Department of Conservation and Land Management in regional park management is two fold. Firstly, it is to manage the areas of regional parks that are proposed to be vested in the Conservation Commission of Western Australia. Secondly, it is responsible for coordinating the management of the Park in conjunction with local government and other managing agencies. The latter is initiated through the preparation of this management plan. For Beeliar Regional Park, the local governments of Melville, Cockburn and Kwinana are involved.

Beeliar Regional Park has been created primarily around two chains of wetlands and also incorporates an area of coastal limestone cliff (Henderson Foreshore). The Park will be managed as a single entity as the wetlands in each chain are derived from similar geomorphological processes.

Over 75% of the wetlands of the Swan Coastal Plain have been lost since European settlement and there is a need, as well as a community expectation, that remaining wetlands should be conserved for their particular environmental, cultural and social values (DPUD, 1992).

The many discrete parts that make up the Beeliar Regional Park are subject to a wide range of pressures mainly derived from the increasing surrounding urban and industrial development. The result is, in many instances, a degrading environment with areas of disturbed vegetation cover and reduced water quality in the wetlands and lakes.

While it is not the intent of this Management Plan to try and recreate the original wetland environment, it does aim to minimise further degradation to the quality of the wetlands and surrounding vegetation. To do this, an integrated approach by the managing agencies is needed to respond to the pressures that are now brought to bear on the Park.

Significant planning has already occurred for some areas of the Park. Management plans have already been prepared and implemented for many of the wetlands. This Plan will act as an 'umbrella' document that coordinates the implementation of existing plans and seeks to draw them together in an integrated manner to conserve and enhance Park values.

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A. INTRODUCTION

1 - Purpose and Status of the Management Plan

PURPOSE OF THE PLAN

The purpose of this management plan ("the Plan") is to provide broad direction for the planning, management and development of Beeliar Regional Park ("the Park"). It will do this by encouraging the protection of Park values, anticipating future community requirements and developing strategies aimed at addressing management issues and concerns. The Plan will help ensure the Park is managed appropriately and is capable of sustaining its high nature conservation and cultural values as well as use by the community.

Given the strategic nature of this Plan, more detailed planning (referred to as subsidiary plans) will be required prior to operations taking place within the Park (Section 40). Examples of subsidiary plans proposed in this Plan include a weed management plan (Section 17), a rehabilitation plan (Section 21) and site development plans for specified Park areas (Section 28).

STATUS OF THE PLAN

This Plan provides statutory direction over all lands and waters of the Park vested in the Conservation Commission of Western Australia and managed by the Department of Conservation and Land Management. The Plan will act as an "umbrella" document coordinating existing plans for specific areas of the Park. Implementation of existing plans will need to be consistent with the overall direction of this Plan. Additionally, future plans for areas within the Park will need to be written in a manner to complement the Beeliar Regional Park Management Plan.

The Conservation Commission of Western Australia and Western Australian Planning Commission (WAPC) endorse this Plan and acknowledge that the Department of Conservation and Land Management has the responsibility for coordinating the management of the Park. In consultation with the Department of Conservation and Land Management, the WAPC will use this Plan to assist with the assessment of development proposals on lands within and adjoining Beeliar Regional Park.

The proposals contained in this Plan have not yet been formally endorsed by the City of Melville, City of Cockburn or the Town of Kwinana. Following public comment on the Plan, the respective Councils of Melville, Cockburn and Kwinana will consider formal endorsement of the Final Management Plan.

2 - Regional Parks

WHAT IS A REGIONAL PARK?

Regional parks are areas of Region Open Space that are identified by planning procedures as having regionally significant conservation, landscape and recreation values. Regional parks are a land management category which provides the opportunity for a coordinated planning strategy by different land management agencies and private land owners.

Regional parks may comprise Crown lands vested in the control of State government agencies, local governments and private lands where the agreement of the landowner is obtained.

As such regional parks could consist of lands with a variety of tenures and reserve purposes. They could be a package of multi purpose, multi vested reserves drawn together for coordinated management by the Department of Conservation and Land Management. Beeliar Regional Park for example consists of land comprising Crown reserves vested in the City of Melville, City of Cockburn, Town of Kwinana and the Conservation Commission of Western Australia as well as freehold land owned by the WAPC and other government agencies and individuals.

Those lands that have been acquired by the WAPC for incorporation into the Park are now to be transferred to the respective local government and/or the Conservation Commission of Western Australia for management as part of the regional park.

It is intended that the high level of protection currently existing for lands already vested in the Conservation Commission of Western Australia (such as national parks or nature reserves) will continue as the regional park concept is implemented.

THE REGIONAL PARK CONCEPT

The concept of Regional Open Space was first introduced to Western Australia by the Stephenson - Hepburn Report in 1955, which recommended that a statutory region plan be prepared for Perth which reserved private land required for future public purposes. In 1963, the Perth Metropolitan Region Scheme (MRS) was established and land was reserved for "Parks and Recreation". This land (subject to amendments of the MRS) has been gradually acquired by State planning authorities with the intention to protect open space of regional significance for conservation and recreation.

The Environmental Protection Authority (EPA) Conservation through Reserves Report for Western Australia (1983) identified areas (called System Six areas) which were considered worthy for conservation. It also recommended areas of land to be managed as regional parks. A system of regional parks was

envisaged which included Beeliar Regional Park (System Six Recommendations M91,92,93).

In 1989, the State government decided that the responsibility for regional park management be established within the Department of Conservation and Land Management and that the responsibility for planning the acquisition of lands for Regional Open Space be retained by the Ministry for Planning (MFP) on behalf of the WAPC.

A task force report (1991) was prepared by the former Department of Planning and Urban Development (DPUD) and the Department of Conservation and Land Management outlining proposed administration, planning and management of regional open space.

The EPA's Red Book status report (1993) describes the transformation of regional parks from concept to reality as being difficult because of the range of land tenure involved and funding requirements for continual management of the parks.

In June 1997, the State government announced a commitment to introduce legislation to give regional parks legal standing and vesting in the former National Parks and Nature Conservation Authority (NPNCA) now the Conservation Commission of Western Australia. The co-ordination of management of eight metropolitan regional parks would be progressively transferred to the Department of Conservation and Land Management.

REGIONAL PARK PLANNING

Planning for regional parks occurs at a number of levels. Regional park management plans are a part of a broad suite of planning undertaken by the relevant managing agencies. Figure 1 illustrates the planning levels typically undertaken for regional parks.

Source: ANZECC 2000.

Figure 1 - Regional Park Planning Hierarchy

3 - Beeliar Regional Park

Urban growth in the vicinity of the Beeliar Wetlands has led to concern regarding the potential impact on the wetlands. The Cockburn Wetlands Study (Newman *et al.* 1976) identified the condition and resource values of the lakes in both the eastern and western chains of the Cockburn wetlands. The study recommended a proposal to establish an integrated park system.

In 1986, the Wetland Conservation Society made representations to the government and obtained a commitment to establish the Beeliar Regional Park.

In 1992, the document *Proposals for the Establishment, Administration and Use of Beeliar Regional Park* was prepared by the former Department of Planning and Urban Development (DPUD). The document sought to establish the boundaries for the Park and addressed issues of land tenure, land use conflicts and management structures. Subsequently the WAPC commenced acquiring land to add to those areas which were already controlled by government agencies.

In 1997, the State government proposed that a management plan for Beeliar Regional Park be prepared by the Department of Conservation and Land Management in conjunction with the local governments of Melville, Cockburn and Kwinana.

OVERVIEW

Beeliar Regional Park is located in the south west of the Perth metropolitan area (see Figure 2). The northernmost area of the Park (Blue Gum Lake) is located approximately 10 kilometres from Perth's Central Business District (CBD) while The Spectacles, being the southernmost area, is approximately 33 kilometres from the CBD.

The Park comprises 19 lakes and many other associated wetlands in two main chains located parallel to the coast. The western chain is approximately two kilometres from the coast and the eastern chain is between five and six kilometres from the coast.

The western chain of wetlands consists of a number of depressions behind the coastal dune system. This chain comprises Manning Lake, Market Garden Swamps 1 and 2, Lake Coogee, Brownman Swamps, Lake Mount Brown. Mount Brown and the Henderson Foreshore (System Six, M91 reserve) adjoin the wetland chain to the southwest. The entire western chain of wetlands and coastal areas are within the municipal boundaries of the City of Cockburn.

The eastern chain of wetlands is more extensive than the western chain and encompasses Blue Gum Lake, Booragoon Lake and Piney Lakes Reserve (within the City of Melville), North Lake, Bibra Lake, South Lake, Little Rush Lake, Yangebup Lake, Kogolup Lake, Thomsons Lake and Banganup Lake (within the City of Cockburn) and The Spectacles (within the Town of Kwinana).

ONE ENTITY

The concept to manage the Beeliar Wetlands as a single entity is not new. In 1986, the Wetlands Conservation Society proposed to the State government that a number of wetlands in the Cockburn area should be managed collectively as Beeliar Regional Park (DPUD, 1992). This is supported by its geomorphological history which indicates that the foundation of the Park is based on two consanguineous chains of wetlands. "Consanguineous wetland suites are natural groupings of wetlands having common or interrelated features due to similarity in their physical setting and causative factors of wetland development" (Semeniuk, 1997). This means that the wetlands in each chain have derived from similar, often linked, geological or other events or processes.

Note: Due to its proximity and connectivity, the Henderson Foreshore is regarded as an extension to the western chain of wetlands. It is however understood, that the foreshore has particular management issues which distinguish it from the remainder of the Park. These issues are addressed in the body of the report.

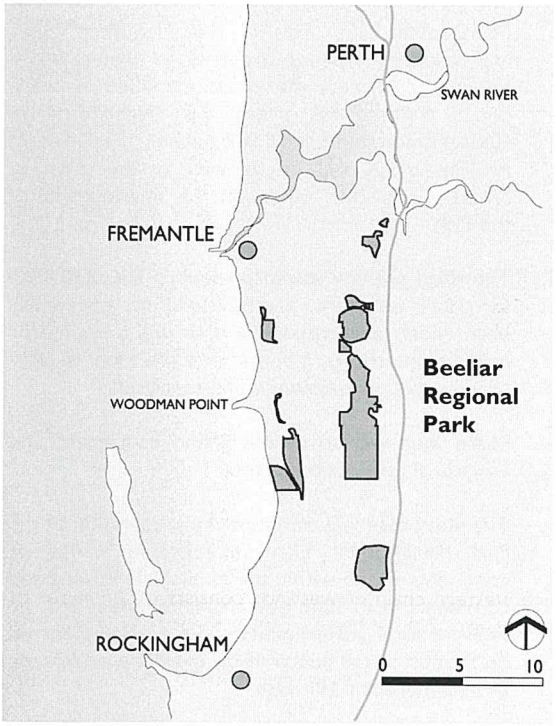


Figure 2 - Park Location

PARK VALUES

Natural Environment Values

Much of Beeliar Regional Park has high conservation value due to its rich diversity and complexity of ecosystems which are limited in distribution across the Swan Coastal Plain. Even though the wetlands within the Park are by no means pristine, they form one of the most important systems of wetlands remaining within the Perth metropolitan region (DPUD, 1992).

The vegetation communities found within Beeliar Regional Park are significant as they represent communities once widespread on the Swan Coastal Plain but now significantly cleared. The vegetation within the Park comprises both structural and floral diversity expressed as a diverse series of landscapes (Keighery 1996). A number of Park areas contain priority flora species, as well as a large number and wide range of plant communities some of which are in very good condition.

The diversity of habitat is important to wildlife utilising the Park. The wetlands and surrounding areas are an important nesting and feeding habitat and because of their high biological productivity, directly or indirectly support most of the wildlife of the surrounding region. Additionally, some of the wetlands in the Park act as summer refuges for a diverse bird population, many of which are trans-equatorial migratory waders.

The Beeliar Wetlands can be considered of international and national significance. The entire Park has been placed on the Interim List of the Register of the National Estate, while Booragoon Lake, Thomsons Lake and The Spectacles have been listed on the Directory of Important Wetlands in Australia. Thomsons Lake (in conjunction with Forrestdale Lake), has been listed as a wetland of international importance under the Ramsar convention. Many wetland areas in the Park have also been identified as locations for JAMBA / CAMBA migratory bird species.

Cultural Values

Beeliar Regional Park has cultural significance to both Aboriginal and non-Aboriginal people.

There are numerous Aboriginal sites within, or immediately adjacent to the Park which have been identified by the Aboriginal Affairs Department (refer Section 23).

The eastern chain of Beeliar Regional Park holds significance for the local Aboriginal people (Nyungars) as it was an important camping and ceremonial area as well as a source of food. The chain of wetlands was a part of a major trade route between Aboriginal people in the Swan and Murray River areas (Polglaze, 1986). North Lake and Bibra Lake in particular are areas of spirituality for the Nyungar people. At Booragoon Lake (an Aboriginal word for south Canning), the Western Australian Museum has found evidence that the western side of the Lake was used as an Aboriginal camp site and food source for at least 38 000 years (Drake and Kennealy, 1995).

Non-Aboriginal people also have historical connections to the area. Thomas Peel first occupied the area in 1830 as the Clarence settlement. However, it was not until the late nineteenth century that intensive agriculture commenced in the area, coinciding with the gold rush in the 1890s. Berson (1978) provides an insight into European settlement and the development of the Cockburn area.

Landscape Values

Beeliar Regional Park provides significant landscape and amenity value to the region. Many landscapes contribute to the overall high visual quality of the Park. These include vegetated uplands consisting of mature woodland and forest areas, vegetated wetland areas, extensive areas of open water and areas of well maintained grassed parkland. The coastal environments

of the Henderson Foreshore area, which comprises limestone cliff formations and coastal vegetation, also add another dimension to the Park's landscape amenity.

Significant views of the major wetland areas can be appreciated from many vantage points around the Park. These views are an important part of the Park's identity. The relationship of adjoining land uses to the Park's landscape often has a significant impact on the overall amenity of the Park.

Recreation Values

Beeliar Regional Park provides for a range of both passive and active recreation opportunities. Of particular significance is the opportunity to recreate in natural environments that are relatively undisturbed yet close to urban areas. A wide variety of natural features such as the lakes, wetlands and bushland areas as well as coastal environments, provide visitors with a variety of recreation opportunities and experiences.

Beeliar Regional Park also contains a number of smaller recreation nodes offering a diversity of settings, uses and facilities. Existing and proposed recreation facilities are described in area plans for individual Park areas and are illustrated in the Recreation Masterplan (Appendix D).

Education and Research Value

Beeliar Regional Park has significant research and scientific values. On one hand it contains rich, dynamic ecosystems with seasonal and periodic variations, subject to considerable external pressures and inputs. Conversely, it has areas with high recreational demand requiring an understanding of human use, landscape design, and changing social use of natural areas for recreation.

In particular, the collection of technical data on wetland habitats, water quality and water quantity make it an extremely valuable resource in gaining technical and managerial expertise that can be applied to other wetlands across the Swan Coastal Plain.

PREVIOUS STUDIES

Areas within Beeliar Regional Park have been the subject of numerous studies, and a wide range of literature exists that covers the biological, cultural and recreational aspects of the Park. This Management Plan draws on the available information and is prepared as an umbrella document, establishing a broad framework for the management of the Park as a single entity.

The previous studies of Park areas have been important in the planning of Beeliar Regional Park and have been used as a basis for identifying and evaluating future management options and directions.

Detailed area plans have been prepared previously for the following Park areas:

- Blue Gum Lake (1991)
- Booragoon Lake (1986)
- Piney Lakes (1992)
- North Lake (1986)
- Bibra Lake (1983)
- Little Rush Lake (1995)
- Yangebup Lake (1995)
- Thomsons Lake Nature Reserve (1982)
- Lake Coogee (1992)
- Market Garden Swamps (1995)
- Henderson Region (Mount Brown and Brownman Swamps) (1990)

In addition to the above area plans, numerous others have been developed which address the management of areas within Beeliar Regional Park. Where appropriate they have been considered in the development of this Plan.

4 - The Management Plan and Community Involvement

The Management Plan for Beeliar Regional Park will be prepared in five phases:

1. The first phase was aimed at identifying the relevant planning and management issues. This was achieved by undertaking a literature review, analysing the existing condition of the Park and organising a community workshop. Public involvement in this phase was encouraged through newspaper articles and canvassing key stakeholders for the community workshop.

2. The second phase was the preparation of the draft Management Plan. This involved identifying values and preparing planning strategies to protect those values and address the issues identified in phase one. Within this phase the Department of Conservation and Land Management, the Cities of Melville and Cockburn as well as the town of Kwinana provided advice on the development of the Plan.

3. The third phase involved presenting the draft Plan for public comment. Its availability for review has been widely advertised, the draft will be open for public comment for a period of three months, after which public submissions will be analysed.

4. Phase four will cover the acknowledgement and analysis of public submissions.

5. The fifth phase will comprise the preparation of the final Management Plan incorporating issues or comments raised within the public submissions and comments from State government agencies and the relevant local governments. The revised Plan will be submitted for approval by the Minister for the Environment and Heritage.

B. PRINCIPAL MANAGEMENT DIRECTIONS

5 - The Vision for the Park

The long-term vision for Beeliar Regional Park is:

"Beeliar Regional Park will encompass two quality chains of wetlands and an adjoining coastal foreshore which will support a diversity of wetland and upland habitats and ecosystems. The Park will be managed as a single entity for conservation purposes as well as for a range of sustainable community uses that recognise Aboriginal and non-Aboriginal heritage in a harmonious way."

GOALS

Goals have also been set for each major part of the Management Plan, while objectives designed to achieve these goals have also been identified. The following management goals are proposed for the Park.

Conservation
Protect, conserve and enhance the Parks biota as well as its physical, cultural and landscape resources.

Recreation
Manage for recreation, tourism and leisure by providing high quality recreation opportunities which are compatible with the protection and enhancement of Park values.

Commercial
Allow for appropriate commercial and other uses within the Park that service visitor requirements, contribute to Park management and minimise impacts on Park values.

Research and Monitoring
Seek a better understanding of the natural, cultural and social environments, and the impacts of visitor use and Park management.

Community Relations
Promote informed appreciation of the Park's natural environment, cultural values and recreation opportunities and facilitate liaison with the community about its management.

Integration of Management
Develop and maintain integrated and coordinated management arrangements between the participating Park managers and planning authorities.

Strategy

1. **Manage the Park for conservation and environmental enhancement and allow recreation and other uses of the Park to occur to the extent that they do not impair the values of the Park. (Department of Conservation and Land Management, CM,CC,TK) [High]**

6 - Policies

The objective is to integrate the policies of the management agencies to complement and support the vision for the Park.

CONSERVATION COMMISSION OF WESTERN AUSTRALIA AND THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT POLICIES

This plan is based on current Conservation Commission of Western Australia and the Department of Conservation and Land Management policies that relate to recreation, conservation, education, research and monitoring in the Park. These policies derive from legislation, principally the *Department of Conservation and Land Management Act (1984)* and the *Wildlife Conservation Act (1950)*, and their associated regulations. These policies, as they relate to this Park, cover aspects such as recreation, conservation and education. The Department of Conservation and Land Management and Conservation Commission of Western Australia policies that relate to recreation, conservation, education and research and monitoring will be applied in the management of the Park. They are available to the public on request.

LOCAL GOVERNMENT POLICIES

The management actions of the City of Melville, City of Cockburn and Town of Kwinana should reflect the intent of this Plan. The local governments involved in Beeliar Regional Park will adopt the principles outlined in this Plan as policy for managing their reserves within Park.

Strategies

1. **Apply Department of Conservation and Land Management and Conservation Commission of Western Australia policies that relate to recreation, conservation, education and research and monitoring in the Park. (Department of Conservation and Land Management) [Ongoing]**

2. **Prepare a local government policy statement that reflects the principles outlined in this management plan. (CM,CC,TK) [High]**

3. **Review the existing area plans in the context of implementing this management plan. (Department of Conservation and Land Management, CM,CC,TK)**

7 - Park Boundary, Land Tenure and Statutory Planning

The objective is to ensure that the values of the Park are protected by security of tenure and reserve purpose.

PARK BOUNDARY

The Beeliar Regional Park boundary has been determined by the Ministry for Planning (MFP) and largely reflects the boundary advocated by the State Planning Commission (now the WAPC) in the *Beeliar Regional Park Proposals for Establishment, Administration and Use (1992).*

A number of changes, however, have occurred to the boundary since 1992 through amendments to the MRS. These amendments include:

South West Corridor (Stage A) Major Amendment

- Addition of a bushland reserve adjoining the Spectacles (between Spectacles Drive and the Kwinana Freeway);
- Deletion of Lake Copulup which adjoins Thomsons Lake Nature Reserve to the east;
- Addition of Branch Circus Wetlands adjoining Thomsons Lake Nature Reserve to the north east.

South West Districts Omnibus No. 3A Jervoise Bay

- Removal of the northern section of the Henderson Foreshore.

In addition to the above changes, Murdoch University has advised the Department of Conservation and Land Management that while it is sympathetic to the management of Beeliar Regional Park, it does not want the Campus to remain in the Park.

In relation to proposed major transport corridors adjoining the Park such as the Roe Highway and the Fremantle – Rockingham Controlled Access Highway, the Park boundary is defined by the extent of the Parks and Recreation reservation in the Metropolitan Region Scheme. These existing road reservations are outside of the Park, and other State government planning strategies will be prepared to provide further detail on the future status of these proposed roads. For further information on the infrastructure projects within or adjoining the Park see Section 32.

The existing Park boundary and land tenure at the date of this Plan is shown in Figure 3.

Inclusion of other lands into Beeliar Regional Park

Given the overall planning and acquisition of lands for regional parks is retained by the WAPC, inclusion of additional areas into Beeliar Regional Park remains the responsibility of the WAPC (in consultation with the Department of Conservation and Land Management).

As described by DPUD (1992), the criteria for determining boundaries for a major regional park such as Beeliar must take into account not only land tenure and the planning context of the area but also the condition and status of the conservation areas contained within it. The park boundary must be manageable and must include areas for conservation, recreation, and landscape protection. Other criteria include:

- The cost of acquiring the land and impacts on private landowners.
- Adequate provision of recreation uses and future demands in a growing population area.
- Fire safe boundaries which afford protection to adjacent homes, and the Park itself.
- Adequate access for local residents and visitors from elsewhere in the region.
- The enhancement of views into and within the Park.
- Provision of future services and roads
- Ensuring sufficient buffers for conservation areas.

In addition to the above factors, management resources need to be carefully considered when additional lands are being proposed to be included into the Park.

There are four current proposals for the inclusion of additional lands into the gazetted area of the Park, which have merit. These are:

1. Surplus areas of the Jervoise Bay Perimeter Road Reserve to be included into the Henderson Region Open Space. The area is to be managed by the Department of Conservation and Land Management.
2. The portion of the Fremantle – Rockingham Controlled Access Highway road reserve which dissects the Henderson Region Open Space (Mount Brown and Brownman Swamps). The process of removing the road reservation is through an amendment to the Metropolitan Region Scheme to be undertaken by the WAPC. At present Main Roads Western Australia is finalising documentation to be presented to the WAPC for their consideration. The area is to be managed by the Department of Conservation and Land Management.
3. A portion of the Amcor Ltd. site adjoining the western side of South Lake. The area is to be transferred to the Crown as a condition of the proposed subdivision and will form a buffer to the adjoining wetland area. The area is to be managed by the Department of Conservation and Land Management.
4. The western portion Lot 4 Beeliar Drive. The area which is currently unallocated Crown land, contains bushland in good condition and adds to the landscape value of the Park. The area is to be managed by the City of Cockburn.

A number of other wetlands outside of the existing Park boundary have been identified as deserving formal protection. These include:

- Market Garden Swamp No. 3 in the City of Cockburn;
- Wattleup Lake, Long Swamp and Bollard Bullrush Swamp in the Town of Kwinana.

These areas were identified in a landscape protection zone which was proposed to help ensure inappropriate developments such as filling of wetlands, or clearing of vegetation is controlled (DPUP 1992). Should these wetland areas be acquired by the WAPC in the future for inclusion into the Park, appropriate management resources need to be considered.

LAND TENURE

Land within the Park consists of reserves created under the Land Administration Act 1997 (LAA) and placed in the care, control and management of a number of government agencies and local governments as well as freehold land owned by government agencies and private individuals.

This Plan seeks to reserve land and place it in the care, control and management of either:

- the Conservation Commission of Western Australia; or
- the relevant local government/s.

Crown reserves will be created in accordance with the management areas outlined in the Plan's Park Management Zones (Section 9).

Reserves to be placed in the care, control and management of the relevant local governments may have management orders under the LAA requiring them to comply with the Beeliar Regional Park Management Plan.

Transfer of government freehold land

Freehold lands owned by the WAPC will be converted into reserves under the LAA and vested with the Conservation Commission of Western Australia or the relevant local government, and managed in accordance with this Plan.

Reserves created from WAPC freehold land and vested with the Conservation Commission of Western Australia will be afforded an appropriate purpose for the protection and enhancement of Park values and will be classified as class A under the LAA (refer to Table 1).

As agreed to by the relevant local governments, reserves created from WAPC freehold and vested with local government will be reserved for the purpose of "Conservation and Recreation" and afforded similar tenure arrangements as the reserves vested in the Conservation Commission of Western Australia.

Freehold land owned by other State government agencies or local governments, including those currently servicing drainage or other similar requirements, will be afforded an appropriate reserve purpose and tenure arrangements consistent with the protection and enhancement of Park values.

Crown reserves and Unallocated Crown land

Existing Crown land reserved for utilities or services such as drainage will retain their existing reserve purpose and tenure arrangements. The purpose and tenure arrangements of other reserves within the Park will be reviewed and their extent and management may be modified using Figure 4 as a guide.

Road reserves considered unnecessary by planning and management agencies will be investigated for inclusion into the gazetted area of the Park and managed by the appropriate agency.

Unallocated Crown land is to be created as reserves and transferred to either the Conservation Commission of Western Australia or the relevant local government. These reserves will be afforded an appropriate reserve purpose and tenure arrangements under the LAA consistent with the protection and enhancement of Park values.

During the process of preparing this draft management plan, the City of Cockburn agreed to transfer Reserve numbers 24309, 39455, 37426, 39584, 39752 (at Henderson Region Open Space) to the Conservation Commission of Western Australia.

Private property

This Plan is not the mechanism by which freehold land, held by private individuals, is to be acquired by the WAPC. The Ministry for Planning on behalf of the WAPC will continue its voluntary acquisition program within regional parks.

Until acquired by the WAPC these lands will remain protected under Perth's Metropolitan Region Scheme by their "Parks and Recreation" reservation.

This Plan will not dictate the management of privately owned freehold land held by individuals in the Park. However, when the land is acquired by the WAPC, management will be in accordance with the Plan's Park Management Zones (Section 9).

Access by Park visitors to areas of private property owned by individuals in the Park is not available until it is acquired by the WAPC. Negotiated settlements are required in order to obtain the remainder of private land within the Park boundary.

A significant portion of the Spectacles is under the private ownership of Alcoa Pty. Ltd. (see Figure 3). Alcoa has implemented and supported a number of conservation, recreation and cultural initiatives at the Spectacles including the preparation of a concept plan for the area. To help ensure a consistent standard of management is applied to all areas of regional parks, the Department of Conservation and Land Management and Alcoa will negotiate a management agreement including future tenure arrangements for the Spectacles.

The transfer of freehold land owned by the WAPC and leased to the City of Cockburn and City of Melville under the Area Assistance Grants Scheme (AAGS) will not be affected by this Plan. The Cities will accept the respective lands in accordance to the lease conditions negotiated with the WAPC.

STATUTORY PLANNING

The Metropolitan Region Scheme (MRS), developed under the Metropolitan Region Scheme Town Planning Act (1959), provides the basis for most planning decisions throughout the Perth metropolitan region. The majority of lands within Beeliar Regional Park are currently protected under the MRS by their Parks and Recreation reservation.

Areas which are not reserved as Parks and Recreation in the MRS include Blue Gum Lake, Booragoon Lake, and Market Garden Swamps 1 and 2. These areas are protected under the relevant local government Town Planning Schemes. The southern area of Henderson Region Open Space (south of Mt Brown) is currently zoned as industrial under the MRS. The area acts as a buffer to the industrial areas of Kwinana. Negotiations

are to be pursued with the WAPC to have the area reserved as Parks and Recreation.

Strategies

1. **Create reserves to be placed in the care, control and management of the relevant managing agency using Table 1 as a guide. (DOLA, WAPC, MFP, Conservation Commission of Western Australia, Department of Conservation and Land Management, CM,CC,) [Medium]**

2. **Establish management orders for reserves to be placed in the care, control and management of the relevant local governments requiring compliance with this Plan. (DOLA) [Medium]**

3. **Seek to purchase the remainder of the private land within the boundary as soon as practicable from willing landowners. (WAPC) [High]**

4. **Negotiate a management agreement with Alcoa including a process for the transfer of their land in the Park to the Crown. (Department of Conservation and Land Management) [High]**

5. **Adopt the Park boundary as shown on Figure 3. The boundary will be modified should additional lands be included in the Park. (MFP, Department of Conservation and Land Management, CM, CC, TK) [High]**

6. **Investigate the closure of road, reserves considered unnecessary by the planning and management agencies within the boundary of the Park and include them in the gazetted area of the Park. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**

7. **Consider the acquisition of additional lands for inclusion into the Park in accordance with the criteria listed by DPUD (1992) and in consultation with Department of Conservation and Land Management. (WAPC, MFP) [Ongoinig]**

8. **Amend the MRS to include all of the Park area in the Parks and Reserves Reservation. Ensure consistency between the gazetted boundary and the MRS boundary. (WAPC, MFP) [High]**

8 - Legislative Amendments and Interim Management

The objectives are to provide for the long term protection of the Park under the Conservation and Land Management Act (1984) and to ensure that interim management arrangements facilitate the appropriate management of the Park.

INTERIM MANAGEMENT ARRANGEMENTS

Prior to the gazettal of the final Plan and subsequent transfer of lands to the appropriate managing agencies, there is a need to clearly define interim management arrangements between the land managing agencies involved in regional parks.

The Department of Conservation and Land Management will coordinate the interim management of Beeliar Regional Park by Joint Management Agreements prepared for Crown lands and freehold lands controlled by State or local government agencies involved in the Park.

A Regional Park Joint Management Agreement for interim park management may comprise either:

- a Section 16 Agreement of *Conservation and Land Management Act (1984)*;
- a Memorandum of Understanding.

Interim management of WAPC owned land

Section 16 of the *Conservation and Land Management Act (1984)* allows the Department of Conservation and Land Management to enter into agreements for the management of private land.

Since June 1997, when the management responsibility for regional parks was progressively transferred to the Department of Conservation and Land Management, the WAPC and Department agreed to enter into a Section 16 agreement under the *Conservation and Land Management Act (1984)*. This formal agreement has been finalised and is an interim management arrangement prior to the land being placed in the care, control and management of the Conservation Commission of Western Australia or relevant local government.

The agreement includes all WAPC lands within regional parks with the exception of those leased to local governments.

On lands owned by the WAPC, the Department of Conservation and Land Management can utilise the WAPC (Reserved Land) regulations administered by the Ministry for Planning.

Interim management of Crown land and freehold land owned by government agencies

Local governments and State government agencies will be responsible for managing lands which they control. An overall integrated approach to the management of Beeliar Regional Park will be coordinated by the Department of Conservation and Land Management.

Interim arrangements on freehold land owned by private individuals

Where individuals hold land as private property, the owner of the land is responsible for its management. The Department of Conservation and Land Management may seek formal management arrangements with individual private landowners within Beeliar Regional Park (for example Alcoa).

LEGISLATIVE AMENDMENTS

The *Conservation and Land Management Act (1984)* will need to be amended to specifically include the management of regional parks. The management of the regional parks may be included as a function of the Department of Conservation and Land Management in the Act.

Strategies

1. **Implement the Section 16 Agreement under the *Conservation and Land Management Act* with the WAPC. (Department of Conservation and Land Management, WAPC) [High]**

2. **Prepare Interagency Management Agreements for interim Park management for areas controlled by State or local government agencies. (Department of Conservation and Land Management, CM,CC,TK) [High]**

3. **Amend the *Conservation and Land Management Act (1984)* to provide for regional parks. (Department of Conservation and Land Management). [Medium]**

9 - Management Zones

The objective is to adopt a management zoning system that protects conservation values, provides for appropriate recreation and other uses, and provides for efficient management of the Park.

MANAGEMENT ZONES

Management Zones are a framework for protecting the Park by minimising existing and potential conflicts between uses and activities. They provide a broad guide to the public uses and management activities which are appropriate in certain areas and indicate which management objectives have priority in any area.

The management zones and areas for the Park are illustrated in Figure 4. They provide a guide for the future vesting of Park areas. However, given there are numerous service and utility reserves in the Park, they should not be used as a detailed schedule for changing land tenure arrangements in the Park.

Within Beeliar Regional Park five management zones have been identified:

a) Conservation and Protection
b) Natural Environment Uses
c) Recreation
d) Sport and Recreation
e) Special Use

Refer to Table 1 for the management emphasis and acceptable uses and facilities within each zone.

The zoning scheme does not direct the management of privately owned freehold land held by individuals in the Park. However, when the land is acquired by the WAPC, management will be in accordance with the Plan's Park Management Zones.

Strategy

1. **Base future management of the Park on the zoning plan. (Department of Conservation and Land Management, CM, CC, TK) [Ongoing]**

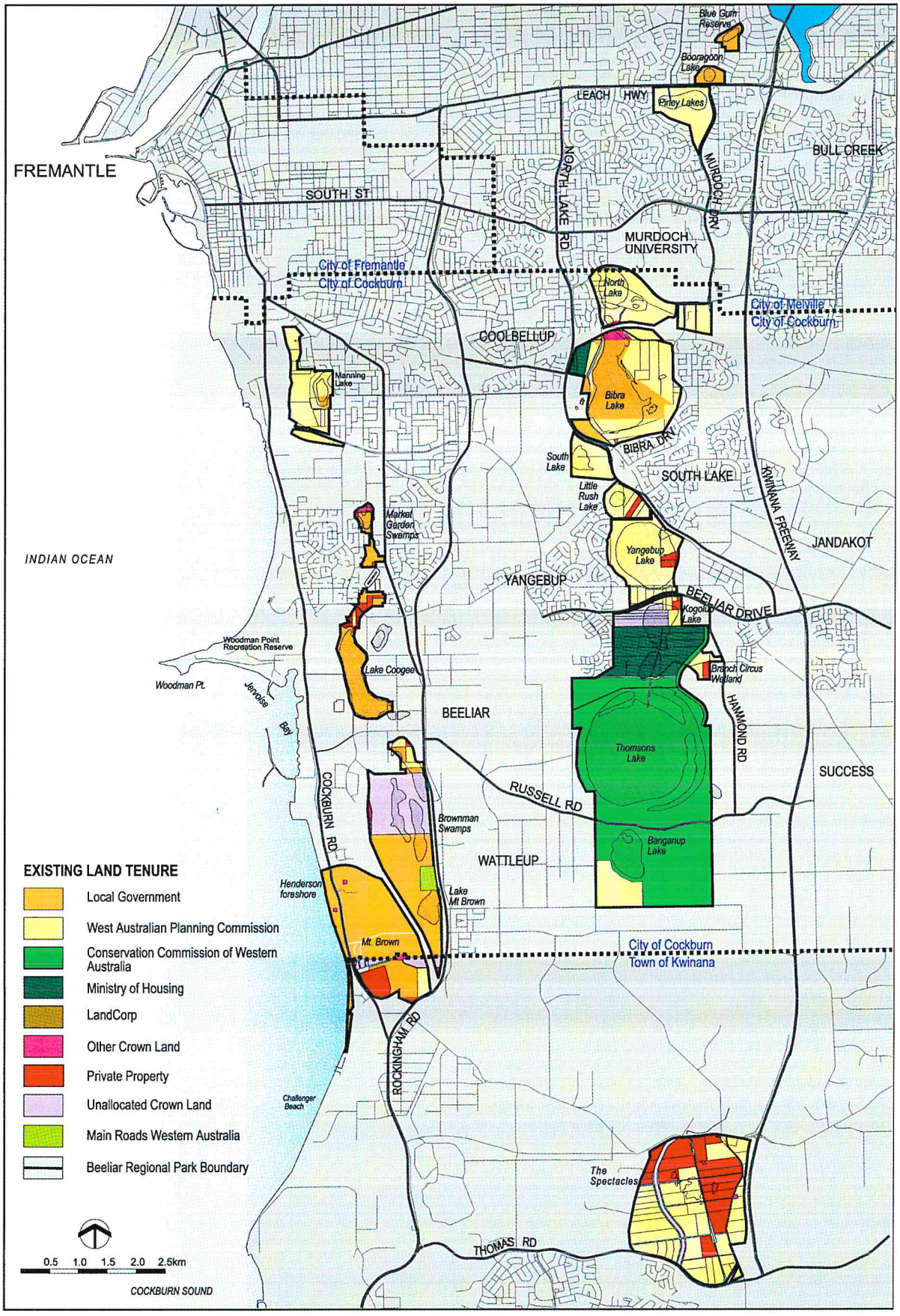


Figure 3 - Existing Land Tenure and Park Boundary

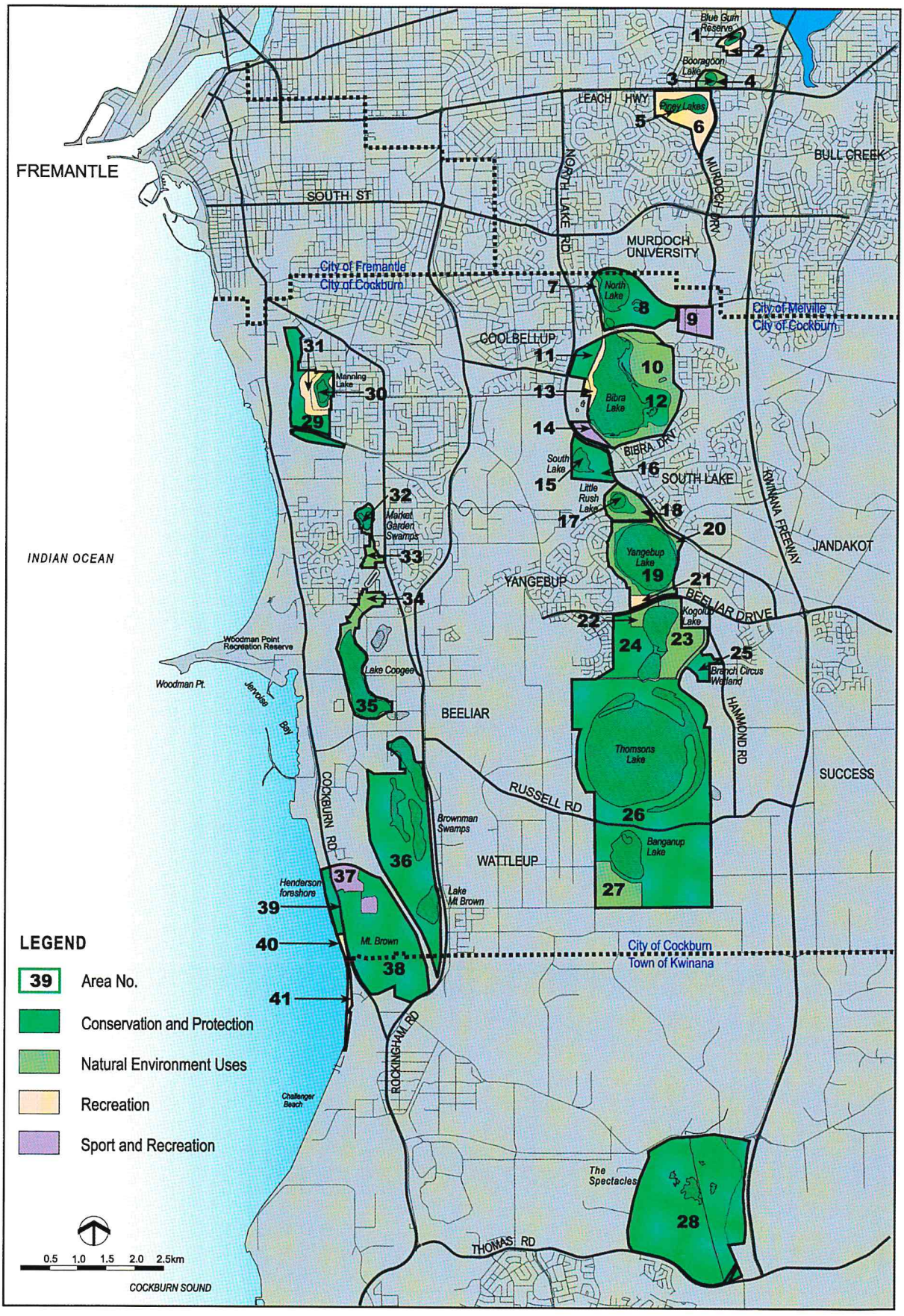


Figure 4 - Proposed Management Zones and Areas

Table 1 - Management Zones

Management Zone	Plan Area	Management Agency	Reserve Purpose	Management Emphasis	Acceptable Uses and Facilities
Conservation and Protection	Area 1 Area 3 Area 5 Area 8 Area 11 Area 12 Area 15 Area 16 Area 17 Area 19 Area 24 Area 25 Area 26 Area 28 Area 29 Area 30 Area 32 Area 35 Area 36 Area 38 Area 39	City of Melville City of Melville City of Melville CALM City of Cockburn City of Cockburn CALM CALM City of Cockburn City of Cockburn CALM CALM CALM CALM City of Cockburn City of Cockburn City of Cockburn City of Cockburn CALM CALM CALM	Recreation and Conservation of Fauna Parkland Public Recreation and Drainage Parks and Recreation Conservation Park Parks and Recreation Recreation Conservation Park Conservation Park Parks and Recreation Parks and Recreation Conservation Park Conservation Park Nature Reserve Conservation Park Parks and Recreation Parks and Recreation Public Recreation and Drainage Recreation Conservation Park Conservation Park Conservation Park	The management emphasis of this zone is to protect and where possible, enhance the conservation values and landscape qualities of the Park. Priority will be given to maintaining the natural state of Conservation and Protection areas with a minimum of impairment. Visible evidence of management will be minimal.	<u>Wetland Areas:</u> Restricted public access. Unauthorised watercraft and vehicles prohibited. Development of facilities such as boardwalks and observation platforms are acceptable in certain locations (see Section 27 - Recreation Masterplan). Protection and enhancement of natural habitats to ensure survival of wetland ecosystems is considered essential. Education and research uses allowed. <u>Upland Areas:</u> Public access restricted predominately to nature trails, cycle tracks and through access ways (in certain locations). Development of facilities such as observation platforms and car parks are acceptable in limited locations (see Section 27 - Recreation Masterplan). Rehabilitation of vegetation. Habitat protection for bird species and other fauna is considered essential. Education and research uses allowed.
Natural Environment Uses	Area 4 Area 7 Area 10 Area 18 Area 20 Area 22 Area 23 Area 27 Area 33 Area 34	City of Melville CALM City of Cockburn City of Cockburn City of Cockburn CALM CALM CALM City of Cockburn City of Cockburn	Parkland Public Recreation and Drainage Conservation Park Parks and Recreation Parks and Recreation Parks and Recreation Conservation Park Conservation Park Conservation Park Public Recreation and Drainage Public Recreation and Drainage	The management emphasis is to provide for appropriate uses of the natural environment. Areas will be managed jointly for public use, conservation and enhancement of flora and fauna, and improvement of landscape qualities. Public use must be compatible with the assigned purpose of the relevant reserve. Visible evidence of management may be moderate to high. Management will encourage uses and develop facilities that promote conservation and education.	Areas are readily accessible by walking trails and cycle paths. Some development of facilities necessary. These may include education nodes and facilities (such as car parks) associated with visitor nodes. Commercial concessions compatible with the values of the area may be considered appropriate within this management zone. The provision of facilities will depend on the values of the area and the community demand for facilities. Rehabilitation and habitat protection will be necessary.
Recreation	Area 2 Area 6 Area 13 Area 21 Area 31 Area 40 Area 41	City of Melville City of Melville City of Cockburn City of Cockburn City of Cockburn City of Cockburn Town of Kwinana	Recreation and Conservation of Fauna / Recreation / Parking / Child Health Centre* Parks and Recreation Recreation / Parking* Parks and Recreation Public Recreation Recreation and Camping Recreation and Dune Protection / Recreation*	The prime emphasis of management will be to provide a variety of recreation opportunities. The type and scale of facilities provided will depend on the values of any given area, community demand for recreation and the appropriate management of the Park. Management involves minimising the impact of visitor activities through the sensitive placement and provision of access and facilities. Visible evidence of management may be high.	Public use may be high in these areas. Predominantly passive recreation pursuits, allowing for park and picnic facility development. Commercial concessions may be considered appropriate within this management zone. Rehabilitation, landscaping and reticulation of areas may be necessary

Sport and Recreation	Area 9 Area 14 Area 37	City of Cockburn City of Cockburn CALM	Parks and Recreation Parks and Recreation Recreation (5h)	Sport and Recreation allows for areas to be used for indoor and outdoor sporting activities. Given these areas are high use, management will endeavour to minimise incompatibilities with surrounding Park areas. Management involves minimising the impact of visitor activities through the sensitive placement and provision of access and facilities. Visible evidence of management may be high.	High use areas developed for active recreation pursuits. May include sporting ovals, car parking, buildings and reticulated and landscaped areas. Commercial concessions may be considered appropriate within this management zone.

* More than one reserve currently comprises the Plan Area.

10 - Integrated Management of the Park

The objective is to establish an integrated management structure for the Park which provides for the effective involvement of the managing agencies.

THE PARK MANAGEMENT STRUCTURE

The joint managers of the Park are the Department of Conservation and Land Management, the City of Melville, the City of Cockburn and the Town of Kwinana. Their areas of responsibility are set out in the previous section on management zones. It is proposed that once this Plan is gazetted, management will be in accordance with the strategies outlined in this Plan.

The Department of Conservation and Land Management will be responsible for managing areas of the Park vested in the Conservation Commission of Western Australia. The State government has considered the Department of Conservation and Land Management the most appropriate agency to provide a strong integrated framework for management of complex conservation and recreation areas. As such the overall coordination of management for Beeliar Regional Park is the Department of Conservation and Land Management's responsibility. The local governments of Melville, Cockburn and Kwinana will manage areas of the Park to be vested in them in accordance with the strategies outlined in this Plan.

Close co-operation is required by the management agencies and the community for this Plan to be implemented efficiently and effectively. Management decisions will involve input and negotiation between the land management agencies. Joint working parties comprising representatives from the Department of Conservation and Land Management, the relevant local governments and other State government agencies will be established to facilitate the preparation of detailed subsidiary plans for the Park.

Interagency agreements will be required to allow Park managers to coordinate and maintain consistency in the application and enforcement of regulations. The agreements will enable the Park managers to enforce regulations of other agencies throughout the Park.

Responsibility for overall planning and acquisition of lands for regional parks and regional open space is retained by the WAPC.

A common management direction

The establishment of a management structure, common goals and agreement on priorities are necessary for safeguarding the Park where a number of land owners, the general public and interest groups are involved. This Plan has been written in conjunction with the proposed land managers, and comments are being sought from the public on the draft in order to establish a common management direction. Community involvement and community education are important components in achieving the management goals set out in this Plan.

Strategies

1. **Establish, where appropriate, joint working parties representing the relevant managing agencies for specific subsidiary plans. (CM, CC, TK, Department of Conservation and Land Management) [High]**

2. **Consult with the other managing agencies when preparing the annual works program and the five year implementation program. (CM, CC, TK, Department of Conservation and Land Management) [High]**

3. **Prepare interagency agreements that provide Park management with the authority to regulate in all areas of the Park (e.g. local government rangers controlling dogs in all areas of the Park) (CM, CC, TK, Department of Conservation and Land Management, Conservation Commission of Western Australia) [High]**

11 - Key Performance Indicators

The objective is to set key performance indicators in order to measure the overall effectiveness or otherwise of management in relation to protection and enhancement of Park values.

Defining key performance indicators in management plans reflects the need for the Park managers to take an outcome-based approach from which the effectiveness of management can be assessed. Key performance indicators relate specifically to the management targets for key ecological and social values.

Key performance indicators for Beeliar Regional Park are:

- fauna populations and species diversity;
- bushland condition;
- visitor satisfaction;
- visitor risk; and
- integrated management.

(see Table 2 - Summary of Key Performance Indicators)

Key performance indicators are important in defining the monitoring programs to be set up for the Park. They also underpin the audit process of this Plan.

Strategies

1. **Establish baseline information to initiate the process of monitoring the Key Performance Indicators through implementation plans such as Weed Control and Rehabilitation Plans. (Department of Conservation and Land Management) [High]**

2. **Develop an integrated program of survey, research and monitoring within the Park focusing on the Key Performance Indicators. (CM, CC, TK, Department of Conservation and Land Management) [High]**

3. **Audit and measure the overall effectiveness of Park management based on the Key Performance Indicators. (Conservation Commission of Western Australia, Department of Conservation and Land Management) [Ongoing]**

Table 2 - Summary of Key Performance Indicators

Key Values	Key Objectives	Key Performance Indicators	Key Management Targets	Key Management Strategies
The Parks acts as an important fauna reserve, bird breeding ground for local birds and a summer refuge for a diverse bird population.	To maintain viable populations and the current diversity of indigenous fauna species in the Park.	• Fauna populations; and • Species diversity.	Maintain the current populations of selected indigenous fauna species in the Park	16.1
Vegetation communities in the Park are representative of communities once widespread on the Swan Coastal Plain but now significantly cleared.	To protect, conserve, and rehabilitate the flora and vegetation in the Park.	Bushland condition – • assessment of bushland condition; • priority weed species; and • changes to vegetation communities.	Increase the areas of bushland condition assessed as good – excellent within the Park; reduce the area of priority weeds in the Park; and maintain the range of vegetation communities.	17.1 21.1
The Park provides opportunities for a wide range of recreation activities. Of particular significance is the opportunity to recreate in natural environments close to urban areas.	To ensure that visitor use is sustainable, and to maintain acceptable levels of visitor satisfaction.	• Visitor satisfaction; and • Visitor numbers.	Maintain sustainable use of the Park and an overall trend of positive visitor satisfaction.	26.1 26.3 29.1
The Park provides the opportunity to recreate safely in the Park while experiencing the diversity of Park settings.	To enhance the safety of visitors in the Park.	• Visitor risk.	Remove or mitigate all identified high risk sites or facilities in the Park.	31.1
The Park's conservation, recreation and landscape values.	To provide an integrated management framework for the Park which provides for the effective involvement of the managing agencies.	• Integrated Management.	Not applicable.	7.1 10.3

C. CONSERVATION

12 - Principal Conservation Directions

CONSERVATION GOAL

Protect, conserve and enhance the Park's biota as well as its physical, cultural and landscape resources.

13 - Geomorphology, Soils and Landform

The objective is to protect and conserve the existing geomorphological structure and soil associations of the Park.

GEOMORPHOLOGY

The geomorphic elements of lands that comprise Beeliar Regional Park are typical of the Swan Coastal Plain. The three most westerly geomorphic units of the Swan Coastal Plain from west to east are Quindalup, Spearwood and Bassendean Dune Systems. Each dune system is the result of accumulation and subsequent distribution of beach sands of successive shorelines. The major factors influencing their formation are thought to be a series of marine transgressions and prevailing westerly winds (Murdoch 1986).

The Park contains both Bassendean and Spearwood Dune Systems. The latter, nearer to the coast is the younger of the two. Both systems originated during the Pleistocene age.

In the Park, the interface between the two dune systems occurs along the eastern chain of wetlands which are formed in a depression between the two systems. According to Newman *et al.* (1976) the depression at the eastern chain indicates an old coastline. It is therefore possible to say, in very general terms, that the eastern chain straddles two soil types – to the east Bassendean sand, and to the west Spearwood sand.

The Spearwood Dune System is split into two associations based on limestone formations. The eastern section (Karrakatta Association) is deep sand with little limestone. In the western section (Cottesloe Association) the limestone is more extensive and several outcrops are present. In many cases the limestone forms long ridges which run parallel to the coast. The western chain of wetlands lies in such a depression between two limestone ridges.

SOILS

The dune soils of the Swan Coastal Plain are aeolian and differ only in age and degree of leaching (Murdoch 1988).

The soils of both the Spearwood and Bassendean Dune Systems are considered infertile. The Bassendean sand is highly leached grey quartz which is extremely infertile. Spearwood sand is not so highly leached and has a characteristic yellow colour due to the presence of iron. A small quantity of clay is also present which, together with the iron, creates some fertility (Newman *et al.* 1976).

Within the wetland areas soils have been modified by the addition of organic matter and finer grain sedimentary material. Generally, the eastern chain of wetlands comprises peaty clays and silts, and sandy silt, with variable clay content, formed over the western part of the Bassendean Sand and over quartz sand derived from the Tamala Limestone (Gozzard 1983). In the western chain of wetlands deposits are partly calcareous silt with some fine sands in places, formed over sand derived from the Tamala Limestone (Gozzard 1983).

The wetland soils of Brownman Swamps and Lake Mount Brown are significant in that they are underlain by carbonate and dolomite muds and muddy sands. This is due to the different hydrological formation of the layers.

Additionally, Lake Coogee has a different soil base to the other wetlands. It has heavy clay deposits thought to have originated from a former estuary (at one stage a river outlet came through the limestone ridge at this point). The estuarine depression has remained as a lake (Newman *et al.* 1976).

LANDFORM

The landform surrounding both chains of wetlands is generally characterised by slightly undulating land with gentle slopes toward the wetland bodies.

There are areas of exception to this gently undulating landform, for example at Manning Lake and the Henderson Region. At Manning Lake the coastal component of the reserve has some steep slopes within a series of ridge and valley formations. This area is comprised of a superficial layer of limestone deposition over sand.

The Henderson Region is again steep in sections with outcrops of limestone and cliff faces present at the Henderson Foreshore. The foreshore is typical of the coastal formations on Swan Coastal Plain where carbonate has been precipitated below surface geology

to form layers and columns of hard, compact limestone. The carbonate has been deposited by percolating waters - hence the cliff formations. The cliffs are an important remnant expression of their type in the Perth Metropolitan Region. In fact, the entire landscape of the Henderson Region is important as it stands as an uncommon example of diversity of landforms and vegetation in the Spearwood Dunes from swale to ridge crest and from hinterland to coast (Semeniuk 1997).

Three key threats to the geomorphology and soil associations of the Park are:
1. erosion caused by uncontrolled access;
2. soil contaminants; and
3. mining.

Erosion
Erosion is a localised problem occurring at a number of upland and wetland areas within the Park where uncontrolled access is damaging vegetation.

Unrestricted vehicle, equestrian and pedestrian access has in the past created tracks and pathways in unsuitable locations, causing erosion of the surface by direct contact, but also opening the possibility of erosion by water runoff, where vegetation cover has been reduced. The current level of erosion and disturbance caused by equestrian activities at Kogolup Lake is unacceptable. The restriction of equestrian activities is discussed in Section 29.

Uncontrolled access in the Park will be reduced by formalising and restricting access to areas at risk from erosion. Mt Brown and the dunes at Manning Lake are two areas particularly at risk from uncontrolled access and therefore erosion. Wind erosion has, in the past, caused problems at fire access tracks and cleared areas at these two sites.

Shoreline Movement Maps prepared by the Department of Transport (1942 – 1994) indicate that there has been no coastal movement at the Henderson Foreshore (M91 coastal reserve) over that period. Access to the cliffs should be better defined to limit the impact of pedestrians on the limestone cliffs.

Soil contaminants
Filling has occurred in the past in many of the wetlands in both the eastern and western chains. Of particular concern is the extensive sanitary landfill that has occurred on the western and southern sides of Bibra Lake and in several areas of the Market Garden Swamps (DPUD 1992). A threat to the integrity of the wetlands is the leaching of contaminants within the landfill areas and from the woolscourers settling ponds to the east of Yangebup Lake (refer Section 14). Additionally, there may be possible health implications for Park visitors.

Mining
Mining is also considered a threat to the landform of the Park. There will be a strong presumption against mining and the extraction of basic raw materials in the Park (see Section 35).

Strategies
1. **Restrict access to areas at risk from erosion by implementing the Recreation Masterplan (Section 27) and providing signs and information (Sections 30 and 39) (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

2. **Restrict commercial horse riding activities in the Park to designated bridle trails (refer to Section 29). (Department of Conservation and Land Management) [High]**

3. **Undertake soil studies when proposing works in areas affected by sanitary landfill to determine levels of contamination. CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

4. **Access to the Henderson Foreshore (M91 coastal reserve) cliffs should be better defined to limit the impact of pedestrians on the limestone cliffs (Sections 27 and 29) (CC, Department of Conservation and Land Management) [High]**

5. **Use clean soil, which is free of Phytophthora dieback and weeds, and similar to the natural soil types of the area when it is necessary to import soil into the Park (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

14 - The Lakes and Wetlands

The objective is to manage water regimes affecting the Park in a manner that complements Water and Rivers Commission policies and enhances the conservation, recreation and cultural values of the Park.

WETLAND SYSTEM

The wetlands in Beeliar Regional Park are surface expressions of the groundwater and as such respond to events which cause variations to the quality and quantity of groundwater supply.

The water regimes of the Beeliar Wetlands respond to both natural processes such as rainfall, and to modified landuses within catchment areas (e.g. urban and industrial development, and groundwater extraction). In order to protect the wetland ecosystems and maintain public amenity, the impacts of existing and proposed land uses and activities, which influence the wetlands' water regimes, need to be understood and managed.

It is important to note that the complex underlying stratigraphy of impervious and porous layers and perched water tables associated with some of the Beeliar Wetlands means that there may be significant departures from the so-called 'normal' hydrological patterns of coastal plain wetlands.

The Eastern Chain

The eastern chain of wetlands has formed in a depression between two of the geomorphic elements of the Swan Coastal Plain – the Spearwood Dune System and the Bassendean Dune System. The wetlands in the chain are shallow, freshwater and are of a similar altitude (15 - 20m AHD) (Australian Height Datum is the height above mean sea level). Seasonal changes in lake water levels reflect fluctuations in the groundwater level (DPUD, 1992).

The wetland chain is located at the western edge of the Jandakot Groundwater Mound. There is a complex series of connections and groundwater flows vary between the wetlands. In general, however, groundwater flows to the eastern Beeliar chain in a westerly direction from the Jandakot Groundwater Mound which is a source of water used to supplement the surface water supply to the metropolitan area of Perth.

Of less importance is the north to south flow of groundwater within the chain. In reality it only occurs when there is significant rainfall in one area of the chain and not in another. The ground water will then move from one wetland to the other, as a balancing process.

Additionally, there is some groundwater movement from a relatively small catchment area to the west of the eastern chain. Again the extent of water movement is determined by weather patterns and rainfall. During high rainfall when the wetlands are full, there will only be a relatively slight flow from the west, however, this flow will increase when rainfall follows dry periods.

The Western Chain

The wetlands of the western chain, are only a partial surface expression of the groundwater and their water regimes are very different from the eastern chain.

The western chain is located in a depression between two limestone ridges within the Spearwood Dune System. The water in these lakes is more saline and the lakes occur at an altitude of approximately -0.22m to 1.8m AHD (DPUD, 1992).

Groundwater movement at the western chain is seasonal. During winter the groundwater flows from the east to the western chain, but in summer, a small groundwater mound develops to the west of Lake Coogee, and the groundwater flow is reversed. This groundwater movement influences the presence of a wedge of saline groundwater protruding eastward from the ocean. Additionally, excessive abstraction of groundwater in the summer draws the saltwater eastward and upward with the potential of bringing it in contact with the abstraction bores. The winter recharge of freshwater pushes the interface, between the saline and fresh water toward the coast.

The groundwater hydroperiod of the western Beeliar Wetlands has been found to be cyclical, with the annual rise and fall superimposed onto a longer term cycle of around 22 years, which has an amplitude of up to three times the annual rise and fall (Deeley and Page 1997). It is likely that these types of complex cycles of annual and longer term rise and fall have been an important part of wetland hydrological cycles for hundreds of years and probably longer, and have undoubtedly influenced the formation and the maintenance of the various wetland vegetation communities.

Threats to Wetlands

The Proposals for the Establishment, Administration and Use of Beeliar Regional Park (DPUD, 1992) identified a number of key threats to the condition and status of the wetlands in the Park. These were:

- Drainage, excavation and filling;
- Pollution including eutrophication;
- Water level changes;
- Salination;
- Aesthetic disruption (Section 22);
- Aquatic or declared weeds (Section 17); and
- Insect pest control (Section 19).

Additionally, other significant problems included new urban proposals in close vicinity to the wetlands, the potential effects of airborne pollutants from the Kwinana Industrial Area (DCE, 1982), wildfires, uncoordinated recreation activities and invasive wetland weed species.

Many of the threats identified above are addressed in other sections of this Plan. The key threats to be addressed in this section of the Management Plan are:

1. Drainage, excavation and filling;
2. Pollution including eutrophication;
3. Water level changes; and
4. Salination.

Drainage, excavation and filling

As discussed in Section 13, sanitary filling has occurred in the past in many of the wetlands in both the eastern and western chains and places constraints on their future management and use. The management of drainage, excavation and filling works (including de-watering activities) associated with urban, industrial land infrastructural development is an issue which has concerned the Park managers and the community in the past. It is vital that there are no physical impacts, either during or post construction, to the lands or waters that comprise the Park from developments that adjoin the Park. This can be achieved by ensuring appropriate conditions are placed on the proponents of developments when planning approvals are being sought.

Pollution including eutrophication

Prior to European settlement, the Beeliar Wetlands would have been recharged only by rainfall and groundwater accession. The nutrient levels in the wetlands would therefore have been very low. The dark coloured waters of most wetlands would have supported very low levels of phytoplankton activity. Much of the wetland primary production would have been associated with the fringing wetland vegetation communities.

Today, however, stormwater runoff from rural, urban and industrial areas contains a range of pollutants including compounds of nitrogen and phosphorus,

suspended solids, oils and other hydrocarbons, pesticides, heavy metals, litter and other gross pollutants. The levels of many of these pollutants in runoff are generally low, but the limited capacity of the wetlands to assimilate these pollutants is quickly exceeded.

Seepage from the woolscourers settling ponds to the east of Yangebup Lake has had a significant detrimental impact on the water quality of Yangebup Lake. Following the removal of their operations from the site, the woolscourers are required to treat the ponds for contamination and further seepage. The City of Cockburn through the Department of Environmental Protection, however, is seeking further action from the woolscourers to treat the polluted water and soils of Yangebup Lake. It is also critical for the protection of the other wetlands within the Beeliar chains that the pollution is contained within Yangebup Lake.

With regard to the eutrophication of wetlands, highly nutrient-enriched wetlands are usually associated with regular blooms of blue-green algae. Most of the wetlands of the Beeliar chains currently experience blooms of blue-green algae and many support nuisance populations of midges.

One of the major issues affecting the water quality of the Beeliar Wetlands is the use of garden fertilisers, pesticides and herbicides in private gardens and surrounding market gardens. The use of fertilisers, when viewed individually, may appear to be insignificant, however, when this effect is multiplied many times and occurs over an extended period, the issue becomes very serious. Implementing initiatives of integrated catchment management and providing community information regarding appropriate fertiliser use within catchment areas of the wetlands will help to reduce the nutrient inputs into the wetland system.

The feeding of water birds especially on the western edge of Bibra Lake has localised effects on water quality. Birds congregate in large numbers, uneaten food and faeces sink to the bottom of the lake and nutrient loading in the local area increases. Artificial feeding also has adverse effects on bird health and populations and will be discouraged (see Section 20).

Water level changes

Following European settlement, significant areas within the catchments of the Beeliar Wetlands were cleared of local vegetation for grazing and market gardening purposes. Deep-rooted perennial natives were replaced with shallow-rooted annual pasture species. The reduction in summer evapo-transpirative losses have lead to a rise in local groundwater levels which has necessitated the construction of a comprehensive network of artificial drains to pass runoff and excess groundwater to the nearest wetland, creekline or estuary.

As described by DPUD (1992) the management of the water balance of the wetlands is the most fundamental task facing the managing agencies of Beeliar Regional Park. The main factors involved are the variations in water table, inputs from developing urban areas which are likely to increase the water levels in the wetlands, and the effects on the water table of water abstraction from private and public bores on the Jandakot Mound.

The disposal of excess groundwater and stormwater runoff into the wetlands has had a significant impact on the hydrological cycles in the wetlands. Importantly, changes to the cycle of water level rise and fall in the wetlands may influence the germination, survival and composition of particular wetland fringing vegetation associations. This will in turn alter the ecology and threaten the wildlife species which inhabit the wetland systems. Additionally, semi-aquatic fringe vegetation helps to maintain water quality by reducing the influx of nutrients through filtration and storage. A lack or reduction in important drying cycles may also impact in the wetlands ability to assimilate nutrients.

In respect to managing water level changes in the wetlands, it is important to note that in 1988 the State Planning Commission resolved to rezone a substantial area of rural land east of Thomsons Lake to urban and urban-deferred in the Metropolitan Region Scheme. The EPA and Minister for the Environment agreed that the proposed rezoning could be implemented, subject to various conditions including the preparation of an overall drainage management plan for the new urban area and the Beeliar Wetlands (DPUD 1992). The Drainage Management Plan for the Southern Lakes Drainage Scheme fulfilled that particular ministerial condition. The scheme will divert drainage water from these new urban areas away from Kogolup and Thomsons Lakes in order to maintain their levels and protect them from further nutrient loading. For further information on the Southern Lakes Drainage Scheme refer to Section 32 - Utilities, Park Services and Infrastructure Proposals.

Salination

Increasing salination is affecting the western chain of wetlands through changes to the hydrology of the area resulting from the removal of deep rooted native vegetation, water abstraction and irrigation in market gardening and urban areas (DPUD 1992). As discussed earlier, excessive abstraction of groundwater in the summer, draws the saltwater eastward and upward with the potential of bringing it in contact with abstraction bores.

Although Lake Coogee is a naturally saline lake, other lakes in the western chain are freshwater. Increasing salinity can impose adverse changes if a wetland is a freshwater environment.

MONITORING THE WETLAND ECOSYSTEM

There is currently no comprehensive or consistent monitoring program for water levels or water quality of the wetlands of Beeliar Regional Park. Existing monitoring programs span a number of State and local government agencies and provide incomplete coverage of all wetlands within the Park.

Water Level Changes

The Water and Rivers Commission and the Water Corporation currently monitor water levels in all of the wetlands in the Park with the exception of Piney Lakes, Branch Circus Wetlands and Brownman Swamps. The majority of this monitoring is undertaken by the Water and Rivers Commission.

The Water Corporation monitors water levels in Yangebup, Kogolup and Thomsons Lakes as an Environmental Condition for the development of the

Southern Lakes Drainage Scheme. Maxima and minima have been set for each lake, and frequency criteria have been applied at Thomsons Lake allowing for extreme rainfall fluctuations and for the wetland to continue a hydrological regime consistent with historical records (Ecoscape 1997).

Through the implementation of other drainage operations, the Water Corporation also monitors the levels of Lake Coogee and Bibra Lake. Additionally, Market Garden Swamp No. 1 is proposed as a drainage compensation area with a maxima water level controlled by the Water Corporation via an ocean outfall.

Pollution including eutrophication

The Water Corporation monitors water quality in Yangebup, Kogolup and Thomsons Lakes as an Environmental Condition for the development of the Southern Lakes Drainage Scheme.

The City of Melville has been undertaking twice-yearly water quality monitoring of the wetlands in the Park (Bluegum, Booragoon, Piney Lakes) for up to five years. Post graduate research students have also collected data on inputs into Bluegum Lake and Piney Lake in the past.

The City of Cockburn has undertaken monthly (up to fortnightly) monitoring of water levels and water quality at North, Bibra, Yangebup, Coogee, Market Garden Swamp, Manning and Kogolup Lakes as part of their ongoing midge control program for the past three years.

The Health of Wetland Ecosystems

Research has also been undertaken into the macro-invertebrate community structure for Yangebup, Little Rush, Kogolup, and Thomsons Lakes by Dr Jenny Davis of Murdoch University. The number of species of predatory invertebrates recorded at a wetland can be used as an indication of the state of the aquatic food chain (Rolls *et al.* 1990). It is for this reason that the monitoring of aquatic invertebrates has been assigned a high priority when measuring the Key Performance Indicator of Fauna populations and species diversity. An assessment of the health of the wetland ecosystems can be undertaken by considering higher taxonomic levels of invertebrates such as genus and family, rather than needing to identify organisms to the level of species.

This type of assessment (rapid bio-assessment) means the costs of assessing wetland health is reduced and allows for the possible involvement of community or school groups in monitoring projects.

Strategies

1. **Prepare a pollution response plan for the Park. The plan should:**
   - **develop a response strategy for emergency pollution spills within the catchments that affect the Park;**
   - **investigate the use of gross pollution traps and other pollution control mechanisms within the Park. (CM, CC, TK, WRC, WC, Department of Conservation and Land Management) [High]**

2. **Adopt management practices throughout the Park that do not add nutrients and pollutants to the wetland systems, e.g. planting, fertiliser and irrigation management practices based on minimal nutrient loss and irrigation run-off. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Implement integrated catchment management initiatives and promote the development of water sensitive design techniques on adjacent land. (CM, CC, TK, Department of Conservation and Land Management) [High]**

4. **Provide information and educational material to the community:**
   - **outlining the effects of pollution on the wetlands;**
   - **appropriate use of fertilisers; and**
   - **discouraging the feeding of water birds.**

   (CM, CC, TK and Department of Conservation and Land Management) [High]

5. **Encourage and facilitate the relocation of adjacent land-use practices which lead to the leaching and run-off of nutrients and pollutants into the wetland system to more suitable locations. (CM,CC, TK, MFP) [Medium]**

6. **Support the City of Cockburn in seeking further action from the woolscourers to effectively treat the polluted water and soils of Yangebup Lake. (Department of Conservation and Land Management) [Ongoing]**

7. **Protect and re-establish reedbeds and fringing vegetation in disturbed areas (Section 21). (CM, CC, TK and Department of Conservation and Land Management) [High]**

8. **Ensure appropriate planning conditions are placed on proponents of developments that adjoin the Park to help ensure there are no adverse physical impacts, either during or post construction to the Park. (CM, CC, TK Department of Conservation and Land Management, WAPC) [High]**

15 - Flora and Vegetation

The objective is to protect, conserve, rehabilitate and restore local or culturally significant flora and vegetation in the Park.

Altered water regimes, disturbance and subsequent weed invasion have modified large areas of local vegetation in the Park. Many Park areas are becoming increasingly isolated due to a loss of surrounding natural vegetation and increased development. Past uses, roads and infrastructure have fragmented the Park, and disturbances and continuing weed invasion are steadily degrading natural ecosystems. Pressure on the Park is also increasing from a variety of recreation pursuits.

As discussed by Keighery (1996), the flora of the Park has not been the subject of integrated studies. However, the compilation of a series of studies identifies 406 native taxa in the Park. This probably represents 85% of the area's flora, and this reflects a range and diversity of flora typical of the geomorphological units on which it occurs.

No species of Declared Rare Flora have been recorded in the Park, however over 20 taxa are considered to have special significance as they are uncommon or at the limits of the species' range, represent outlying populations of the taxa. Examples include Hackett's hopbush (*Dodonaea hackettiana*) and *Hibbertia spicata* sub-species *leptotheca.* For further information refer to Keighery (1996).

The vegetation of the Park can be broadly described in three units:

1. upland vegetation communities and assemblages;
2. wetland vegetation communities and assemblages; and
3. coastal vegetation communities and assemblages.

An outline of Park vegetation units is shown on Figure 5. A description of the vegetation communities and assemblages present in the Park is contained in Appendix B.

UPLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

Significant disturbances and other activities in the past such as agriculture, market gardening, drainage schemes, land filling and fire have removed much of the original upland vegetation within the Park. Upland areas of the Park are characterised by Low Woodlands and Open Forests of *Banksia* and *Eucalyptus* species (refer Appendix B).

There are six types of upland vegetation communities or assemblages present in the Park. The threats to these communities and assemblages are as follows:

- importation of soil into the Park;
- unplanned fire;
- weeds;
- threat of Phytophthora dieback and other diseases;
- urban interface issues and uncontrolled access by vehicles, pedestrians and horses.

Importation of soil into the Park

It is important that soil imported into the Park is free of Phytophthora dieback and weed seed, and is similar to the natural soil types of the area. Measures for the control of Phytophthora dieback and weeds are discussed below.

Unplanned fire

Increased urban development around the Park and greater visitor use of the Park are likely to increase the incidence of unplanned fire. Refer to Section 18 for the management of fire within the Park.

Weeds

Weeds are a major problem in the Park and require immediate action by the managing agencies. Measures (including the preparation of an integrated Weed Management and Rehabilitation Plan) for the control of weeds in the Park are discussed in Section 17.

Phytophthora Dieback

Phytophthora dieback, an oomycete or 'water mould', refers to the deadly plant disease caused by the pathogen *Phytophthora cinnamomi* and other related species. The disease is considered to be a significant threat to the Park given the existing upland plant communities in the Park contain a number of susceptible species, for example jarrah, banksias and grasstrees (*Xanthorrhoea).*

Limited sampling for Phytophthora has been undertaken in the Park (Thomsons Lake). Sections of Yangebup, Kogolup and Thomsons Lakes were assessed for Phytophthora dieback as part of the construction of the Southern Lakes Drainage Scheme. The findings show that part of the north-eastern section of Thomsons Lake Nature Reserve is affected by dieback. The Jarrah-Banksia Woodland at Yangebup Lake shows some damage which could be by dieback, but no definite conclusion could be made without sampling. And at Kogolup Lake, the death of Jarrah-Banksia Woodland species along most edges indicates that dieback may be present, however, the area was too degraded to be assessed without sampling (Hart, Simpson and Associates, 1998).

Phytophthora dieback could have an impact on revegetation programs in the Park if the species planted are vulnerable to the disease. The risk of impact from Phytophthora dieback can be reduced by modifying activities that spread the pathogen, or by controlling access to highly susceptible areas. Modifying activities may involve cleaning machinery, vehicles or footwear, scheduling activities for dry soil conditions, or using materials that are free of *Phytophthora cinnamomi.* Controlling access may involve track rationalisation,

upgrading tracks, or restricting off-road and management vehicles access (Dieback Working Group, 2000).

Urban interface issues and uncontrolled access
Maintaining the integrity of bushland adjoining urban areas raises many issues such as weed invasion, uncontrolled access, and rubbish dumping. These issues are addressed in Sections 17, 29 and 32 respectively.

The inappropriate clearing of vegetation and willful damage to vegetation in upland areas has been a problem in the past. All native flora is protected by the Wildlife Conservation Act (1950). Any incidences of willful damage to vegetation in the Park will be investigated and appropriate action taken by the Department of Conservation and Land Management.

WETLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

Much of the Park's wetland vegetation is recognised as having high conservation value and is representative of the area's natural vegetation associations.

The wetland vegetation within the Park has evolved and is influenced by features such as the water levels, salinity of the wetlands and lakes, as well as the differing soil types and geomorphic features of the Park. For example, it would appear that the flooded gum *(Eucalyptus rudis)* and the paperbark *(Melaleuca preissiana)* are present in the eastern chain but not in the western chain, due to the greater presence of limestone and the saline water in the west.

The threats to wetland vegetation in the Park include uncontrolled access to the wetland, weed invasion, and unplanned fire. Additionally, however, the management of water levels and water quality is a key issue in the context of conserving the natural processes associated with the wetland habitat (Section 14).

COASTAL VEGETATION COMMUNITIES AND ASSEMBLAGES

As with the Park's wetland vegetation, the coastal vegetation is recognised as having high conservation value and is representative of the area's natural vegetation associations.

At the Henderson Foreshore (System Six M91coastal reserve) and Manning Lake where coastal limestone is present, soils are shallow and this, combined with exposure to salt laden winds, produces a very different plant regime from that elsewhere in the Park. In the coastal environment, the vegetation is susceptible to the pressures of close proximity to an urban setting. Hence the issues to be addressed include uncontrolled access, disease (such as *Armillaria luteobubalina*), weed invasion and unplanned fire.

Honey Fungus (*Armillaria luteobubalina*)
In comparison to Phytophthora dieback, *Armillaria* occurs on the coast (coastal dunes and on the Spearwood Dune System) and rarely occurs on the Bassendean Dune system. *Armillaria* kills up to 40% of coastal species including many of the dominant small trees and shrubs (Shearer *et al.* 1996) impacting on both the structure and composition of coastal dune vegetation. The disease results in open disease centres composed mainly of sedges or small shrubs and creepers with more bare ground than nearby healthy vegetation.

Although *Armillaria* occurs naturally in the south-west of Western Australia, its normal slow rate of spread by direct root contact may be exacerbated by the movement of infected root material associated with track construction and maintenance. The characteristic fruiting bodies generally grow in clumps on tree bases, stumps or roots, and appear in June/July each year. There are no known controls for the disease, except clearing the site.

Strategies

1. **Develop and implement a rehabilitation plan. The plan will include rehabilitation priorities and a detailed bushland condition assessment of the Park (Section 21). (CM, CC, TK, Department of Conservation and Land Management) [High]**

2. **Prepare and implement a weed control plan. This plan is to be integrated with the rehabilitation study and not carried out in isolation (Section 17). (CM, CC, TK, Department of Conservation and Land Management) [High]**

3. **Reduce the frequency of fire, utilising strategies set out in Section 18. (CM, CC, TK and Department of Conservation and Land Management) [Ongoing]**

4. **Provide information and interpretive material to the public which:**
   - **promotes an understanding and appreciation of the Park's flora and ecosystems; and**
   - **encourages them to plant local species in areas surrounding the Park (Section 39). (CM, CC, TK and Department of Conservation and Land Management) [Ongoing]**

5. **Investigate any willful damage to vegetation in the Park and take appropriate action. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

6. **Reduce the risk of introducing and spreading plant diseases in the Park by limiting access to areas sensitive to infection and by ensuring appropriate hygiene standards for machinery when undertaking works within the Park. (CM, CC, TK and Department of Conservation and Land Management) [Ongoing]**

7. **Develop and implement a targeted and integrated monitoring program of bushland condition, changes to vegetation communities and weed proliferation. (CM, CC, TK, Department of Conservation and Land Management) [High]**

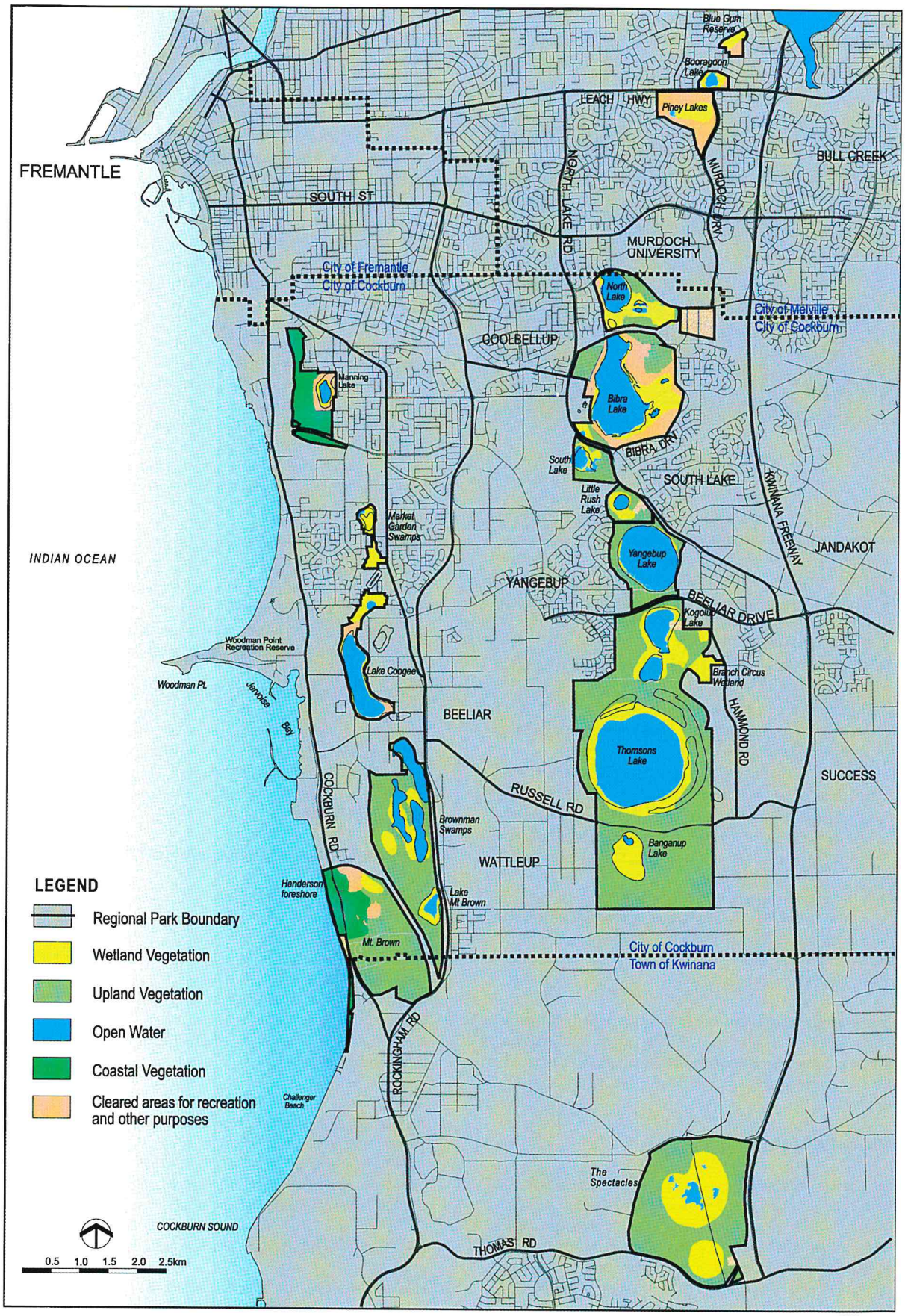


Figure 5 - Park Vegetation

16 - Fauna

The objective is to maintain the diversity of the indigenous fauna species in the Park and, if feasible, reintroduce species lost from the Park.

Conservation of native fauna and their habitats is one of the primary reasons for establishing Beeliar Regional Park. The Park provides refuge for an abundance of birds as well as shelter and habitat for many reptiles, marsupials, amphibians and insects.

The main threats to fauna within the Park are:

- the loss and fragmentation of habitat which can be attributed to wildfire (Section 18);
- invasion of weeds (Section 17);
- changing water levels and water quality (Section 14);
- Phytophthora dieback (Section 15);
- competition and predation by introduced animals and pets (Section 20);
- inappropriate recreation activities (Section 29);
- the loss of native habitat surrounding the Park; and
- death or injury of native fauna on surrounding transportation corridors is also an important management issue.

Given the above threats it is likely that fauna populations in the Park have declined and will continue to decline. In order to maintain the diversity of fauna species in the Park it may therefore be necessary to reintroduce native wildlife into the Park.

Greenway corridors and other links between and within Beeliar Regional Park, to adjoining areas of ecological significance are also important in helping to maintain the diversity and vigour of the Park's ecological systems (Section 24).

AVIAN FAUNA

The Beeliar Wetlands serve as an important breeding ground and summer refuge for a diverse bird population, some of which are trans-equatorial migratory wading birds. When shallow inland breeding grounds begin to dry out in spring and summer, large concentrations of birds have been recorded at the wetlands in the Park.

The Park's upland and coastal areas provide habitat for a diversity of bush birds. The distribution of bush birds in the Cockburn wetlands is determined by the presence of food, the structural diversity of vegetation and the proximity of developed land. The structural diversity of the vegetation determines the range of suitable habitats available for birds. A high structural diversity provides a range of different habitats and hence a diverse range of species (Newman *et al.* 1976).

An abundance of bird species (e.g. North Lake - 123, Bibra Lake - 112 and Thomsons Lake - 105) have been recorded in the Park (DEP 1998). The Blue-billed Duck (*Oxyura australis*), Musk Duck (*Biziura lobata*), Hardhead (*Aythya australis*) and Pink-eared Duck (*Malacorhynchus membranaceus*) as well as Dusky Moorhen (*Gallinula tenebrosa*) and Australasian Shoveler (*Anas rhynchotis*) and Freckled Duck (*Strictonetta naevosa*) have all been recorded in the Park. An extensive list of bird species recorded in the Park is available from Birds Australia (1996D).

A number of migratory birds listed under the Japan-Australia Migratory Birds Agreement (JAMBA) and the China-Australia Migratory Birds Agreement (CAMBA) have been recorded at the Park. Australia is a signatory to these two international agreements which support the conservation of migratory birds and their habitats. The intent of the JAMBA and CAMBA migratory bird agreements will be applied in the management of the Park.

Thomsons Lake in conjunction with Forrestdale Lake is a designated Ramsar site. The Ramsar Convention identifies wetlands of international importance, especially as waterfowl habitat and provides a framework for international cooperation in the conservation and wise use of the wetlands.

Two species of birds likely to be present in the Park are listed as threatened species and specially protected under the Wildlife Conservation Act 1950. The Australasian Bittern (*Botaurus poiciloptilus*) is considered rare or likely to become extinct, while the Peregrine Falcon (*Falco peregrinus*) is listed as otherwise in need of special protection.

TERRESTRIAL AND AQUATIC FAUNA

Reptiles and Amphibians

At least 52 native species of reptiles and amphibians have been recorded or are expected to occur in wetlands affected by the Jandakot Groundwater Mound (Water Authority of Western Australia 1991a). Notably, these include the Lined Skink (*Lerista lineata*) and the Western Blue Tongue Skink (*Tiliqua occipitalis*) which is declining in the metropolitan area (Murdoch University, 1986).

Seven frog species have been recorded in the Park. These occur in both the upland and wetland areas of the Park and are the Moaning Frog (*Helioporous eyrei*), Sandplain Froglet (*Crinia insignifera*), *Crinia georgiana*, Western Bell Frog (*Litoria moorei*), Slender Tree Frog (*Litoria adelaidensis*), Pobblebonk Frog (*Limnodynastes dorsalis*) and the Turtle Frog (*Myobatrachus gouldii*) Ecoscape (1995), Jaensch (1992) and Lynch (1995).

Several species of lizards including three species of pygopod, two species of goanna and one species each of dragon, gecko and blind snake are thought to inhabit the Park. One species of tortoise, the Oblong Tortoise (*Chelodina oblonga*) is present in the Park (Ecoscape 1995).

The Dugite (*Pseudonga affinis*), the Western Tiger Snake (*Notechis scutatus occidentalis*), as well as the Bandy Bandy Snake (*Vermicella bertholdi*) have been recorded in the Park (Ecoscape 1995).

The Western Tiger Snake (*Notechis scutatus occidentalis*) which is found within the Park is now considered uncommon in the metropolitan area and is an important species in the Beeliar Wetlands ecosystem. The presence of this species within the Park is important in conservation and evolutionary terms, and should be included in education programs and interpretive material to help develop an appreciation for wildlife. It is also acknowledged that the presence of the Western Tiger Snake (which is venomous) is a concern to some Park visitors and local residents. It is therefore proposed to provide contact details of wildlife carers within the Park for the removal of dangerous or injured fauna.

Mammals

Mammal species recorded in the Park include the Quenda or Southern Brown Bandicoot (*Isoodon obesulus fusciventer*). Other native mammals known to occur in sections of the Park, particularly Thomsons Lake and Banganup Lake include the Western Grey Kangaroo (*Macropus fuliginosus*), the Western Brush Wallaby (*Macropus irma*), the Brush-tailed Possum (*Trichosurus vulpecula*) and native Rakali or Water Rat (*Hydromys chrysogaster*).

The Swan Coastal Plain has nine species of insectivorous bats some of which are likely to use the Park for occasional foraging, if not as a permanent home. The White Striped Mastiff Bat (*Tadarida australis*) and the Chocolate Wattled Bat (*Chalinolobus morio*) have been recorded in the Park (Ecoscape 1995).

Fish

The native Swan River Goby (*Pseudogobius olorum*), the introduced Mosquito Fish (*Gambusia holbrooki*) and European Carp (*Cyprinus carpio*) are present within the wetlands of the Park.

Invertebrates

Aquatic and terrestrial invertebrates such as water fleas (*Daphnia*), midges (chironomid), the freshwater shrimp (*Palaemonetes australis*), and the gilgie (*Cherax quinquecarinatus*) represent a significant and important component of the wetland food web and are the major food sources for many species such as waterbirds and tortoises (Murdoch 1994).

Monitoring within the Park (e.g. Yangebup, Little Rush, Kogolup, and Thomsons Lakes and the Spectacles) has shown that a large diversity of species exists. This is important as the number of species of predatory invertebrates recorded at a wetland can be used as an indication of the state of the aquatic food chain (Rolls *et al.* 1990). Moreover, reductions in invertebrate species diversity, or changes in the presence or absence of particular groups of organisms has been shown to reflect a deterioration of the overall wetland environmental quality (WAWA 1991)(see Section 14). It is for this reason that the monitoring of aquatic invertebrates has been assigned a high priority when measuring the Key Performance Indicator of Fauna populations and species diversity in the Park.

Strategies

1. **Develop and implement a targeted and integrated monitoring program of the fauna within the Park with monitoring of aquatic invertebrates assigned a high priority. (CM, CC, TK, Department of Conservation and Land Management, Educational Institutions, Cockburn Wetlands Education Centre, WA Museum, Birds Australia) [High]**

2. **Identify seasonal mowing areas and areas not to be mown to preserve bird, reptilian, marsupial and other fauna habitat and breeding sites. (CM, CC, TK, Department of Conservation and Land Management) [High]**

3. **Ensure the management of water levels and water quality in the Park takes into consideration waterbird and other fauna habitats (particularly at the Ramsar site of Thomsons Lake) and reflects historical regimes of inundation. (WRC, WC) [High]**

4. **Provide interpretive material which:**
   - **promotes an understanding and appreciation of the Park's fauna, particularly waterbirds and the Western Tiger Snake;**
   - **discourages the artificial feeding of birds;**
   - **educates local residents about the effects of the dumping of 'exotic' animals and fish in the wetlands systems;**
   - **supports volunteer groups involved with the Park; and**
   - **informs the public about the adverse impacts of feral animals and domestic pets on native fauna in the Park (Section 39). (CM, CC, TK and Department of Conservation and Land Management) [High]**

5. **Ensure recreation uses are consistent with the protection and management of fauna (e.g. dog walking Section 26). (CM, CC, TK and Department of Conservation and Land Management) [Ongoing]**

6. **Provide the contact details of wildlife carers for the removal of injured fauna from the Park or dangerous fauna from places where they constitute a significant risk to people. (Department of Conservation and Land Management) [Medium]**

7. **Promote the survey and study of fauna in the Park, especially the study of invertebrate species (Department of Conservation and Land Management) [Medium]**

8. **Consider the reintroduction of appropriate native wildlife into the Park and include feral animal control. (Department of Conservation and Land Management) [Low]**

9. **Develop and implement a strategy to minimise wildlife deaths from roads adjoining the Park. (CM, CC, TK and Department of Conservation and Land Management) [High]**

17 - Weeds

The objective is to minimise the impact of environmental weeds on biodiversity within the Park using methods compatible with the conservation of the natural environment.

Environmental weeds have been defined as plants that establish themselves in natural ecosystems (marine, aquatic and terrestrial) and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade (Department of Conservation and Land Management, 1999). Weeds may originate from interstate or overseas and may or may not be declared under the Agriculture and Related Resources Protection Act 1976.

The presence of weeds is a major problem within the Park. The area occupied by weeds continues to grow and in some Park areas, unless they are controlled, they will lead to the eventual demise of the local vegetation.

The invasion of weeds is a major threat to the conservation values of the Park and it is vital that measures are introduced to limit or control the degradation processes. There are many reasons for the presence of weeds in the Park including:

- past land uses such as clearing and developing pasture for grazing;
- soil disturbance from vehicle access;
- construction of paths and other facilities or drainage channels which allow weeds to establish;
- frequent fires which promote the growth of weeds;
- drainage outlets that carry stormwater from adjoining areas and promote the spread of weeds in wetland areas
- the dumping of garden refuse in the Park which introduces many plants that vigorously compete with local vegetation;
- invasive species from adjoining gardens;
- increased nutrient levels;
- transportation of weed seeds by birds; and
- grasses planted for amenity purposes in parkland settings invading bushland areas.

Weeds appear to be spreading and are impacting on most native ecosystems in the Park. In particular Veld Grass (*Ehrharta calycina*) is impacting on many of the upland areas within the Park where some sections of the understorey have been largely replaced by the weed. Other major weeds in upland areas include Blackberry *(Rubus fruticosus),* Cape Tulip (*Homeria miniata*), Castor Oil (*Ricinus communis*), Bridal Creeper (*Asparagus asparagoides*), Victorian Tea Tree (*Leptospermum laevigatum*), Pampas Grass (*Cortaderia selloana*) as well as figs *(Ficus spp.)* and thistle species (*Cirsium spp.).*

With regard to the wetland areas of the Park, couch, buffalo and kikuyu grasses are impacting on the local wetland fringe vegetation and Bulrush (*Typha orientalis*) is invading the emergent native vegetation. Additionally, Arum Lily (*Zantedeschia aethiopica*), Watsonia (*Watsonia bulbillifera*) and Papyrus *(Cyperus papyrus)* have potential to significantly impact on the wetland areas of the Park. Declared weeds pose a significant risk to the Park, two species of particular concern are Water Hyacinth (*Eichhornia crassipes*) and Salvinia (*Salvinia molesta*). At present there are no declared weed species present in the Park.

As with many of the wetlands on the Swan Coastal Plain, the non-local bulrush *(Typha orientalis)* is impacting on native ecosystems in the Park. This species is an aggressive coloniser, especially following disturbance, often to the detriment of various local reeds and sedges including *Typha domingensis.*

Although *Typha orientalis* is a non-local species, it does perform a number of valuable functions. It provides shelter, nesting sites and is a food source for some avifauna and other wildlife. Removal of *Typha orientalis* stands may result in increased nutrient levels within the waters of the Park with consequent implications for algal blooms and subsequent impacts on waterfowl. Efforts to keep its presence to a minimum would allow the native species to return, and would provide benefits both ecologically and aesthetically. The removal of *Typha orientalis* from the Park needs to be carefully considered.

There are significant rush beds within the Park that are currently largely weed free or have a low incidence of *Typha orientalis.* These areas have very high nature conservation values. It is important that largely weed free areas are identified, maintained and expanded.

All methods of weed control (chemical, physical, or biological) need to be considered for their application in the Park. Ecological considerations place constraints on weed control, as side effects such as those on native plants or habitat, or the pollution of water bodies, may rule out the use of some techniques. There are also financial constraints on the amount of weed control that can be carried out.

Guidance for weed management in the Park is provided by the Department of Conservation and Land Management Policy Statement 14 – Weeds on Department of Conservation and Land Management Land and *The Environmental Weed Strategy for Western Australia.* It is recognised however, that more detailed planning is required to develop an integrated and coordinated approach to weed management in the Park. As such the Department of Conservation and Land

Management will prepare a weed management plan for the Park.

The Weed Management Plan will use the principles of weed control as outlined in the Environmental Weed Strategy (1999). Planning for weed control will consider the following priorities:

- recognise weed potential;
- maintain areas of the Park that have vegetation in good condition; and
- control weeds impacting on threatened species and communities

The Plan will also outline the most effective methods for controlling priority weed species within the Park.

Weed control can greatly benefit from community involvement. The involvement of the community in park management is critical to the successful implementation of this Plan. Managing agencies have limited resources and weed control can be very labour intensive. The managing agencies acknowledge the considerable efforts by the community in undertaking weed control works within the Park. Volunteer groups have completed weed control projects successfully within the Park for a significant time.

Although the overall coordination of weed control within the Park is the responsibility of the managing agencies, volunteer groups and the agencies should establish co-operative arrangements with agreed processes and outcomes when undertaking specific weed control projects. Where volunteer groups initiate a project, discussion should occur with the relevant managing agency to ensure that activities are consistent with the Park's annual works programme, implementation plans and monitoring processes.

Members of the community wanting to be involved in weed control programmes in the Park can do so by:

- joining the community volunteer groups within the Park; and
- participating in activities in the Park organised or coordinated by the managing agencies.

Strategies

1. **Prepare and implement a weed management plan in accordance with the Environmental Weed Strategy developed for the Department of Conservation and Land Management. The plan will:**
   - **assess bushland condition;**
   - **prioritise and control weed species according to invasiveness, distribution and environmental impacts;**
   - **assess changes to vegetation communities;**
   - **identify largely weed free areas, maintain these areas, and conduct weed control works out from these areas;**
   - **specify appropriate control techniques and timing for removal;**
   - **integrate with the rehabilitation plan (Section 21) and not carried out in isolation. (Department of Conservation and Land Management) [High]**
2. **Consult with the Water Corporation and the relevant local governments to control weed infestations in drains that flow into the Park. (Department of Conservation and Land Management, CM, CC, TK, WC) [Ongoing]**
3. **Set boundaries for grass areas used for recreation and control the spread of grasses outside these areas. (CM, CC, TK, Department of Conservation and Land Management) [High]**
4. **Use interpretive and educational material to inform Park visitors and neighbours about the effects of dumping rubbish and garden refuse in the Park. Park neighbours will be informed that dumping aquarium contents in the local drainage system may lead to the proliferation of aquatic weed problems. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**
5. **Encourage volunteer community groups to become involved with weed control in the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**
6. **Coordinate community involvement in weed control works within the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**
7. **Monitor the extent of priority weed distribution and abundance in the Park as part of monitoring bushland condition. Relate results to previous studies to monitor weed spread. (Department of Conservation and Land Management) [Ongoing]**

18.5 Fire

The objective is to protect the biodiversity of the Park as well as people and property, by minimising the impact of unplanned fire.

Wildfire is a significant threat within Beeliar Regional Park. Large areas of local upland vegetation and infestations of bulrush (*Typha orientalis*) in wetland areas constitute a fire hazard. Fires in bulrush are difficult to

control and can cause damage to fringing paperbark vegetation.

Increasing urbanisation and visitor use of the Park is likely to increase the incidence of unplanned fire, as is experienced in other bushland areas in the Perth metropolitan area. It is, however, recognised that well controlled visitor access can reduce the incidence of unplanned fire (see Section 29).

Wildfires need to be avoided in the Park because they can threaten human life, property and natural and cultural values. Frequent wild fires in wetland areas will prevent the establishment of paperbark vegetation and lead to an even greater dominance of non-local bulrush. Fire activity encourages the invasion of bulrush in a wetland area because it regenerates far quicker than other local rush species. Bulrush is highly flammable in late summer and early autumn when most of the mature leaves have died. If a fire occurs during this period permanent damage to the plants is minimal, as they are dormant.

Selective prescribed burning may be considered for the protection of Park values and the protection of the special reproductive characteristics of fire sensitive plants and to enhance biological diversity.

The number of wildfires that occur in the Park needs to be reduced and fires that occur in the Park need to be quickly controlled. Fire suppression in Beeliar Regional Park is the joint responsibility of the Fire and Emergency Service Authority (FESA) and the relevant local government bush fire brigade. FESA is responsible for fire suppression in the gazetted fire district, while outside the gazetted fire district, local government brigades undertake fire suppression activities in liaison with the managing agencies of the reserve.

The gazetted Fire District is indicated in Figure 6.

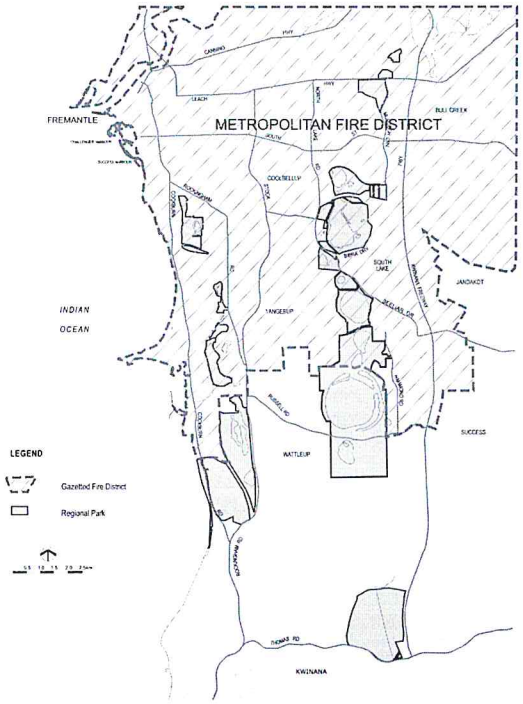


Figure 6 - Gazetted Fire District

The Fire Incident Controller is responsible for initiating post fire recovery strategies. Pre-suppression works and post-suppression follow-up works in the Park are the land managers' responsibility. When managing fire, the Department of Conservation and Land Management is guided by the Bushfires Act and the Department of Conservation and Land Management Policy Statement No.19 - Fire Management.

An important consideration in pre-suppression works and post-suppression follow-up works should be the protection of environmentally sensitive areas. Measures should be initiated to help ensure the spread of plant diseases and weeds is minimised.

A Fire Response Plan has been developed by the Department of Conservation and Land Management in conjunction with FESA and the relevant local governments to help ensure effective response to unplanned fire by the responsible agencies and outlines practices such as:

- fire control actions and strategies that protect environmentally sensitive areas from unplanned fire;
- undertaking pre-suppression activities including reducing fuel loads by mowing or slashing large open grassed areas. Mown or slashed areas should be delineated so that mowing practices do not adversely affect natural regeneration and fauna habitat;
- maintaining a fire record system of all fires in the Park including date and cause;
- ensuring an effective network of firebreaks is maintained.

The Fire Response Plan is consistent with the Department of Conservation and Land Management's Fire Management Policy Statement No.19.

Strategies

1. **Implement and periodically update the Park's Fire Response Plan. (CM, CC, TK and Department of Conservation and Land Management) [High]**

2. **Co-ordinate rehabilitation works with fire prevention requirements. Fire management will be considered in the preparation of the rehabilitation plan (Section 21). (CM, CC, TK and Department of Conservation and Land Management) [High]**

3. **Consider selective prescribed burning for the protection of Park values and to enhance the biological diversity of the Park. (CM, CC, TK and Department of Conservation and Land Management) [Ongoing]**

4. **Initiate measures in pre-suppression works and post-suppression follow-up works to minimise the spread of plant diseases and weeds in the Park. (CM, CC, TK and Department of Conservation and Land Management) [High]**

5. **Ensure that recreation planning takes into account fire prevention requirements. For example when constructing or upgrading paths in the Park consider building them to a standard that will carry fire control vehicles, so that access is improved for fire management (Section 27). (CM, CC, TK and Department of Conservation and Land Management) [Ongoing]**

19 - Mosquito and Midge Control

The objective is to minimise the negative effects of mosquito and midge populations in a manner that has minimal environmental and social impacts.

MOSQUITOES

Wetlands in urban areas often require a management response to mosquito populations. Mosquitoes may cause a nuisance to nearby residences and are a public health risk as some species have the potential to transmit diseases such as Ross River Virus. The Health Department of WA administers a mosquito control program. This program subsidises Contiguous Local Authority Groups (CLAGs) in areas that have been identified as having locally contracted mosquito-borne viruses, to control mosquitoes and protect from viruses. The local governments of Melville, Cockburn and Kwinana would therefore have to demonstrate known cases of locally contracted mosquito borne disease before qualifying for this assistance. The Conservation Commission of Western Australia also has a formal policy on mosquito control.

Mosquitoes also form part of the diet of local and migratory birds. Ninox Wildlife Consulting (1990) showed that peaks in the number and abundance of waterbird species in mosquito breeding areas during the summer months coincide exactly with equivalent peaks in populations of the mosquito *Aedes vigilax*. This species is known to be a carrier of Ross River Virus north of Carnarvon. Reports of the virus in the south west have only recently (1996) been recorded.

The City of Cockburn has implemented a detailed mosquito monitoring program since 1997. Periodic trapping in a number of locations within the City has revealed that mosquito numbers in the Park are at low levels. While some species which may be vectors of Ross River virus have been trapped, isolation tests for the virus have not been undertaken. Currently the City of Cockburn believes that a mosquito control program is not required, however this will be reviewed when the results of further monitoring are known. The City supports a community education program informing local residents about ways of reducing mosquito breeding areas.

MIDGES

The swarming of midges that occurs seasonally at the Beeliar Wetlands is a symptom of the degraded environment from which they emanate. Research shows that high midge densities occur as a response to wetland nutrient enrichment and that midge problems are a symptom of a disturbed system and an effect of poor water quality (Pinder, Trayler, Davis, 1991) which can be attributed to factors occurring throughout the many catchments of the Beeliar Wetlands (Section 14).

The eutrophication of wetland environments provides conditions which allow midge numbers to proliferate and often have adverse affects other invertebrates. Accordingly, the natural predators are limited and the midge population increases as it feeds on the algal blooms that are caused by the eutrophication of the lakes.

The current problem areas in Beeliar Regional Park are centred around North Lake, Bibra Lake and Yangebup Lake although there is also the potential for other areas including Lake Coogee to be affected.

The City of Cockburn has developed an Integrated Midge Control Strategy, which is designed to provide both short and long-term solutions to midge control. The long-term solutions are aimed at reducing the major causes of wetland degradation. This is to be achieved through integrated catchment management. In the short term solutions are aimed at providing the residents of the City with some protection by the monitored application of targeted spraying. The Department of Conservation and Land Management supports these initiatives to help control midges and will assist in the rehabilitation and management of the Park.

The community can also play a significant role in establishing rehabilitation programs and assisting in water sampling of the wetlands. It is hoped that with the involvement of the community at this level, an education program can be developed within the community to control the use of nutrient based products such as fertilisers.

Planning agencies such as the Ministry for Planning and local governments should also ensure that the Metropolitan Region Scheme and local Town Planning Schemes afford appropriate vegetation buffers around lakes and wetland areas of the Park. Buffers are important as they help minimise the impacts of midges on nearby residents.

The City of Cockburn has also established a Midge Research Working Group in association with Murdoch University. The Group directs midge control research on the Swan Coastal Plain. The Department of Conservation and Land Management also supports these research initiatives to help control midges.

Strategies

1. **Develop a community education program informing local residents about ways of reducing mosquito breeding areas and controlling the use of nutrient based products such as fertilisers within the catchments of the wetlands. (CM, CC, TK, HDWA) [Medium]**

2. **Apply the principles of the Integrated Midge Control Strategy developed by the City of Cockburn for midge control across all Park areas. (CM, CC, TK, Department of Conservation and Land Management) [High]**

3. **Seek to ensure urban developments within close proximity of the Park have adequate vegetation buffers. (CM, CC, TK, MFP, Department of Conservation and Land Management) [Ongoing]**

4. **Continue to seek alternatives to chemical pest control that are compatible with the ecological values of the Park. (CM, CC, TK, HDWA, Department of Conservation and Land Management) [Ongoing]**

20 - Pets and Introduced Animals

The objective is to minimise the environmental and social impact of pets and introduced animals in the Park.

PETS

The ownership of pets in close proximity to the Park has ramifications for the Park's management. Pets such as dogs, cats and horses are impacting on the natural environment within the Park. Their management needs to be strengthened.

Cats from nearby residences are also impacting on native fauna and need to be controlled. Domestic cats hunt for birds, reptiles and other creatures. Cat owners should be encouraged to keep them at home, especially at night and have them de-sexed to help control feral populations.

Dog walking is a common activity in the Park and a legitimate activity in certain areas. However, appropriate restraint of dogs is necessary if they are not to have an adverse effect on wildlife and activities of other Park visitors.

The local government laws relating to dogs apply to reserves vested in them, and nominate gazetted dog areas and reserves where dogs are prohibited. Given Beeliar Regional Park's high conservation values, the need to protect the Park's native fauna and the opportunity to exercise dogs off leads in other reserves in nearby areas, it is appropriate that dogs are only permitted in the Park provided they are on a leash and under effective control at all times.

Exceptions to this are the gazetted dog exercise areas in the Park namely - Reserve 26870, Azelia Road, Hamilton Hill, (Manning Lake reserve) and Lot Pt 50, Bibra Drive, and Reserve 44060 Bibra Drive (Bibra Lake). At Piney Lakes, dogs are allowed off the leash in the reserve, but must be under control. This will need to be reassessed, in light of the conservation value of some sections of this reserve.

Dogs will not be permitted in any areas of the Park with a zoning of Conservation and Protection (see Figure 4 – Management Zones and Areas), or areas such as the wetlands or water bodies of the Park.

With regard to horse riding, current activities occurring in the Park are considered inappropriate, as they are occurring in a relatively uncontrolled manner and impacting upon the Park's conservation values. The trampling of vegetation, the creation of tracks and the potential of spreading dieback in a number of locations are major management issue. Direction for the management of horse riding in the Park is provided in Section 29 - Park Access and Circulation.

INTRODUCED ANIMALS

Introduced animals such as feral cats, foxes, rabbits, fish and others occur in the Park and all have a detrimental effect on environment values. The control and removal of these animals will help protect the Park's fauna and flora.

Hybridisation and competition between domestic and native ducks is believed to interfere with native duck species. Park users will be discouraged from feeding ducks and other birds through educational signs (see Section 39). Artificial feeding encourages greater numbers of birds than can be naturally supported. Uneaten food such as bread also increases nutrients (in already nutrient rich lakes) and decaying bread can also allow botulism to spread in bird populations.

The introduced honeybee (*Apis mellifera*) is present in the Park and can have detrimental effects on native insects hollow-using animals and vegetation. Competition between native bees and honeybees and other native pollinators for flora resources usually favours the more aggressive foraging of the introduced bee, resulting in a decline of native insects. Other possible effects are inefficient pollination of some local plants, destruction of flowers and hybridisation of some native plant species by cross-pollination of different native species. Removal of beehives containing introduced species will occur in accordance with operational priorities.

With regard to the removal of introduced animals in the Park, the managing agencies will need to determine the extent and impacts of introduced animals and then, where appropriate, implement control options. The City of Cockburn and Department of Conservation and Land Management are investigating control methods for rabbits in the Park at high priority areas such as rehabilitation sites.

Strategies

1. **Use interpretive material to inform the community about the adverse effects of pets and introduced animals on native fauna. Explaining restrictions on pet access and to encouraging responsible pet ownership is to be included in interpretive material (Section**

39). (Department of Conservation and Land Management, CM, CC, TK) [High]

2. **Ensure dogs are on a leash and under effective control in the Park except for gazetted dog exercise areas. Exclude dogs from areas of the Park with a management zoning of Conservation and Protection and any of the wetlands or water bodies of the Park (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Provide dog excreta bins and signs in gazetted dog exercise areas and other areas of the Park where appropriate. (CM, CC, TK) [Low]**

4. **Develop and implement a strategy to control introduced animals within the Park. (Department of Conservation and Land Management) [High].**

21 - Rehabilitation

The objective is to restore degraded areas of the Park to a condition resembling the natural environment.

Environmental degradation is a major management issue in the Park. Past land uses and provision of roads, utilities and service corridors have resulted in modifications to vegetation communities and weeds have also become a major problem. It is difficult to restore severely degraded sites to natural habitat, however, considerable conservation gains can be made if a full suite of local overstorey and understorey species are used for revegetation.

A variety of techniques are available for landscape rehabilitation and the most appropriate is determined by the specific circumstances encountered.

Where possible, plant material or seed used in rehabilitation works should originate from within the Park or the nearest viable seed source, in order to conserve the genetic integrity of the vegetation communities. It is important that mulch and soil used in rehabilitation works does not contain unwanted weed seeds, plant disease (for example Phytophthora dieback) (see Section 15) or pollutants.

Seed collection from within the Park will generally only be permitted for rehabilitation projects within, or directly impacting upon the Park.

Given the Park's urban surroundings, an important consideration in Park rehabilitation will be the maintenance of views. Where possible, views will be maintained, however, the principles of conservation should not be compromised. Lower vegetation types will be used to maintain views over the Lake. Local residents will be informed of significant revegetation works proposed for the Park.

Local residents, community groups and education institutions should be encouraged to be actively involved in rehabilitation works. These activities are to be coordinated by the joint managers of the Park through the preparation of a rehabilitation plan for the Park.

The rehabilitation plan will be in accordance with the Department of Conservation and Land Management's Policy 10 – Rehabilitation of Disturbed Land and will provide a guide for the long-term restoration of degraded areas within the Park. The plan will identify major disturbance sites within the Park and priorities for their restoration to a condition resembling the natural environment.

Rehabilitation of areas fringing the lakes and wetlands will be given a high priority. Local fringing vegetation helps create a more natural habitat and nutrient inputs are reduced through filtration and storage (see Section 14).

The managing agencies acknowledge the considerable effort by volunteer groups in completing rehabilitation works within the Park, particularly through the Cockburn Wetlands Education Centre. In undertaking rehabilitation projects volunteer groups should establish agreed processes and outcomes with the managing agencies. All activities should be consistent with the planning and operations for the Park.

Strategies

1. **Prepare and implement a rehabilitation plan for the Park prioritising proposed works. (CM, CC, TK, Department of Conservation and Land Management, community groups) [High]**

2. **Coordinate rehabilitation works between the land managers and relevant community groups. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Coordinate rehabilitation with weed control, fire protection and recreation facility and trail development at the planning, design and implementation stages. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

4. **Inform local residents neighbouring the Park when proposing to undertake significant rehabilitation works within the Park. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

5. **Use locally collected seed (where possible) for propagating plants or for direct seeding. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

6. **Encourage members of the local community and schools to participate in rehabilitation works and seek external funding to achieve these works where possible. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

7. **Ensure mulch and soil used in rehabilitation works does not contain unwanted seeds or plant disease. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

8. **Where appropriate, allow licensed seed collection from within the Park for rehabilitation projects within, or directly impacting upon the Park. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

22 - Park Aesthetics and Landscape Amenity

The objective is to maintain and enhance the natural and cultural landscape qualities of the Park.

The management of the landscape is a key consideration in the overall management of Beeliar Regional Park. The following guidelines provide a practical framework for the management of the landscape within Beeliar Regional Park:

- Alterations to the natural landscape should be subtle, remaining subordinate to natural elements by borrowing extensively from line, form, colour texture and scale found commonly in the surrounding landscape.
- Site specific visual resource factors should be carefully identified and evaluated before any management activities are undertaken.
- Where appropriate, degraded landscapes such as disused access tracks should be rehabilitated.
- Roads, management tracks and firebreaks should follow the natural landform, or landuse patterns.
- Prescribed burning operations (if required) should incorporate prescriptions and techniques that minimise the visual impact.
- Where structures are required they should be 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.

The landscape description, landscape quality and landscape character of Beeliar Regional Park are described in the following subsections:

LANDSCAPE DESCRIPTION

The Park lies within the Swan Coastal Plain landscape character type (Department of Conservation and Land Management, 1994). The coastal plain slopes gently westwards from the Darling Scarp to the Indian Ocean. A description of the Swan Coastal Plain Landscape Character Type is included as Appendix C.

The majority of the Park is comprised of two chains of wetlands and is therefore characterised by low-lying land, either permanently or seasonally inundated. Landscapes range from the open water bodies and open parkland areas to areas of low Banksia woodland, sections of Flooded Gum and Jarrah open woodland on the upland areas.

At the Henderson Region (Mount Brown and the Foreshore Coastal Reserve M91) and Manning Lake elevated positions and low coastal vegetation allow extensive views along the coast, out to the ocean and to the Darling Scarp.

LANDSCAPE QUALITY

The Park landscape encompasses areas which can be described as being of high, medium, or low visual quality. These categories can be mapped using the Department of Conservation and Land Management's Visual Landscape Management System (1989). Once mapped, any modifications within and adjacent to the Park can be assessed according to the visual quality rating and the ability of the landscape to incorporate the proposed change.

There are many areas of high scenic quality. Most of these occur in areas with a management zoning of Conservation and Protection and include natural areas with water as a major element. Other areas of high scenic quality include well maintained parkland areas.

Areas of low visual quality include large cleared areas, highly disturbed areas (with dumped rubbish or weed infestation), built structures such as drainage outlets, back fences of houses, power lines and other utilities in the Park. Degraded and/or inappropriate structures are found within the Park. These structures detract from the enjoyment of the Park environment and need upgrading, replacing, screening or removing to contribute positively to Park amenity. Other areas of the Park are visually impacted by incompatible adjacent land uses or disturbed by past land use and are in need of rehabilitation.

LANDSCAPE CHARACTER

At the community workshop for the preparation of this Plan, the wetlands were described as an important element in 'defining the character of Perth's South West Corridor'.

Maintaining or improving the natural and cultural landscapes of the Park are integral components of the effective management of the Park. While this means protecting natural areas, in other instances it involves rehabilitating modified landscapes of the Park. Rehabilitation works should use local plant species grown from locally collected seed or from the nearest viable seed source. The created landscape should resemble the character of the original landscape even if it has not been possible to replicate the landscape due to lack of technology or resources. View corridors, incorporating the use of low vegetation, should be considered in rehabilitation planning (see Section 21). Planting only local plant species does not apply to historical sites provided that particular plants are not invasive.

Strategies

1. **Classify landscape features in the Park according to the Department of Conservation and Land Management's Visual Management System in order to assess the form and location of all facilities and services within the Park. (Department of Conservation and Land Management) [Low]**

2. **Identify and protect important landscapes within the Park. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**

3. **Ensure recreation facilities and park furniture are of a high standard and suited to the surrounding landscape. Facility provision should be planned and agreed to by the joint managers of the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

4. **Ensure that new infrastructure and developments within or adjacent to the Park are designed to minimise impacts on visual quality and include a landscape plan demonstrating integration with the surrounding area. Liaise with Western Power, Water Corporation, and other infrastructure providers before works are carried out in the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

5. **Identify sites of low visual quality (e.g. drainage outlets, degraded and weed infested areas) and undertake appropriate remedial action. (CM, CC, TK, Department of Conservation and Land Management) [Low]**

6. **Consider view corridors when undertaking rehabilitation works within the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

23 - Cultural Context

The objective is to identify, protect and appropriately manage sites with Aboriginal and non-Aboriginal cultural heritage value within the Park.

ABORIGINAL ASSOCIATION AND USE

At the time of European settlement, research indicates that the Perth region supported three districts containing the Mooro, Belloo and Beeliar clans (Seddon 1972). The Beeliar District extended south of the Swan River encompassing the two chains of wetlands that form the basis of Beeliar Regional Park - hence the name of the Park.

Beeliar Regional Park is significant to the local Aboriginal people as parts of it were important camping areas and sources of food and other materials (Polglaze, 1986).

The eastern chain of the Beeliar Wetlands is said to have been a part of a major trade route between Aboriginal people in the Swan and Murray River areas (Polglaze, 1986). Although this is supported by Hammond (1933) who said that it was part of a route from North Fremantle to Mandurah, there is apparently little ethnographic evidence available, unlike the equivalent wetland chains to the north of the Swan River.

The exception to this, however, is at Bibra and North Lakes where archaeological sites have been identified. According to Polglaze (1986), the hydrology of the two lakes would have made them very desirable campsite locations, particularly Bibra Lake, being a largely permanent freshwater lake. There are a number of archaeological sites at the shores of the Lakes. Recent Aboriginal camping grounds were situated on the southern side of Hope Road, close to the north-eastern edge of Bibra Lake and also along its southern shore (O'Conner, Bodney and Quartermaine 1989).

The lakes also hold importance as spiritual and mythological locations.

The spirituality and importance of North and Bibra Lakes to the Aboriginal community continues today. This is evidenced by a recently collected oral history of the Beeliar Wetlands. According to Judy Jackson "....we still visit the area,...practice our religion, our spirituality..." (Drake and Kennealy 1995).

According to Polglaze (1986) the wetlands "provide an important link to the natural context, cultural traditions, spiritual life and history of the Aboriginal people of the Swan Coastal Plain".

There do not appear to be any sites of recognisable significance in the western chain.

A key issue in the management of Beeliar Regional Park is to ensure that Aboriginal sites are protected from damage which may occur during maintenance operations or works projects. It is therefore the responsibility of the managing agencies to ensure that management obligations are fulfilled according to the Aboriginal Heritage Act 1972 - 1984 and the Native Title Amendment Act 1998, before any planning or public works take place.

Additionally, it is important that local Aboriginal people are provided the opportunity to be involved in projects and the management of the Park.

Native Title Amendment Act (1998)
Some of the lands that comprise Beeliar Regional Park are subject to two native title claims. In accordance with the Native Title Amendment Act 1998 (NTAA) public works constructed on all reserved lands and waters managed by the Department of Conservation and Land Management will need to be notified in writing.

Parties that require notification are:
- Representative Aboriginal bodies;
- Registered native title bodies (corporate) and registered native title claimants for Department of Conservation and Land Management land/waters on which the operations are to be carried out.

These parties need to be given the opportunity to comment on the proposed public works. A "public work" is defined in the NTAA to include buildings, structures which are fixtures, roads, bridges, wells, bores and major earthworks constructed or established on behalf of the Crown. Additionally, a management plan for any national or state park intended to preserve the natural environment of an area must be notified in the same manner as for public works. The NTAA's intention to preserve the natural and cultural environment will probably cause conservation parks, regional parks, nature reserves, conservation/recreation purpose Section 5 1 (g and h) reserves, marine reserves and marine nature reserves to be included in this requirement.

Aboriginal Heritage Act (1972)
Under the *Aboriginal Heritage Act (1972),* it is an offence to damage, alter or destroy any Aboriginal sites unless written consent has been obtained from the Minister for Aboriginal Affairs. This includes sites not yet registered with the Aboriginal Affairs Department.

Declared Aboriginal sites within and adjoining Beeliar Regional Park are:

Booragoon Lake	S194
Piney Lakes	S193
North Lake	S190
	S191
	S192
Bibra Lake	S660
	S1292
South Lake	S1289
Kogolup Lake	S2667
Thomson's Lake	S2967
	S188
	S186
The Spectacles	S2729

Source: Aboriginal Affairs Department, 1999

NON-ABORIGINAL HERITAGE

Initial European settlement had little influence upon the wetland areas south of the Swan River (DPUD, 1992). The first European settlement of Cockburn district was Thomas Peel's failed town of Clarence on the western side of Market Garden Swamps in 1830. The settlement only lasted a couple of years (Drake and Kennealy, 1995).

The infertility of the coastal sands resulted in few land grants. Seddon (1972) states that there were twelve land grants south of Fremantle averaging about 700 acres each. Land use was confined to market gardening south from Spearwood to the Hope Valley and in the wetland fringes. The remaining areas were farmed extensively for sheep, cattle and horse grazing on poorly drained infertile soils (DPUD, 1992).

According to Berson (1978), the general nature of the area, being scattered pockets of fertile land amongst a generally infertile area, combined with the dominance of nearby Fremantle over the area, presented a barrier to the development of a large unified settlement. This is illustrated by the Pensioner Guards who were granted land in the 1870s on the western banks of Lake Coogee. The pensioner settlement was later abandoned as the land proved to be too infertile to be sustainable as productive land. There are numerous remnants of historical cottages present in the area which relate back to the pensioner settlers, however, all of these are outside of the boundary of Beeliar Regional Park.

The area became more popular as a food production area with the coming of the gold rush in the late 19th century, when the population of the state trebled and the demand for fresh fruit and vegetables increased (Berison 1978).

Market gardening began to surround the wetlands in the region in the late 1800s (Drake and Kennealy, 1995). Extensive areas were cleared for the creation of market gardens and particularly so when irrigation became available.

In 1920 the State government bought Thomas Peel's Estate (established in 1829) and launched the ill-fated Peel Estate Group settlement Scheme. A once complex network of wetlands and streams was drained extensively for agriculture. By the mid-1920s over 400 kilometres of drains had been constructed. The Peel Main Drain connects the Spectacles to the Serpentine River and Peel Inlet (Drake and Kennealy 1995). The area surrounding the Spectacles contained several market gardens, other crops and dairies around the wetlands in the 1930s and 1940s, however, it was not considered successful in terms of agricultural land use (Drake and Kennealy, 1995).

Farming was also present at the wetland area of Piney Lakes reserve until 1924. The wetland area was utilised as the other soils in the area were too infertile for farming purposes. When the land was transferred to the ownership of the University of Western Australia in 1924 it was cleared and the university, in conjunction with the then Forests Department, established a pine plantation. A nursery for the propagation of pines was also established and operated until 1951. The majority of the plantation was cleared in 1976 (Ecoscape and Landmarc 1992).

Another key heritage site within the Park is the Azalea Ley homestead, Davilak House, built in 1905 and located at Manning Lake (City of Cockburn Municipal Heritage Inventory). Manning Lake was purchased by Charles Manning in 1860 and the Manning family farmed a 923

acre (approximately 377.5 hectare) estate from North Lake to Coogee.

The National Trust has assessed the Azalea Ley Homestead as significant given it "...demonstrates a way of life and forms a unified setting... a stately place...(with) evidence of a life style (of the area) before the City of Cockburn was built" (The National Trust Register of Significant Places).

Today the homestead contains a private museum with both general and local artefacts and documents of interest. It is also the start of the Davilak Heritage Trail.

The City of Cockburn also has a rich railway history (probably more than any other local government in the State). It has a disused railway along the coast which serviced the ammunition storage depot at Woodman Point, a disused railway between Spearwood and Armadale (along Armadale Road), and a Tramway Reserve which was possibly created to service an explosives depot south of Baldivis Road in the City of Rockingham. These historical features provide significant opportunities for the development of trails and interpretive material within the Park (Maher Brampton Associates, 1999).

With respect to non-Aboriginal heritage sites, key issues that need to be addressed include the general maintenance and management of sites in the Park, as well as developing appropriate processes for interested parties prepared to restore and utilise sites of cultural significance. The ICOMOS Burra Charter, adopted by the Australian International Council on Monuments and Sites as revised in 1999, provides the basis for management of places of cultural significance. It defines conservation principles, processes and practises for application to places of cultural significance.

Strategies

1. **Ensure management obligations are fulfilled according to the Aboriginal Heritage Act 1972 -1984 and the Native Title Amendment Act 1998, before any planning or public works take place. (CM,CC, TK and Department of Conservation and Land Management) [Ongoing]**

2. **Incorporate information on Aboriginal and non-Aboriginal history of the Park into interpretive material where appropriate (Section 39). (CM, CC, TK and Department of Conservation and Land Management) [High]**

3. **Liaise with Aboriginal and historic groups to determine their interests and possible involvement in the Park. (CM,CC, TK and Department of Conservation and Land Management) [Medium]**

4. **Nominate significant sites for heritage listing on either the relevant Municipal Heritage Inventory, or State and National Heritage Registers. (CM,CC, TK and Department of Conservation and Land Management) [Medium]**

5. **Manage historic sites in accordance with the ICOMOS Burra Charter and in consultation with other appropriate conservation bodies, such as the WA Museum, National Trust, Australian Heritage Commission and historical societies. (CM,CC, TK and Department of Conservation and Land Management) [Medium]**

24 - Greenway Corridors and Links

The objectives are to manage Beeliar Regional Park consistently with Greenway principles and to encourage appropriate management of corridors and links between the Park and other conservation or recreation areas.

Greenways is a generic term that has been applied to a wide range of landscape planning strategies, concepts and plans (Tingay and Associates, 1998). It has been defined as "networks of land containing linear elements that are planned, designed and managed for multiple purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable use" (Ahern, 1995).

It is important to maintain and improve Greenway corridors and other links between and within Beeliar Regional Park to adjoining areas of ecological significance. This is necessary to help maintain the diversity and vigour of the Park's ecological systems and to help integrate the Park within the broader urban and industrial landscapes.

Currently, major arterial roads and other infrastructure limit linkages between various parts of the Park and to other regional parks. Major roads divide the eastern chain of wetlands at Leach Highway, Farrington Road, North Lake Road, Beeliar Drive and Russell Road. Thomas Road is located on the southern boundary of the eastern wetland chain. At the western chain, Cockburn Road divides the Henderson Region. Stock Road – Rockingham Road acts as a major barrier between the two wetland chains and the Kwinana Freeway impacts on the potential to link it to Jandakot Regional Park.

Additionally, the proposed road reserve for the Roe Highway will have significant impacts upon the linkage between North Lake and Bibra Lake. Similarly, the Fremantle - Rockingham Controlled Access Highway will impact on the linkage between the western chain of wetlands and Woodman Point Regional Park.

A study of Perth's Greenways has identified a number of proposed greenway corridors linking to and within Beeliar Regional Park (see Figure 7). They are as follows:

Link No.	Link Name
1	Coastal Strip
73	North Lake – Bibra Lake – Roe Highway Extension
75	Stock Road to Bibra Lake
76	Russell Road – Thomsons Lake – Woodman Point Regional Park
78	Thomsons Lake to The Spectacles
80	Kwinana Freeway
81	Forrestdale Lake to Thomsons Lake
82	Piney Lakes – Wireless Hill – Swan River
85	Chain of wetlands parallel to and east of Mandurah Road including Stakehill suite of wetlands
87	Leda Ridgelines – Rockingham Road
90	Blue Gum, Booragoon, Piney, Bibra and North Lakes, Little Rush, Yangebup and Thomsons Lakes
96	Stock Road – Coast (Woodman Point)
97	Southern River – Forrestdale Lake – Thomas Road, The Spectacles - Coast
120	Extensions to 76

In Section 29 reference is made to establishing access links between the various parts of the Park. It is equally valid to endeavour to establish vegetative links between these areas, provided that they add to the overall conservation value of the Park and its environs.

Such links could serve as wildlife corridors which may encourage the return of fauna to parts of the Park from which they have disappeared. Clearly the access links and the vegetation links could share the same land.

The use of local plants in landscaping road reserves together with purpose-designed animal underpasses and fauna warning signs can assist to minimise the impact of major roads on the movement of fauna.

The type of interface between the Park and adjoining land uses plays a major role in insulating or exposing (as the case may be), the Park to undesirable impacts. The spread of invasive weed species can be minimised by the creation of appropriate buffers where none exist and by the planting of local species in existing areas. Park managers should liaise with the landowners involved with proposed Greenways near Beeliar Regional Park to develop a coordinated approach to their management.

Where development is to occur adjacent to the Park, it is preferable that a road or pathway is constructed between the development and the Park, as it would serve as a buffer separating differing land uses.

Strategies

1. **Develop a list of Park compatible plants for the local community and relevant local governments. Discourage the planting of invasive introduced plants near the Park. (CM,CC, TK, Department of Conservation and Land Management) [Medium]**

2. **Encourage providers of future transport and power services to adopt "wildlife friendly" designs, and management practices. (CM,CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Liaise with the Ministry for Planning so that future development proposals adjoining the Park incorporate appropriate interface treatments (e.g. a road or dual use path edge) with the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

4. **Liaise with adjoining landowners involved with proposed Greenways near Beeliar Regional Park to develop a co-ordinated and complementary approach to management. (CM,CC, TK, Department of Conservation and Land Management, MFP) [Ongoing]**

5. **Implement the Greenways proposals for linkages within Beeliar regional Park as indicated in Figure 7. (MFP, CM,CC, TK) [Ongoing]**

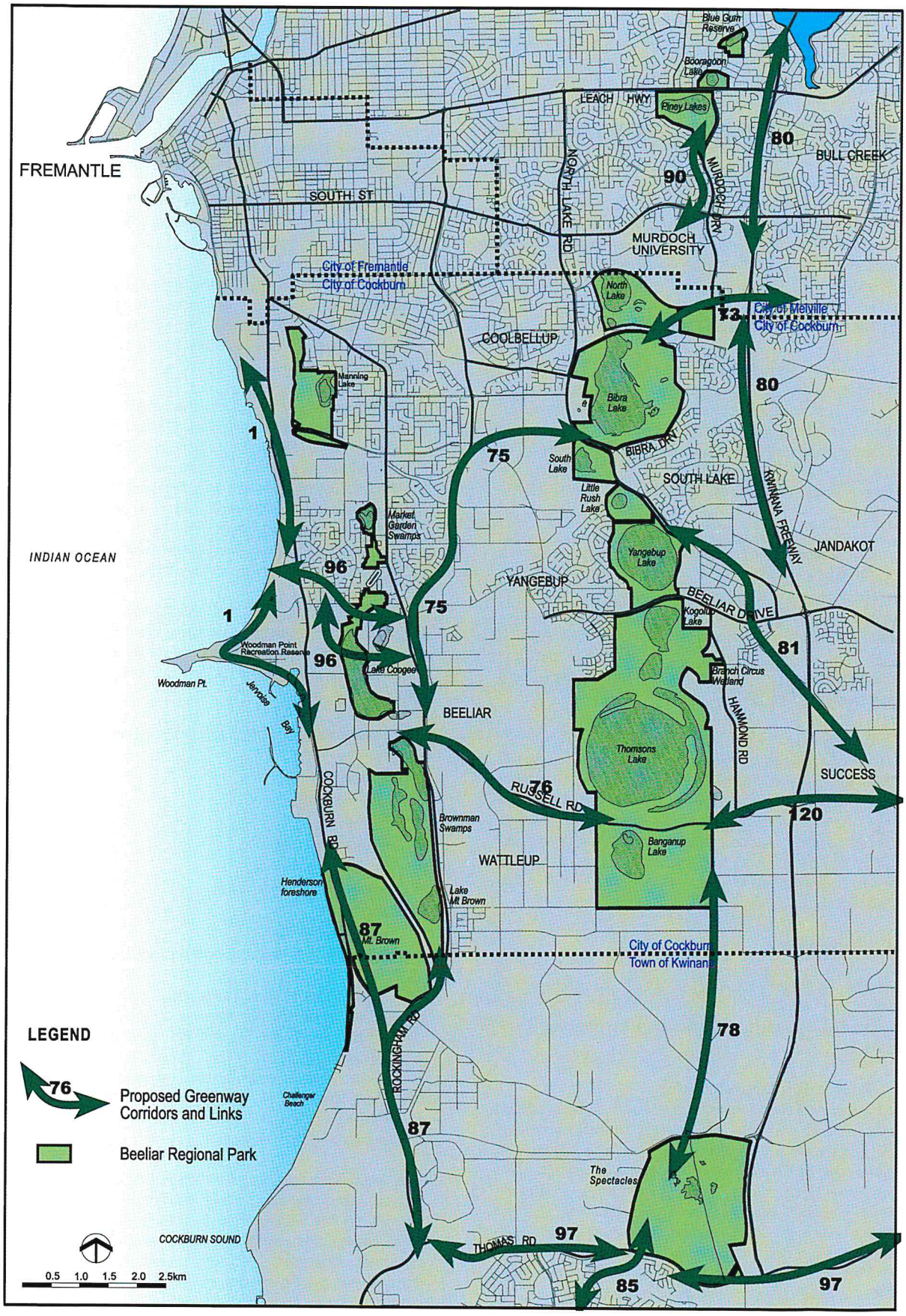


Figure 7 - Proposed Greenway Corridors and Links

D. RECREATION

25 - Recreation Goal and Guiding Principles

RECREATION GOAL

Provide and manage for recreation, tourism and leisure in a manner that minimises conflict between visitors, and is consistent with other management objectives and Park values.

RECREATION GUIDING PRINCIPLES

1. Preservation of the Values of the Land Itself
Natural systems (including landscapes, particular sites and biota) should be able to sustain the recreation which is occurring or proposed. Recreation should be focused in public use areas of the Park. The intensity of recreational activities may need to be controlled to ensure it does not destroy the value and nature of the activity.

2. Consistency of Recreation with Reserve Purpose
Recreational activities should be compatible with the assigned purpose and management zoning of reserves within the Park. Reserves within the Park will be assigned an appropriate purpose for the protection and enhancement of Park values under the Land Administration Act 1997.

3. Equity
A range of activities consistent with a reserve's purpose should be allowed in the Park. However, uses that impair other forms of acceptable use or jeopardise the safety of other visitors should be specifically managed, directed to more appropriate places or not permitted. Priority will be given to low impact activities and those that increase awareness, appreciation and understanding of the natural environment.

4. Management
Activities and facilities must comply with the managing agencies' requirements. If effective management of recreational activities or facilities cannot be provided they should be restricted, relocated or removed from the Park.

5. Recreation Opportunities
A range of recreation opportunities should be provided for in a local and regional context thereby providing Park visitors with a choice of recreation activities and experiences which enhance the values of the Park. The Recreation Opportunity Spectrum (ROS) is a planning tool that enables managers to provide for the greatest possible range of opportunities in a given area, while limiting unintended incremental development (Stankey and Wood 1982). Principles of the ROS have been utilised in developing the Recreation Masterplan.

26 - Visitor Use

The objective is to ensure that the level of visitor use and behaviour is sustainable and minimises conflict with other Park visitors and values.

The Park provides the opportunity for visitors to experience a variety of conservation and recreation zones. Visitor use should be concentrated at the recreation sites illustrated in the Recreation Masterplan (Appendix D).

A recreation survey to identify the reasons and numbers of people visiting the Park was undertaken by Barnes (1998). While the survey identified that surrounding local residents regularly use Park areas on a daily basis, the Park should be viewed as a regional resource. For example, Barnes (1998) indicated that people from at least 36 Perth metropolitan suburbs as well as others from interstate and overseas visited Bibra Lake during a six week period in April and May 1998.

Barnes (1998) also suggested people visit the Park for a wide range of reasons. Visitor use can be attributed to the Park's amenities, aesthetics, safety for small children, accessible car parking and its 'central' location within the metropolitan area.

The most common recreation activities within the Park are:

- walking;
- dog exercise;
- picnicking;
- nature observation;
- bush care activities;
- using the playgrounds;
- cycling;
- horse riding; and
- using sporting facilities where they are available.

The promotion of the above recreation pursuits has been considered in the preparation of the Recreation Masterplan (Appendix D) and Management Zones and Areas (Figure 4) for the Park. Restricting dog exercise and horse riding to appropriate and designated areas in the Park requires a coordinated approach by the managing agencies as well as support by the local community and Park visitors.

It is important to note that whilst walking and cycling are popular with those living locally to the Park, most visitors to the Park arrive by car, particularly at the larger, designated recreation nodes which have a greater range of amenities. Parking areas have also been illustrated in the Recreation Masterplan.

Strategies

1. **Develop and implement a visitor survey program to gain an understanding of visitor use, numbers and satisfaction within the Park. Use the Department of Conservation and Land Management's VISTAT as a basis for the program. (CM, CC, TK, Department of Conservation and Land Management) [High]**

2. **Ensure Park management has the authority required to regulate visitor use when necessary. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**

3. **Prepare a communication plan incorporating a sign system and sign plan as well as interpretive strategies and techniques. Interpretive material should be aimed at:**
   - **promoting visitor use and activities which are consistent with the protection and promotion of Park values and minimise conflicts between Park visitors; and**
   - **providing information about the recreation and interpretation opportunities available in the Park. (Department of Conservation and Land Management) [High]**

27 - Recreation Masterplan

A Recreation Masterplan (Appendix D) has been prepared to help ensure that a variety of recreation opportunities are offered in the Park. The Masterplan will also help coordinate recreation developments within the Park and allocate appropriate facilities and services to those areas of the Park best able to accommodate them in a sustainable manner. Developments, where possible, will utilise already degraded sites.

The Masterplan reflects the management zones and land uses described in Section 9 of this Plan. The four management zones (Conservation, Natural Environment Use, Recreation, and Sport and Recreation) provide a guide to acceptable facilities and uses at a given site (see Table 2). The Recreation Masterplan considers access, internal circulation and the type of facilities to be provided within the Park.

The Conservation and Protection Areas of Beeliar Regional Park will have access limited to boardwalks, nature trails and cycling paths with an emphasis being on the enjoyment of nature. The Natural Environment Use Areas will have greater access with an emphasis on rehabilitation, education and interpretation. Provision of some facilities within these areas is anticipated.

The Recreation as well as Sport and Recreation Areas will be the most intensively used and modified sections of the Park. The emphasis will be on providing well designed recreation areas without detracting from the natural or cultural values of the Park.

Strategy

1. **Implement the Recreation Masterplan that allocates appropriate facilities and services to those areas of the Park best able to accommodate them in a sustainable manner. (CM, CC, TK, Department of Conservation and Land Management) [High]**

28 - Recreation Sites and Facilities

The objective is to provide and manage a range of quality recreation sites and facilities that allow for a diversity of recreation opportunities without conflicting with other Park values. Recreation facilities should complement the surrounding areas of the Park focusing on nature based opportunities

Although the Beeliar Regional Park provides for a range of recreation opportunities, of particular significance is the opportunity to recreate in a natural environment within an urban area. Maintaining this experience will be a key consideration in providing for recreation sites and facilities within the Park as it is this experience that attracts many people to the Park.

In the past there has been limited direction for the coordinated development of recreation sites within the Park. This has lead to a proliferation of facilities in the Park some of which are poorly located, while others could be considered inappropriate or surplus to demand. Conversely, there are areas in the Park which could sustain greater public use provided appropriate facilities are developed. These include South Lake, Kogolup Lake and the Henderson Region including Mt Brown, Mt Brown Lake and the Henderson Foreshore Area (refer to the Recreation Masterplan, Appendix D).

The provision of adequate shade at recreation sites is also a key consideration for Park management. In siting new recreation facilities under existing mature trees, management needs to be cognisant of safety issues such as falling branches. Additionally, when developing shade structures in conjunction with recreation sites, management needs to consider the potential impacts that structures can have on the quality of visitor experience and landscape amenity.

SITE PLANS

Five site plans are to be developed for areas within Beeliar Regional Park managed by the Department of Conservation and Land Management and Land Management. The plans will be consistent with the Recreation Masterplan (Appendix D) and will provide more detailed direction for the development of each site. The plans will be prepared in consultation with the community and the other managing agencies involved in the Park. The site plans are discussed below:

North Lake

The site plan for North Lake will investigate upgrading and consolidating the parking and picnic area at the north-western bank of the Lake. A walk trail circuit will be provided around the perimeter of the Lake which will utilise existing fire breaks where possible. The rehabilitation of disused access ways and interpretation of the surrounding environment will be key elements of the plan.

South Lake

The plan for South Lake will investigate providing parking in the northern section of the reserve with access from North Lake Road. A walk trail circuit around the perimeter of the Lake will allow for pedestrian access only and will consolidate existing informal trails. A lookout is proposed to the south of the Lake.

Kogolup Lake

It is proposed that a low key visitor node including recreation facilities such as a picnic area, seating and interpretive material be provided in the north west portion of the site which is currently degraded. Access and parking for the area will be via Beeliar Drive, while walk trails will provide access to the western part of the site. Any development of recreation facilities at Kogolup Lake will need to be cognisant of the horse riding requirements of the area.

Harry Waring Marsupial Reserve (Banganup Lake)

There is potential to develop the buildings currently within the Harry Waring Marsupial Reserve to accommodate a low key environmental / ecotourism development. Any activities would need to be consistent with the purpose of the reserve and the conservation and research values of the area. Limiting disturbance to the site and protecting areas of cultural significance would be a key consideration in any further detailed planning. Further investigation of social and environmental issues will be required by the managing agencies.

Jervoise Bay Conservation and Recreation Enhancement Plan

Site plans for the Henderson Foreshore (M91 Coastal Reserve) and Lake Mt Brown have been developed as part of the Jervoise Bay Conservation and Recreation Enhancement Plan. The implementation of these plans will be consistent with this Management Plan.

Sensory Park at Yangebup Lake

In 1998, the City of Cockburn commissioned a feasibility study into the development of a "Sensory Park" in the south west portion of Yangebup Lake. The report proposed a variety of recreation facilities including:

- carparking;
- toilets;
- picnic facilities;
- a bird aviary;
- adventure / obstacle courses;
- BMX track;
- mini golf and cricket nets;
- play equipment;
- night lighting; and
- a café.

A special emphasis for the park is developing facilities accessible by people with disabilities.

Strategies

1. **Prepare site development plans for significant works within the Park. The plans will be prepared in consultation with the community and the other managing agencies involved in the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

2. **Where appropriate make adequate shade provisions at recreation sites and facilities. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Provide suitable and safe facilities guided by Australian standards. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

4. **Develop facilities and structures in a manner that is sympathetic to the surrounding landscape. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

29 - Park Access and Circulation

The objective is to provide safe and convenient access to and within the Park that is consistent with the protection of Park values.

Given the location of the Park in a developing urban environment, access is a major issue. Whilst access for recreation and education purposes is a legitimate use, uncontrolled vehicle and pedestrian access has severely degraded some areas of the Park. Uncontrolled access also enables the dumping of rubbish and garden refuse which continues to be a problem in the Park.

Visitors can access most areas of the Park via public transport or private vehicles. Other forms of access include walking and cycling, horse riding and access for the disabled. Access and circulation planning for the Park will be undertaken in consultation with the Department of Main Roads, Bikewest and the relevant local governments.

The City of Cockburn's Trails Master Plan provides a guide for the development of recreation trails within its municipality area. The Overall Access and Circulation Plan for the Park (Figure 8) closely reflects the proposals outlined by the City of Cockburn.

Detailed planning for access needs to be undertaken with recreation planning for the Park and is a critical aspect of the Recreation Masterplan (Appendix D).

ROAD ACCESS

Vehicle access is an important consideration for the Park. Private vehicles access the Park by a comprehensive road network system with a number of major arterial roads adjoining or dissecting the Park including the Kwinana Freeway to the east.

Major roads which dissect the Park east-west include Leach Highway, South Street, Farrington Road, North Lake Road, Beeliar Drive and Russell Road. Thomas Road also adjoins The Spectacles to the south. The development and expansion of east-west transport corridors is considered a major threat to the integrity of the Park (Section 32).

Existing car parking is provided at a number of locations in the Park and these are indicated in Appendix D. The car park capacities, sizes and surfaces vary depending on visitor demand and the types of facilities provided at each particular site.

It will be necessary to develop additional parking areas to facilitate access to the Park where there is an existing visitor demand or where the provision for new access is planned. The provision of additional parking facilities is considered in the Recreation Masterplan (Appendix D) will help address the undesirable effects of uncontrolled parking and access.

CYCLE AND PEDESTRIAN ACCESS

The many quiet neighbouring suburban streets provide local residents with a good opportunity to access the Park by cycling and walking. In addition to the visitors who access the Park by vehicles, four new railway stations which are proposed at locations between Cockburn Road and the Kwinana Freeway will also provide potential access for pedestrians and cyclists.

Generally, however, trails and pathways within the Park and between discrete Park areas are limited. The lack of formed pathways restricts circulation and connectivity throughout the Park. Pedestrians are currently using firebreaks and management tracks to walk throughout the Park. Cyclists are restricted to dual use paths and formed limestone tracks.

Increased visitor pressures on the Park and the lack of a structured pathway system mean that informal paths are being created by people seeking new experiences which result in greater disturbances to bushland areas and lake and wetland edges.

An effective path system should have minimal impact upon the values of the Park, whilst allowing visitors to experience the diverse recreation opportunities and zones within the Park.

Proposed Park access and circulation is shown in Figure 8 and the Recreation Master Plan (Appendix D).

ACCESS FOR ALL

Generally, access for people with disabilities requires improvement at Beeliar Regional Park. In many Park areas, access for people with mobility problems is restricted due to the undeveloped nature of the pathways. However, at the more intensive recreation areas in the Park, for example, Bibra Lake and Manning Lake, wheelchair access is better developed.

Appropriate pathways and ramps will need to be provided to allow those with disabilities to experience the diverse settings within the Park. All future developments should consider the needs of disabled people in design criteria. This includes access to conservation and recreation areas.

HORSE RIDING

The managing agencies of the Park recognise that a significant number of people enjoy riding horses in the Park's natural settings. This attraction, however, needs to be balanced when considering the following issues:

- the possible damage by horses to the Park's nature conservation values that include introducing or spreading dieback disease, eroding soil, trampling and browsing vegetation and introducing and spreading weeds through feed and droppings;
- the potential safety conflicts with other Park visitors; and
- conflicts with other visitor experiences.

The riding of horses by commercial equestrian groups and individuals is mainly occurring at Kogolup Lake and outside of the fenced area at Thomsons Lake. *The Beeliar Bridle Trail Assessment* (Maher Brampton 2001) indicated that the current horse riding activities occurring in the Park are considered inappropriate, as they are occurring in a relatively uncontrolled manner and adversely impacting upon the Park's conservation values.

Commercial Equestrian Operations and Group Events

Commercial equestrian operations and groups are currently accessing the Park without a commercial license. Local horse hire operators have accessed areas at Kogolup and Thomsons Lakes for many years. Given the historical nature of this activity, the fact that informal bridle paths have already been established and the significant demand for horse riding in the area, commercial operators and groups will be allowed to continue to access Park areas, however, their activities will be restricted and regulated.

The operations of commercial horse hire ventures will be regulated under licensed agreements with use only permitted on designated bridle trails. The conceptual design of the bridle trails is outlined in the Appendix D – Recreation Masterplan. License conditions will enable riding trails to be closed if weather conditions require closure or if erosion, disease, or degradation of vegetation occurs. Additionally, a lack of compliance with conditions will result in the removal of licenses.

Income generated from the licenses will be used to help offset Park management costs and contribute to trail

construction and maintenance as well as the provision of associated facilities such as fencing, directional signs and interpretive material.

Individual Horse Riders

Individual horse riders (riders not involved with commercial operators) will be allowed to access the designated bridle trails at Kogolup Lake and outside of the fenced area at Thomsons Lake. Riding outside of the designated bridle trails is considered to be incompatible with the values of the area and will not be permitted.

A small group of local residents also access the south west portion of Banganup Lake (outside of the fenced area of the Harry Waring Marsupial Reserve). The bushland condition of the area will be monitored to assess changes to the woodland areas. If monitoring indicates that the bushland condition is deteriorating and it can be demonstrated that horse riding is contributing to the demise of the area, then horse riding will be restricted or prohibited.

PRIVATE VEHICLES AND MOTORBIKE ACCESS

Private vehicles, trail bikes and motor bikes are restricted to designated parking areas and access roads. Access outside these areas may endanger other Park users, adversely affect wildlife and cause damage to the landscape.

BOAT AND CANOE ACCESS

The use of motorised and non-motorised recreational watercraft is considered inappropriate within the Park given the potential adverse impacts on native fauna and wetland vegetation.

ACCESS FOR MAINTENANCE VEHICLES

Boundary access for maintenance vehicles is provided at many points throughout the Park, including access for fire vehicles and those carrying out mosquito control works. As far as practicable these vehicles will use existing pathways, fire access tracks and fire breaks.

Management vehicle use within the Park must be justified and strictly controlled. Uncontrolled access has resulted in degradation in some areas. A review of the existing track system will limit the impact of vehicles.

Strategies

1. **Implement the Recreation Masterplan. The Masterplan will:**
   - **co-ordinate access and circulation allowing visitors to move safely and conveniently throughout the Park. Park access should be integrated with surrounding community and regional path networks;**
   - **provide appropriate recreation facilities and services;**
   - **provide adequate parking facilities at major recreation nodes;**
   - **provide sensitively located and designed shoreline access to selected wetlands (e.g. boardwalks and viewing platforms); and**
   - **help restrict private vehicles to designated car parks and access roads. (CM, CC, TK, Bikewest, Department of Conservation and Land Management) [High]**
2. **Rehabilitate existing informal trails that are identified as unsuitable for access (Section 21). (CM, CC, TK, Department of Conservation and Land Management) [Medium]**
3. **Restrict horse riding activities at Thompsons Lake and Kogolup Lake to designated bridle trails. Regulate commercial horse riding groups utilising the Park under licensed agreements. (Department of Conservation and Land Management) [High]**
4. **Allow for emergency response within the Park and where appropriate, ensure new paths provide emergency vehicle access (Section 27). (CM, CC, TK, Department of Conservation and Land Management) [High]**

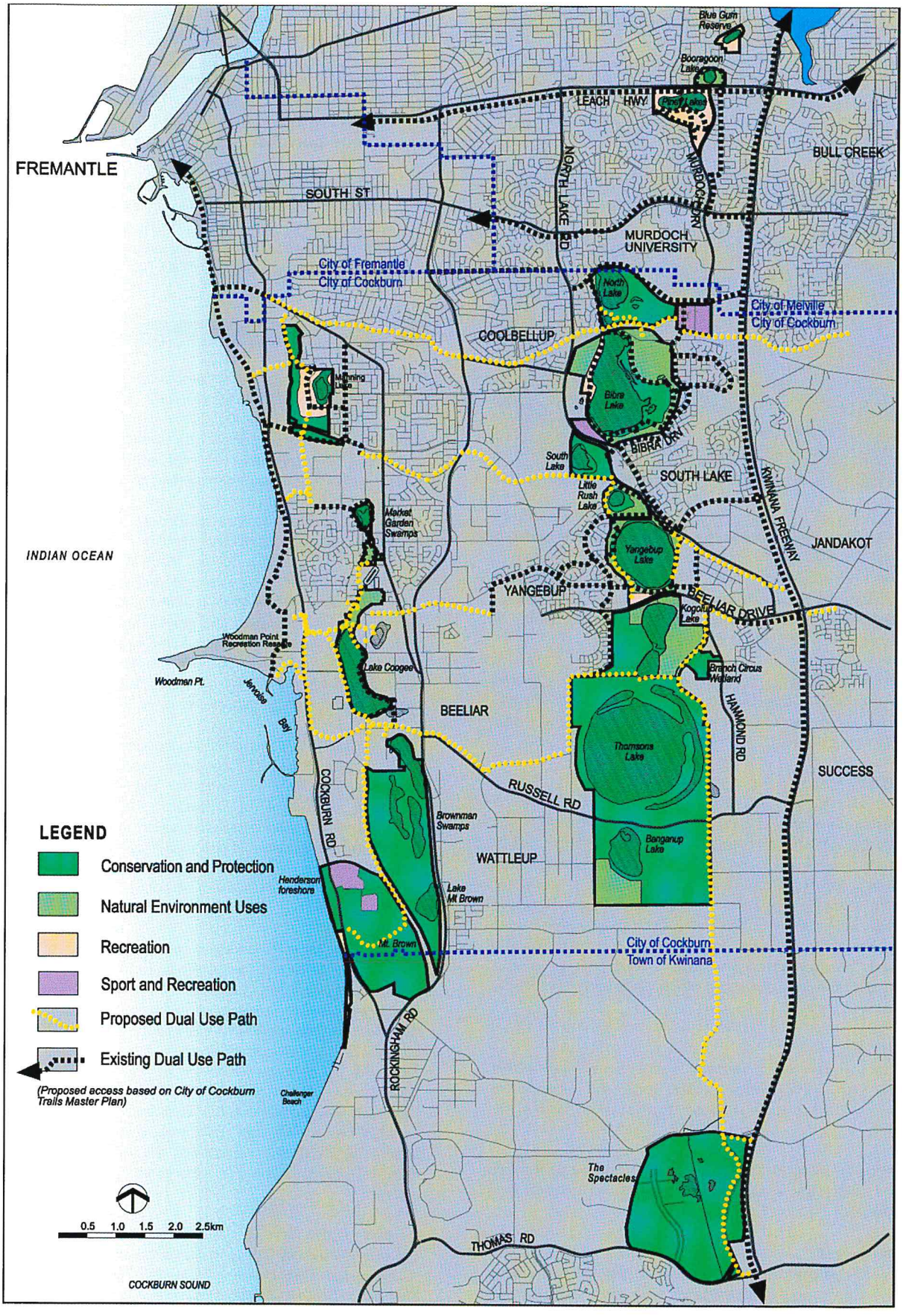


Figure 8 - Overall Park Access and Circulation

30 - Signs

The objective is to provide a system of signs that communicates the location of the Park features, provides orientation assistance, identifies hazards, leads to appropriate use of the recreation areas and helps communicate information about the Park.

Signs play an important role, both notifying Park visitors about the way in which the Park can be accessed and used, as well as communicating information about the Park's identity and values. Signs need to be designed and located to provide messages about the Park in a consistent way and without compromising the quality of the area in which they are sited.

To help ensure signs are designed and located appropriately, the Department of Conservation and Land Management will prepare a sign system and a sign plan for the Park.

Sign System

The sign system will be form a part of the overall Department of Conservation and Land Management's Sign Manual and will outline the design specifications of all signs provided in the Park. It is important that the signs be of a high standard, robust and have a consistent style. Existing sign styles vary between those located in areas under the management of the local governments and those managed by Department of Conservation and Land Management. The sign system will provide a consistent system of signs which are clearly identifiable with the Park.

Sign Plan

The sign plan will direct the placement of signs within the Park. Informational, directional and interpretive signs will be placed at prescribed locations within the Park.

Recognition of the Park will also be enhanced by the use of a park logo on all signs installed by the management agencies.

Strategies

1. **Develop and implement a sign system and sign plan for the Park. The sign system will outline the design of all signs provided in the Park and will form part of Department of Conservation and Land Management's Sign Manual. The sign plan will direct the placement of Informational, directional and interpretive signs within the Park. (Department of Conservation and Land Management, CM, CC, TK,) [High]**

2. **Develop a Park logo for use on feature and information signs. (Department of Conservation and Land Management, Community Advisory Committee) [High]**

3. **Liaise with other authorities which have jurisdiction within the Park to ensure consistency of signs within the Park. (Department of Conservation and Land Management, CM, CC, TK) [Ongoing]**

31 - Visitor Safety

The objective is to take all reasonable and practical steps to enhance the safety of visitors in the Park.

There is always an element of risk in outdoor recreation activities. Nevertheless, all reasonable and practical efforts will be taken to minimise risks to visitors.

Visitor safety will be promoted through information and education about potential problems and dangers. Visitor safety will also be an integral component in undertaking works programs and capital developments within the Park. Recreation facilities and amenities for visitors will be developed and maintained in accordance with relevant Australian Design Standards. Management actions to reduce safety hazards should, if possible, be consistent with the values of the Park and should not intrude unduly on the experience of visitors.

The coastal limestone cliffs at Henderson Foreshore (M91 Coastal Reserve) have been assessed in the last two years in light of potential cliff falls that have occurred elsewhere in Western Australia. Some remedial works have been undertaken in an attempt to reduce any perceived dangers of cliff collapse (Ecoscape and Coastwise 1999). Further assessment of cliff stability should be undertaken as part of any proposals for that area.

It has been recently brought to the attention of the Department of Conservation and Land Management that the Mt Brown and Henderson Foreshore area is contaminated with unexploded ordnance. The area was used for live demonstration firing during World War II by the Commonwealth Department of Defense. The Fire and Emergency Authority of Western Australia (FESA) carried out a field validation study in 1995. Based on this study FESA has classified the area as low to high risk. The high risk area is centred on the summit of Mt Brown, which was the target during the demonstrations. The risk decreases away from the summit.

As part of the Jervoise Bay Enhancement Plan Project the Department of Conservation and Land Management is liaising with Department of Defense, FESA, the Crown Solicitor's Office and Risk Assessment in relation to risk management and amelioration options given potential public risk posed by unexploded ordnance in the area.

When managing risk, the Department of Conservation and Land Management is guided by Policy Statement No. 53 - Visitor Risk Management.

Strategies

1. **Prepare and implement a safety audit program to ensure procedures are developed to manage and monitor all known risks. (Department of Conservation and Land Management) [High]**

2. **Undertake an assessment of cliff stability as part of any development proposals for the Henderson Foreshore Area. (Department of Conservation and Land Management) [Medium]**

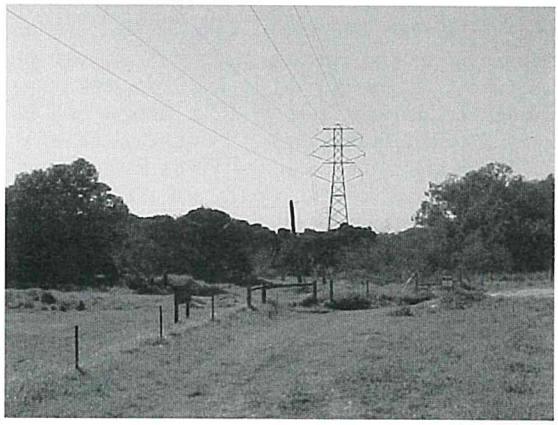
3. **Investigate risk management and amelioration options when considering any public works within the Mt Brown and Henderson Foreshore area given the potential public risk posed by unexploded ordnance in the area. (Department of Conservation and Land Management) [Ongoing]**

4. **Ensure visitor safety is an integral component in undertaking works programs and capital developments within the Park. (CM, CC, TK, Department of Conservation and Land Management) [High]**

5. **Provide interpretive material and information to visitors that highlight potentially hazardous areas, activities and appropriate preventative actions and emergency procedures. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**

32 - Utilities, Park Services and Infrastructure Proposals

The objective is to provide cost efficient, effective and safe services and utilities within the Park in a manner that minimises environmental impact.



Services such as electricity, water, sewerage, gas and telephone are available at locations within the Park. Future recreational, commercial, educational or managerial facilities within the Park may require services at additional locations within the Park.

STORMWATER FACILITIES AND DRAINAGE OUTLETS

There are many stormwater facilities and drainage outlets throughout the Park whose management is the responsibility of the Water Corporation, the relevant local government or the Department of Main Roads. Many of these drains divert stormwater and surface water runoff from the surrounding catchment area into the wetland system. Nutrient enrichment and altered water regimes threaten the natural values of the wetlands.

The two main issues associated with drainage facilities are:

- ecological impacts (Section 14 - Water quality, Section 15 - Vegetation and Section 17 - Weeds); and
- aesthetic and visual impacts (Section 22 - Landscape Amenity).

The ecological impacts associated with stormwater drainage can be reduced and this requires cooperation and consultation between the managing agencies. The management of stormwater entering the Park's wetlands is a catchment wide issue, and controls need to be implemented at that level. As such, all new developments adjoining the Park will be required to dispose of stormwater appropriately within the development site. No additional direct drainage outfalls are permitted in the Park. In the longer term, existing stormwater outfalls will be reviewed to assess the viability of improving water quality entering the Park without constructing additional recharge devices within the Park's boundary.

Many outlets are unattractive and more attention to detail is necessary so that they blend with their natural surroundings. Consideration should be given to their appearance and function by battering back walls and planting the sides with local vegetation. This would have the effect of improving existing outlets and stripping nutrients from stormwater before it reaches the Beeliar Wetlands. These treatments together with modifications to outlet alignments should lead to utilities that remain functional and yet merge into their surroundings.

ROADS

Roads will only be constructed in the Park if they are for management purposes or are servicing a recreation facility. Where possible, facilities should be located near the boundaries to reduce the need to place roads within the Park. Where new urban or industrial development occurs adjacent to the Park, the construction of a roadway or pathway between the development and the Park will provide a well-defined barrier clearly separating differing land uses. Appropriate fencing to control access should also be considered during the development process.

The impacts of upgrading the road network surrounding (and in many instances traversing) the Park are discussed under the sub-heading of Infrastructure Developments Impacting upon the Park.

PARKLAND SERVICING AND MAINTENANCE

Parkland and recreational areas will need regular maintenance that will predominantly be the responsibility of the City of Cockburn, City of Melville and the Town of Kwinana. Maintenance of parkland areas is the responsibility of the managing agency which controls that area. The collection of rubbish, maintenance and provision of toilet facilities and general maintenance operations within the Park will require regular access.

Existing and proposed toilets within the Park are to be connected to sewer outlets or other environmentally acceptable disposal systems. The use of septic tanks is to be avoided except in conjunction with alternative treatment units.

The provision of bins will be minimised and visitors encouraged to take their rubbish home. The dumping of rubbish has been a management issue in some areas of the Park. This will require the enforcement of the relevant local laws relating to rubbish dumping.

POWER LINES

To minimise the visual impact of power supply to facilities within the Park it is advocated that all power lines be placed underground. Mains power lines should be placed so that there is minimal visual impact. Where feasible, power supplies should be from alternative energy sources, for example solar power for Park lighting.

INFRASTRUCTURE PROJECTS WITHIN OR ADJOINING THE PARK

Being located within a developing urban area and in close proximity to industrial areas at Kwinana, Henderson and Fremantle, the Park will continue to be subjected to infrastructure proposals that threaten its values.

Currently, underground sewerage and drainage lines cross the Park at various locations, while services associated with roads also traverse the Park. It is important that the managers of the Park liaise with service providers so that, where possible, future development services are located outside the Park boundary. Additionally, there should be no physical impacts, either during or post construction to the lands or waters that comprise the Park from infrastructure developments that adjoin the Park. This can be achieved by ensuring appropriate conditions are placed on the proponent of developments when they are seeking planning approvals.

Where service corridors are required within the Park, they should be rationalised by combining utility requirements. Where possible, Park developments such as service roads and firebreaks should be developed along these corridors. In circumstances where infrastructure providers have cleared areas of the Park in the past without mitigating impacts (e.g. Water Corporation sewer outfall at Henderson), the managing agencies should seek mitigation works.

Two sewerage and stormwater projects have the potential to impact significantly on the integrity of Beeliar Regional Park. They are:

1. Southern Lakes Drainage Scheme; and
2. Munster Pump Station and Bibra Lake Main Sewer Extension.

Southern Lakes Drainage Scheme

Through the Southern Lakes Drainage Scheme, the Water Corporation of Western Australia is developing a programme of works aimed at protecting the integrity of a number of wetlands in Beeliar Regional Park.

The Southern Lakes Drainage Scheme is required as an environmental condition for urban development of land in the Thomsons Lake area and has approval from the Environmental Protection Authority.

The scheme will divert drainage water from these new urban areas away from Kogolup and Thomsons Lakes in order to maintain their levels and protect them from nutrient loading. The scheme will also control the maximum water levels of Yangebup, Kogolup and Thomsons Lakes.

There are two main components of the scheme:

- Drainage – the construction of a drain to divert stormwater from the new urban areas past Thomsons and Kogolup Lakes to an existing outfall which extends into Cockburn Sound from Woodman Point; and
- Sewerage - the construction of a Deep Sewer Main to service the new urban development will be constructed at the same time as the drainage scheme work to minimise disturbance to vegetation. The sewer main will eventually link into the Bibra Lake main sewer on the western side of Lake Yangebup (Water Corporation 1998).

Where earthworks for the drainage scheme impact directly on the Park, the Water Corporation is committed to restore the easement through an intensive rehabilitation program. The rehabilitation planning has taken into consideration visitor access requirements. Further investigation of the rehabilitation program will occur in consultation with the Water Corporation.

Munster Pump Station and Bibra Lake Main Sewer Extension

The Water Corporation has identified the requirement to upgrade its sewerage system in order to provide the capacity required for the Perth South catchment. In order to do this, the Water Corporation needs to increase sewer and pumping capacity throughout the catchment. A gravity main leading to a new pump station on the west side of Lake Coogee will be constructed as part of upgrading the capacity. All works will be in accordance with the Public Environmental Review prepared for the project and the conditions placed on the project by the Environmental Protection Authority (EPA).

The project offers significant improvements to the sewerage system in the area and will benefit the Park by reducing the risk of sewage overflows. This benefit, however, has impacts on the environment such as the loss of wetland fringing vegetation and subsequent loss of habitat, potential impacts upon the area's heritage values and the visual impacts of suspending a three metre diameter pipe on a low bridge across the northern portion of Lake Coogee.

Proposed extension of the Roe Highway

The Roe Highway project is part of the National Highway System, and has been planned as a Controlled Access Highway in the Metropolitan Region Scheme (MRS) since 1963. The road reserve is located outside of the boundary of the Park, which is defined by the Parks and Recreation reservation in the MRS. The ultimate objective of the Roe Highway is to provide strategic links from key industrial, commercial and transport centres to Fremantle Port (MRWA 2000).

The project has been separated into eight stages. Planning for the final stage, between the Kwinana Freeway and Fremantle, has been placed on hold pending a State government review of freight movement (road and rail) throughout the metropolitan area. This review is expected to be released for public comment by the end of 2001, and will provide further detail on the future status of the proposed road.

Should the final stage proceeds, there will be impacts on Beeliar Regional Park, as the road reserve is located between Bibra Lake and North Lake. Issues such as wetland hydrology, protection of flora and fauna, recreation use, Aboriginal heritage as well as noise and visual amenity will need to be considered in the planning and design for the project.

Proposed Fremantle – Rockingham Controlled Access Highway

The proposed Fremantle – Rockingham Controlled Access Highway has been proposed as a strategic link servicing the industrial areas in the south west metropolitan area of Perth. The alignment of the proposed road is identified in the Metropolitan Region Scheme (MRS) and identified as a Controlled Access Highway.

The current alignment of the road reserve in the MRS forms the western boundary of the Manning Lake area, adjoins the western margin of Lake Coogee, and dissects the Henderson Region Open Space (Mt Brown, Lake Mt Brown and Brownman Swamps). As discussed in Section 7 this portion of the Controlled Access Highway road reserve through the Henderson Region Open Space will be included into the gazetted area of the Park.

Planning for the project has been placed on hold pending a State government review of freight movement (road and rail) throughout the metropolitan area. Should the proposal proceed, impacts on the Park such as wetland hydrology, protection of flora and fauna, recreation use, Aboriginal heritage as well as noise and visual amenity will need to be considered.

Strategies

1. **Where appropriate, ensure a detailed rehabilitation program accompanies service works which occur in the Park (Section 21). (CM, CC, TK, Department of Conservation and Land Management) [High]**

2. **Prevent additional direct stormwater drainage outlets from being constructed in the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Review existing drainage facilities to improve water quality entering the Park and to improve the aesthetics of the outlets (Section 22). No additional recharge basins are to be constructed in the Park. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**

4. **Promote "take it home" rubbish education. (CM, CC, TK, Department of Conservation and Land Management) [Medium]**

5. **Place power lines to facilities and amenity lighting underground, to improve aesthetics of the Park. (CM, CC, TK, Department of Conservation and Land Management) [Low]**

6. **Seek mitigation works from infrastructure providers where they have cleared areas of the Park in the past without mitigating impacts (e.g. Water Corporation sewer outfall at Henderson). (CM, CC, TK, Department of Conservation and Land Management) [High]**

7. **Request that appropriate conditions (which help protect the values of the Park) are placed on the proponents of infrastructure developments when they are seeking planning and environmental approvals. (CM, CC, TK, Department of Conservation and Land Management, WAPC, EPA) [Ongoing]**

E. COMMERCIAL CONCESSIONS

33 - Commercial Goal and Guiding Principles

COMMERCIAL GOAL

Allow for appropriate commercial uses within the Park and manage them in a manner that minimises impact on other values and contributes to park management costs.

COMMERCIAL GUIDING PRINCIPLES

1. Consistency of Commercial Use with Reserve Purpose

Commercial activities should be compatible with the assigned purpose of reserves within the Park. Reserves within the Park will be afforded an appropriate purpose for the protection and enhancement of Park values under the Land Administration Act 1997. Developments within the Park should service visitor demand. Facilities or services which exist or can be developed elsewhere, in a way which adequately meet the needs of visitors, would not normally be provided within the Park.

2. Preservation of the Values of the Land Itself

Commercial use should not compromise the natural and cultural values of the Park. Commercial activities should not be located in areas of the Park with a zoning of Conservation and Protection. Future developments should be of a character and arrangement that does not detract from the natural settings, landscape amenity and conservation values of the Park. Through the tendering process proponents of significant developments within the Park will be required to assess the environmental impacts of the proposed commercial use.

3. Equity

Commercial use within the Park should be of a nature that promotes multiple use by Park visitors. Commercial uses which impair other forms of acceptable use or jeopardise safety of other visitors should be specifically managed, directed to more appropriate places or not permitted. Priority will be given to commercial uses that incorporate features aimed at increasing the awareness, appreciation and understanding of the natural environment. All development applications will be assessed in terms of the overall commercial requirements for the Park.

4. Leased or Owned by the Managing Agencies

Commercial use of areas within the Park should be either through a lease or license arrangement, or where the managing agency owns and operates the facility or development.

5. Financially Viable

Through the tendering process, proponents of significant developments within the park will be required to document the financial viability of the proposed commercial use. Revenue generated by all commercial use within the Park will be used to help meet the overall cost of managing the Park.

6. Management

Activities and facilities must comply with the managing authorities' requirements. If effective management of commercial facilities or activities cannot be provided they should be restricted to appropriate levels, relocated or removed from the Park.

34 - Leases and Licences

The objective is to ensure that commercial operations and leases are consistent with this Plan and that any leases and commercial operations help offset Park management costs.

Leases and licenses may be granted on lands or waters managed by the Department of Conservation and Land Management to provide appropriate facilities and services for visitors. A lease allows the lessee to occupy a particular area of land or waters, whereas a license allows the licensee to enter and use the land.

Proposals for leases and licenses are assessed by the Department of Conservation and Land Management and require approval by the Conservation Commission of Western Australia and the Minister for the Environment. If the land in question is within a management area of the Water and Rivers Commission, the Commission must be consulted. If the land is subject to a Section 16 agreement under the *Conservation and Land Management Act (1984)*, the approval of the owner and consent of the occupier is required before a lease can be granted. Concessions must be consistent with the purpose of the area and the protection of its values.

Leases and licenses provide a mechanism to bring private capital and management expertise into visitor services in natural areas. They need to be carefully designed and managed, or they may detract from the conservation and landscape values of the Park. Appropriate concessions can generate income to help offset Park management costs and can significantly enhance public access and enjoyment of the Park.

The Department of Conservation and Land Management, the City of Melville, City of Cockburn and Town of Kwinana as managers of the Park should assess leasing and commercial operations according to the goals and objectives as set out in this Plan.

All development proposals on land reserved as Parks and Recreation in Perth's Metropolitan Region Scheme require approval from the Western Australian Planning Commission (WAPC). The WAPC in association with the Department of Conservation and Land Management will use this Plan as a mechanism for guiding development proposals within the Park or which impact upon the Park.

All commercial concessions within the Park will be established and managed in accordance with the Department of Conservation and Land Management's

Policy Statement No 18 - Recreation Tourism and Visitor Services. The tendering process for proponents involved in the Park will be consistent with the State and local government tendering processes.

Advertising within the Park requires the approval of the relevant managing agency.

EXISTING COMMERCIAL VISITOR SERVICES

Existing commercial visitor services (including community environmental organisations and recreation clubs) within the Park are as follows:

City of Melville

- Blue Gum Reserve Child Health Care Centre, Reserve 38557, Moolyeen Road, Brentwood.
- Blue Gum Reserve Recreation Centre, Reserve 29571, Disney Street, Brentwood.

City of Cockburn

- Spanish Club of Western Australia, JandAA Pt172 Baker Court, North Lake.
- Murdoch Pines Golf Range, JandAA Pt172 Baker Court, North Lake.
- Lakeside Recreation Centre and Leeming Lakeside Baptist Church (Inc.), CockBL 393 Bibra Drive, North Lake.
- Native ARC (Inc.), Pt of Lot 387 Hope Road, Bibra Lake.
- Bibra Lake Scouts, Pt of Lot 387 Hope Road, Bibra Lake.
- Education Department of Western Australia, Lot 387 Hope Road, Bibra Lake.
- Wetlands Education Centre, Lot 387 Hope Road, Bibra Lake.
- Adventure World Pty Ltd (car park) Reserve 26954, Cnr. Gwilliam and Progress Drive, Bibra Lake.
- Food Van, CockBL 2121, (Bibra Lake Reserve) Progress Drive, Bibra Lake.
- McKillop Catholic Primary School, Lot 8 Yangebup Road, Yangebup.
- Azelia Ley Historic Homestead, Lot 9 Loc. 3727, (Manning Lake Reserve) Davilak Avenue, Hamilton Hill.
- Coastal Park Moto-Cross Track operated by the Coastal Motorcycle Club of Western Australia (Inc), Reserve 39455 Cockburn Road, Henderson.
- Cockburn Volunteer Sea Search and Rescue, Reserve 39584 Gemma Road, Henderson.
- The Cockburn International Raceway operated by Tiger Kart Club (Inc), Reserve 37426 Gemma Road, Henderson.
- Western Australian Radio Modellers (Inc), Reserve 39584, Gemma Road, Henderson.
- Cockburn Holiday Village, Reserve 24308, Cockburn Road, Henderson.

Additionally, the Western Australian Croatian Association has approval to develop a soccer ground and associated facilities at Lot 14 Progress Drive, Bibra Lake. The City of Melville has approval to develop an environmental education centre at Piney Lakes Reserve.

OPPORTUNITIES FOR COMMERCIAL VISITOR SERVICES

There are opportunities for commercial activities that could provide Park visitors with the scope to learn about and explore the Park in new ways. These could include approved ecotourism activities. Commercial operations in the Park are not precluded and provide the opportunity to offer services to the public and a way to raise revenue to assist in the management and provision of facilities in the Park.

The City of Cockburn has developed an Ecotourism Strategy for resources within its municipality. The strategy identified Harry Waring Marsupial Reserve as a site within the Park requiring further investigation for ecotourism activities.

Harry Waring Marsupial Reserve (Banganup Lake)

There is potential to develop the buildings currently within the Harry Waring Marsupial Reserve to contain a low key environmental/ecotourism development. The University of Western Australia currently has a license to undertake research activities at the reserve. Any future ecotourism ventures would need to be consistent with the purpose of the reserve and the conservation and research values of the area. Overnight accommodation is an option that could to be considered as part of an ecotourism development. Income from such a facility could support the research and conservation management of the Park and extend the Department of Conservation and Land Management's community education programs.

Limiting disturbance to the site and protecting areas of cultural significance would be a key consideration in any further detailed planning. Expressions of interest would be sought through the State government tendering process for the development to proceed. A comprehensive environmental assessment, social survey, feasibility study and business plan would be required before the development could proceed.

Bicycle Hire

The provision of cycling facilities is consistent with the management objectives of the Park and should be encouraged. This may include a license to operate a hire business issued to approved operators and which would be subject to license conditions.

Horse Hire

Commercial horse riding operators will be allowed to continue to access Park areas.

The operations of these ventures will be regulated under licensed agreements with use only permitted on designated bridle trails. The conceptual design of the bridle trails is outlined in the Appendix D – Recreation Masterplan. License conditions will enable riding trails to be closed if weather conditions require closure or erosion, disease, or degradation of vegetation occurs. Additionally, a lack of compliance with conditions will result in the removal of licenses. Income generated from the licenses will be used to help offset Park management costs.

Guided Tours

There is the possibility for tour operators to undertake guided tours within the Park. These tours could take a range of forms including:

- Aboriginal and non-Aboriginal cultural heritage tours and activities; and
- nature observation tours and activities.

Commercial guided tours would require the permission of the relevant management agencies under a licence arrangement.

OTHER LEASES, DEVELOPMENTS AND COMMERCIAL ACTIVITIES

Developments and concessions other than those for visitor services are generally not considered appropriate within regional parks, unless there is a considerable benefit to the Park. A number of residential leases exist within the Park, which are inconsistent with the future management of the Park.

It is likely that the managing agencies of the Park will be required to assess proposals for telecommunication facilities (e.g. mobile phone towers) in the Park. When assessing proposals for telecommunication facilities, or managing telecommunication facilities, the Department of Conservation and Land Management is directed by Policy Statement 49 – Radio Communications Facilities Policy.

Existing leases within Beeliar Regional Park will be honoured. Upon expiry, an assessment of the lease will be made of its appropriateness within the Park by the relevant managing agency (see Commercial Guiding Principles).

Residential Leases

Two residential leases exist within the Park. These are located at Lot 7 (215) and Lot 1 (238) Johnson Road, The Spectacles. Residential leases are considered inappropriate within the Park. It is envisaged all residential properties will be professionally assessed and recommendations presented for their future use.

Research License

The University of Western Australia operates the Harry Waring Marsupial Reserve (Lake Banganup) under a license arrangement with the Department of Conservation and Land Management for research purposes.

One-off Special Events

One-off special events will be assessed by the relevant management agency. Depending on the type of activity a concession arrangement may be required between the event organiser and the managing agency. Management agencies should use the guiding principles established for commercial uses as a means of determining the appropriateness of proposed activities. As the agency coordinating the management of regional parks, the Department of Conservation and Land Management should be consulted in the assessment of one-off community events.

Strategies

1. **Establish and manage any commercial operations in accordance with the Department of Conservation and Land Management's Policy Statement No 18, Recreation Tourism and Visitor Services. Concessions in the Park may be permitted if they are consistent with the purpose of the relevant reserve and approved by the Minister for the Environment. Proceeds from commercial operations are to be used for Park management and infrastructure. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

2. **Ensure any commercial activities are consistent with the commercial guiding principles. Conditions are fulfilled by concession holders and an appropriate fee is paid that contributes an income to Park management. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

3. **Proponents of major commercial activities must complete an appropriate expression of interest. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

4. **All development proposals to be assessed in terms of the overall commercial requirements for the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

5. **Assess one-off special events in relation to the guiding principles for commercial use of the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

6. **Where appropriate, allow provisions for community organisations and clubs that are consistent with the reserve purpose. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

7. **Develop management guidelines for advertising within the Park. CM, CC, TK, Department of Conservation and Land Management) [Medium]**

8. **Investigate the potential development opportunities at the Harry Waring Marsupial Reserve. (Department of Conservation and Land Management) [Low]**

9. **Assess the residential lease properties in the Park regarding their future use. (Department of Conservation and Land Management) [High]**

35 - Mining and the Extraction of Basic Raw Materials

The objective is to protect the Park's values from exploration, mining and the extraction of basic raw materials.

There is a strong presumption against mining and the extraction of basic raw materials (BRM) in Beeliar Regional Park.

EXTRACTION OF BASIC RAW MATERIALS (BRM)

Depending on the land tenure involved there are different legislative requirements for extraction or mining of basic raw materials.

On freehold land basic raw materials including sand, limestone, limesand, clay, gravel and hard rock) are not defined as "minerals" under the *Mining Act (1978)* and commercial extraction is subject to Extractive Industry Licences under the *Local Government Act (1995)*. Any freehold property in the Park that is subject to an extractive industry licence will be processed under the *Local Government Act (1995)*.

Basic raw materials targeted on Department of Conservation and Land Management managed land or crown land will be processed under the *Mining Act (1978)*. Any proposals to access basic raw materials on Department of Conservation and Land Management land for "public works purposes" will be considered in accord with the Conservation Commission of Western Australia's Basic Raw Basic Raw Materials Policy Statement No. 5.

Mining of basic raw materials from within the Park is unlikely to be environmentally acceptable and such proposals will be referred to the EPA.

MINING

Applications for mining within the Park will be processed in accordance with:

1. The Mineral Exploration and Development Memorandum of Understanding (MOU) between the Environmental Protection Authority and the Department of Minerals and Energy (DME) (1995) for applications occurring in any conservation reserves in the Park (refer DME Information Series No 11); and

2. The Regional Park Mining Protocol currently being developed by the Department of Conservation and Land Management and DME for all other land tenure in the Park including freehold property, unallocated Crown land, local government reserves and crown reserves vested in other authorities other than Department of Conservation and Land Management.

Mineral exploration in 'A' Class nature reserves, national parks and conservation parks (South West of Western Australia) is subject to the concurrence of the Minister for the Environment and the Minister for Mines. The Conservation Commission of Western Australia may refer proposals causing significant environmental disturbance to the EPA. Approval for mining will require the consent of both Houses of Parliament and EPA assessment.

Strategies

1. **Finalise the Regional Park Mining Protocol. (Department of Conservation and Land Management, DME) [High]**

2. **Assess all requests to access basic raw materials within the Park are in accord with:**
   - **Department of Conservation and Land Management and Conservation Commission of Western Australia policies;**
   - **the Regional Park Mining Protocol; and**
   - **the DME and EPA MOU.**

   (Department of Conservation and Land Management, CM, CC, TK) [Ongoing]

F. RESEARCH AND MONITORING

36 - Research and Monitoring Goal

RESEARCH AND MONITORING GOAL

Seek a better understanding of the natural, cultural and social environments, and the impacts of visitor use and Park management.

37 - Research and Monitoring

The objective is to further develop and maintain knowledge in regard to visitor use, natural processes and other external influences on the Park.

RESEARCH

There are many opportunities for research within the Park and a great need for these studies to be integrated. Comprehensive studies of the Park's wetlands and lakes should assess water quality, water levels, ground water interaction, salinity and midge populations. In addition, visitor impacts, management impacts and external influences all need to be subject to continuing evaluation to assess their effect on the Park.

The managing agencies of the Park are fortunate to have two universities involved in the Park. Murdoch University contains a centre of environmental studies and has been involved in research projects in the Park for many years. The University is currently undertaking research on a variety of issues including water quality, groundwater extraction and midge growth (Section 14).

The University of Western Australia (UWA) is involved through research undertaken at the Harry Waring Reserve. UWA has been operating the Harry Waring research facility for a number of years for research into wetlands and marsupial breeding.

Ongoing research by the two universities and other groups should be encouraged and supported by the Park managers.

It would be appropriate that research projects and monitoring programs involve as wide a range of people as possible. The involvement of volunteers, educational institutions and individual researchers can reduce research and monitoring costs and assist in providing information to management bodies and the broader community.

It is important that all research undertaken in the Park is coordinated by the Department of Conservation and Land Management and a process for authorising access is determined by the managing agencies. This process will help ensure an integrated approach to research, which avoids duplication and where projects can be assigned priorities.

MONITORING

The priorities for monitoring in the Park have been defined by the key performance indicators (Section 11). Key performance indicators for Beeliar Regional Park are:

- bushland condition;
- fauna populations and species diversity;
- visitor satisfaction;
- visitor risk; and
- integrated management.

Individual sections of this Plan provide strategies concerning research and monitoring that is required.

In the past, Murdoch University and community groups have undertaken monitoring projects in the Park. Community groups can play a valuable role in research and monitoring and should be encouraged and trained in environmental practices.

The Cockburn Wetlands Education Centre monitors water quality, water birds and weed infestation at North Lake, Bibra Lake and South Lakes. Monitoring of water levels and water quality is discussed in Section 14, monitoring of mosquitos and midges are outlined in Section 19.

Strategies

1. **Develop an integrated program of survey, research and monitoring based on the Key Performance Indicators (Section 11). (Department of Conservation and Land Management, CM, CC, TK) [High]**

2. **Support and where possible seek grant applications to encourage scientific research and monitoring within the Park. (Department of Conservation and Land Management, CM, CC, TK) [Ongoing]**

3. **Encourage the participation of volunteers, educational institutions and other organisations in research projects within the Park and promote research programs that address the Key Performance Indicators. (Department of Conservation and Land Management, CM, CC, TK) [High]**

4. **Established a process for authorising access to the Park in an effort to ensure an integrated approach to research and monitoring (Department of Conservation and Land Management, CM, CC, TK) [Medium]**

G. COMMUNITY RELATIONS

38 - Community Relations Goal

COMMUNITY RELATIONS GOAL

Promote informed appreciation of the Park's natural environment, cultural values and recreation opportunities and facilitate liaison with the community about its management.

39 - Information, Interpretation and Education

The objectives are to increase the community's awareness, appreciation and understanding of the Park's values and to gain support for management practices.

An effective communication program is essential to achieve the goals and objectives of the management of the Park. It informs the public of attractions, facilities and recreation opportunities available within the Park and provides an avenue to promote an appreciation, and greater understanding and enjoyment of the natural environment. Additionally, it fosters appropriate behaviour so that adverse impacts on the environment are minimised.

The Beeliar Regional Park communication program will have three parts:

- Information – providing an overview of opportunities and details of facilities, activities and regulations;
- Interpretation – exploring natural and cultural features; and
- Education – providing detailed materials and programs designed to facilitate learning, focusing on target groups (e.g. school groups, community groups).

An integrated information, interpretation and education program will be developed for Beeliar Regional Park in conjunction with other educational material produced by the Department of Conservation and Land Management. Mechanisms for facilitating the program include signs, displays, publications (such as brochures and Park notes) and guided activities. Close liaison between the Park managers will be necessary to help ensure the development of a coordinated program of information, interpretation and education for the Park.

Involvement of the community in Park operations, ongoing liaison with community groups and the provision of interpretive and educational materials will be important for maintaining the values of the Park and to maximise its use as an educational resource.

The Cockburn Wetlands Education Centre plays a particularly important role in environmental education and information within the Park. The efforts of the staff and volunteers involved in the Centre have assisted in raising the awareness and understanding in the local community of the Park's identity and values.

As another significant education resource, the City of Melville is developing an interpretation and community centre as part of the Piney Lakes development.

Materials for interpretation and education have been developed for the Park. These include material on the social and natural history of the Park. Visitors to Beeliar Regional Park will require information to help plan their visit, enjoy and appreciate the Park and help them to recall their experience when they depart. The Park offers many opportunities for developing an enriching body of interpretative material.

Key areas for interpretation and education within the Park include:

- the lakes and wetland areas;
- recreational opportunities;
- flora and fauna;
- cultural influences (both Aboriginal and non-Aboriginal);
- Beeliar Wetlands relationship with other wetlands on the Swan Coastal Plain;
- the Regional Park entity, its management and evolution; and
- responsible use of the Park.

The development of interpretive and educational material should be undertaken in a coordinated way to ensure the most effective use of available resources and to ensure that the information prepared is presented in a well integrated and consistent manner throughout the Park.

Strategies

1. **Develop a communication plan for interpreting Park values and understanding management programs. (Department of Conservation and Land Management) [High]**

2. **Continue to liaise with all interest groups to ensure a coordinated approach to interpretation and education within, and adjacent to the Park. (Department of Conservation and Land Management, CM, CC, TK) [Ongoing]**

3. **Continue to encourage, promote and support the local volunteers with essential resources to help them carry out their activities. (Department of Conservation and Land Management, CM, CC, TK) [Ongoing]**

H. PLAN IMPLEMENTATION.

40 - Priorities, Funding and Staff

The objective is to manage the Park according to the priorities developed for implementation.

PRIORITIES

The priorities for managing the Park have been established by the joint managers of the Park and appear in brackets behind each strategy in the Plan. They represent the priorities at the start of the planning process and will be reviewed in reference to changing circumstances during the term of the Plan. There are many strategies outlined in this Plan. While some are guidelines others are prescriptions for specific actions. The local governments of Melville, Cockburn and Kwinana as well as the Department of Conservation and Land Management will implement this Plan within the framework of available resources.

Subsidiary plans and implementation programs
In implementing the priorities of the Plan, more detailed subsidiary plans will be required prior to operations taking place within the Park (see Section 2).

Subsidiary plans to be (or have been) prepared as part of the Beeliar Regional Park planning process include:

- a Pollution Response Plan (Section 14);
- a Weed Control Plan (Section 17);
- a Fire Response Plan (Section 18);
- a Rehabilitation Plan (Section 21);
- a Visitor Survey Program (Section 26);
- a Recreation Masterplan (Section 27);
- Site Development Plans (Section 28);
- a Sign System and Sign Plan (Section 30);
- a Safety Audit Program (Section 31);
- a Regional Park Mining Protocol (Section 35);
- a Communication Plan (Section 39); and
- a Volunteer Information Package (Section 41).

Additionally, a five-year implementation program and annual works program will be prepared to guide the implementation of this Management Plan.

The City of Melville, City of Cockburn, Town of Kwinana and the Beeliar Regional Park Community Advisory Committee will be consulted by the Department of Conservation and Land Management in the preparation of the Park's annual works program and five-year implementation program.

STAFFING

The local governments involved in Beeliar Regional Park will use council staff and contractors for the implementation of this Plan. The Department of Conservation and Land Management services its management obligations with staff from the Regional Parks Unit and contractors.

FUNDING ARRANGEMENTS

The respective local governments and the Department of Conservation and Land Management will finance and manage their respective land areas (Figure 4). The Department of Conservation and Land Management has been allocated a recurrent budget for the maintenance of regional parks from State Treasury. Additionally, a capital budget has been provided by the Western Australian Planning Commission (WAPC) for the future planning and development of facilities within regional parks. Funding for local governments involved in regional parks is available through the Area Assistance Grants Schemes administered by the WAPC.

Responsibility for acquisition of private land proposed for inclusion in the Park remains with the WAPC.

Strategies

1. **Prepare and implement a five-year implementation program and annual works program, taking into account the priorities identified in this Plan. Consult with the appropriate management agencies and the Park's Community Advisory Committee when preparing these programs. (Department of Conservation and Land Management) [High]**
2. **Seek corporate sponsorship and other funding arrangements for the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

41 - Community Involvement

The objective is to actively encourage as much community involvement as possible in implementing the Management Plan.

Preparation of the Management Plan
The community was made aware of the preparation of this Management Plan through liaison, newspaper advertising, articles and publications produced by the Park's managing agencies.

A community workshop was held in October 1998 as part of the management planning process. The workshop was attended by people representing broad community interests as well as representatives from the local governments and the Department of Conservation and Land Management.

Liaison between the Department of Conservation and Land Management, the City of Melville, the City of Cockburn and the Town of Kwinana has also taken place and will continue.

Community involvement in the implementation of this Management Plan

The public is involved in the implementation of this plan through membership of the Beeliar Regional Park Community Advisory Committee. The Committee will promote community involvement in the Park by acting as a broad community forum at which issues affecting the Park are openly discussed. A call for nominations to the committee was first advertised during June 1997, and established in January 1999. The committee consists of community members, Department of Conservation and Land Management representatives and representatives from the relevant local governments involved in the Park. The committee's role is to assist in the development of the Management Plan and to provide advice in regard to the ongoing management of the Park.

The existing Community Advisory Committee's role, composition and structure will be reviewed periodically.

It is very important that the community is actively involved in implementing the management plan. This encourages a sense of ownership of the Park by the community and encourages interested people to become involved in the Park's future planning and management. To facilitate the community involvement in the Park the Department of Conservation and Land Management has prepared a Regional Park Volunteer Information Package.

Residents bordering the Park can have a great impact on the Park. It is important to seek the cooperation and involvement of adjacent landowners to protect the values of the Park. This can be done through educational programs, which promote responsible use of the Park and inform the community of management roles and responsibilities. Programs should outline the effects of inappropriate activities such as dumping rubbish and garden waste in the Park, and the disposing of fish and pool water into local drains which flow into the Park's wetlands and lakes.

There are a number of educational institutions within close proximity to the Park. These include Murdoch University, University of Western Australia (Harry Waring Marsupial Reserve), Challenger TAFE, Kwinana Senior High School and Marter Christi Catholic School. All educational institutions should be encouraged to use the Park for educational research purposes.

There are a number of different ways members of the community can be involved in assisting with the implementation of this Plan including:

- joining community volunteer groups;
- joining the Department of Conservation and Land Management's Bush Rangers Program;
- contacting members of the Beeliar Regional Park Community Advisory Committee;
- reporting problems and issues to the managing agencies;
- involvement in clean up days (e.g. Cleanup Australia Day); and
- using the community service program to assist in Park management.

It is important that all works carried out are carefully planned and coordinated by the managing agencies. Activities need to be consistent with the planning and operations of the managing agencies. Volunteer works should be developed in consultation with community groups and need to be consistent with the Park's annual works program and five year implementation program.

Strategies

1. **Maintain active liaison with community groups involved in the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

2. **Encourage and support the activities of community groups, schools and associations interested in the Park. (CM, CC, TK, Department of Conservation and Land Management) [High]**

3. **Facilitate community involvement in the Park by implementing the Regional Park Volunteer Information Package. (Department of Conservation and Land Management) [Ongoing]**

4. **Promote responsible use of the Park and keep the community and other organisations informed of management actions, programs and developments within the Park. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

5. **Promote community groups involved in the implementation of this Management Plan and subsidiary plans. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

6. **Encourage the use of the Park by educational institutions. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

7. **Coordinate all activities of volunteers in the Park in liaison with community groups. (CM, CC, TK, Department of Conservation and Land Management) [Ongoing]**

42 - Term of this Plan

This Plan will help progress the Park towards its long-term vision (Section 5). In doing so it will be subject to conditions and reviews to ensure its appropriateness and effectiveness.

The term of this plan will be 10 years. If the Plan does not require revision after 10 years, it will continue to provide management direction. Section 61 of the *Conservation and Land Management Act (1984)* provides for the Plan to be amended as required. If major changes to the Plan are proposed, the revised Plan will be released for public comment.

43 - Performance Assessment

The Conservation Commission of Western Australia has overall responsibility for monitoring the implementation of the Plan. The effectiveness of the Plan will be reviewed through a formal auditing and review process.

The Plan will be subject to:

- a mid-term (five year) and end-of-term (10 year) audit; and
- an annual review.

The difference between the two processes is described below:

Mid-term and end-of-term audit

The Plan will be audited mid-term and towards the end of its 10 year term by the Conservation Commission of Western Australia. This will include a re-assessment of the overall direction of the Plan (including the need for a replacement Management Plan) in light of what has been achieved, changes in surrounding land uses, community aspirations, funding and relative priorities.

Overall management performance will be audited assessing the key performance indicators and key management strategies (see Table 3).

Annual review

The purpose of the annual review is to assess the implementation progress of the Plan prior to preparing the operations program for the following year. The annual review will be undertaken by Park management and should identify which strategies have been achieved since the last review and facilitate target setting for the next year. Major milestones and achievements should be noted for updating the Plan and informing the Conservation Commission of Western Australia.

Strategies

1. **Review the implementation of the Management Plan annually to identify strategies that have been achieved and to what degree any new information may affect management. (Department of Conservation and Land Management, CM, CC, TK, Community Advisory Committee) [Ongoing]**
2. **Audit the Management Plan mid-term and towards the end of its 10 year term. (Commission of Western Australia) [Ongoing]**

Table 3 - Performance Audit Table

Key Performance Indicators	Key Management Targets	Key Management Strategies	Timeline
Fauna populations and species diversity.	To maintain the current populations of selected indigenous fauna species in the Park	16.1 Develop and implement a targeted and integrated monitoring program of the fauna within the Park with monitoring of aquatic invertebrates assigned a high priority.	To be completed prior to mid-term audit.
Bushland condition – • assessment of bushland condition; • priority weed species; and • changes to vegetation communities.	Increase the areas of bushland condition assessed as good – excellent within the Park; and reduce the area of priority weeds in the Park, as identified in the weed management plan.	17.1 Prepare and implement a weed management plan in accordance with the Environmental Weed Strategy developed for the Department of Conservation and Land Management. The plan will: • assess bushland condition; • prioritise and control weed species according to invasiveness, distribution and environmental impacts; • assess changes to vegetation communities; • identify largely weed free areas, maintain these areas, and conduct weed control works out from these areas; • integrate with the rehabilitation plan (Section 21) and not carried out in isolation. 21.1 Prepare and implement a rehabilitation plan for the Park prioritising proposed works.	To be completed within 1 year of the release of the draft Management Plan. To be completed within 1 year of the release of the draft Management Plan.
Visitor satisfaction and visitor numbers.	Maintain sustainable use of the Park and an overall trend of positive visitor satisfaction.	26.1 Develop and implement a visitor survey program to gain an understanding of visitor use, numbers and satisfaction within the Park. Use the Department of Conservation and Land Management's VISTAT as a basis for the program. 26.3 Prepare a Communication Plan incorporating a sign system and sign plan as well as interpretive strategies and techniques. Interpretive material should be aimed at: • promoting visitor use and activities which are consistent with the protection and promotion of Park values and minimise conflicts between Park visitors; and • providing information about the recreation and interpretation opportunities available in the Park. 29.1 Implement the Recreation Masterplan. The Masterplan will: • co-ordinate access and circulation allowing visitors to move safely and conveniently throughout the Park. Park access should be integrated with surrounding community and regional path networks; • provide appropriate recreation facilities and services; • provide adequate parking facilities at major recreation nodes; • provide sensitively located and	To be completed prior to mid-term audit. To be completed prior to mid-term audit. Access and circulation aspects of the Masterplan to be completed prior to the end of term audit.

		designed shoreline access to the Lake (e.g. boardwalks and viewing platforms); and • help restrict private vehicles to designated car parks and access roads.	
Visitor risk.	Remove or mitigate all identified high risk sites or facilities in the Park.	31.1 Prepare and implement a safety audit program to ensure procedures are developed to manage and monitor all known risks.	To be completed prior to mid-term audit.
Integrated Management.	Not applicable	7.1 Create reserves to be placed in the care, control and management of the relevant managing agency using Table 1 and Figure 4 as a guide. 10.3 Prepare interagency agreements that provide Park management with the authority to regulate in all areas of the Park (e.g. local government rangers controlling dogs in all areas of the Park).	To be completed prior to mid-term audit. To be completed prior to mid-term audit.

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Appendix A - Abbreviations

A list of abbreviations used in this plan:

AHD	Australian Height Datum - the height above mean sea level
CAMBA	China Australia Migratory Birds Agreement
CBD	Central Business District
CC	City of Cockburn
CM	City of Melville
DME	Department of Minerals and Energy
DOLA	Department of Land Administration
DOT	Department of Transport
DPUD	Department of Planning and Urban Development (now MFP)
DUP	Dual Use Path
FESA	Fire and Emergency Services Authority of Western Australia
HDWA	Health Department of Western Australia
ICOMOS	The International Charter for the Conservation of Monuments and Sites. The Burra Charter was adopted by the Australian ICOMOS in 1981.
JAMBA	Japan Australia Migratory Birds Agreement
LC	LandCorp
MFP	Ministry for Planning
MRWA	Main Roads Western Australia
MRS	Metropolitan Region Scheme
RAOU	Royal Australasian Ornithologists Union (now Birds Australia)
RAMSAR	Convention on the Conservation of Wetlands of International Importance: Especially as Waterfowl Habitat. Known as the Ramsar Convention
SPC	State Planning Commission (now WAPC)
SRMA	Swan River Management Authority
TK	Town of Kwinana
WAPC	Western Australian Planning Commission
WC	Water Corporation
WP	Western Power
WRC	Water and Rivers Commission

Appendix B - Vegetation Communities and Assemblages within the Park

THE UPLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

In the Park there are six types of upland plant communities or assemblages:

- **Low Woodland of Banksia Species**
  Characterised by the dominant species of *Banksia attenuata* and *B. menziesii* at Blue Gum Lake, Kogolup Lake, Thomsons Lake and Harry Waring Reserve and with the addition of *B. ilicifolia* and *B. grandis* at Brownman Swamps and Lake Mount Brown, in medium to good condition.

- **Low Woodland to Low Forest of Eucalypts and Banksia species**
  Present at North Lake, Yangebup Lake and Brownman Swamps in good condition with patches also remaining at Bibra Lake. The species include *Eucalyptus marginata, Banksia attenuata, B. menziesii, B. ilicifolia* and *B. grandis.*

- **Open Forest of Eucalypt and Banksia species**
  Occurs at Brownman Swamps which is the best representation both in terms of area extent and condition but is also present at Yangebup Reserve (in good condition), and at South Lake, Manning Lake and Market Garden Swamps (in altered condition). The dominant species comprise *Eucalyptus marginata, E. gomphocephala, Banksia attenuata, B. menziesii, B. ilicifolia,* and *B. grandis.*

- **Low Woodland to Low Forest of Eucalypts, Casuarina and Banksia**
  Present at Thomsons Lake and The Spectacles in good condition and at Kogolup Lake in moderate condition, comprising the following dominant species: *Eucalyptus marginata, Corymbia calophylla, Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana.*

- **Very Low Open Woodland Eucalypt species**
  Occurs around Thomsons Lake with the dominant species being *Eucalyptus todtiana.*

- **Scrub of Acacia**
  Present at Thomsons Lake with the dominant species being *Acacia saligna.*

THE WETLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

There are twelve types of wetland communities or assemblages present in the Park:

- **Low Forest of *Melaleuca rhaphiophylla***
  Occurs at Booragoon Lake, North Lake, Kogolup Lake and at The Spectacles in good condition.

- **Low Woodland to Low Forest of *Eucalyptus rudis***
  Occurs in patches or in combination with other assemblages at Booragoon Lake, Kogolup Lake, Thomsons Lake, Banganup Lake (Harry Waring Reserve), and The Spectacles in good condition and in poor to medium condition at North, Bibra and Little Rush Lakes.

- **Low Forest of *Melaleuca preissiana***
  Fairly widespread occurring in ten Park locations, being best represented at Piney Lakes Reserve, Kogolup, Thomsons, Banganup, North and South Lakes and at The Spectacles.

- **Low Open Forest of Melaleuca**
  Occurs at Piney Lakes and at Banganup Lake and comprises *Melaleuca preissiana* as the dominant species over an understorey heath of *M. teretifolia* and *M, lateritia.* Its best example is at Piney Lakes. This was once a widespread community typifying the Bassendean wetland assemblages.

- **Low Open Woodland of Marri and Paperbark**
  Occurs at Piney Lakes in good condition and comprising *Corymbia calophylla* and *Melaleuca preissiana.*

- **Low Open Woodland of Banksia and Melaleuca**
  Occurs at five Park locations being best represented at Thomsons, North and Piney Lakes and the eastern shore of Bibra Lake.

- **Shrubland of *Melaleuca teretifolia***
  Is widespread throughout the Park both in patches and as dense thickets, being best represented at Booragoon, Bibra and South Lakes and at The Spectacles but also occurring at Little Rush, Banganup and Kogolup Lakes.

- ***Banksia spp. and Agonis linearifolia* Scrub**
  Has only been cited at only North Lake where it is in good condition.

- **Heath of *Astartea fasticularis***
  Once widespread through the adjacent Jandakot region but very little of it remains, cited only at Piney Lakes, where it is in good condition. This species also occurs, again at Piney Lakes, as a heath in combination with *Viminaria*.

- **Sedge communities**
  Occur at a number of the wetlands:
  Baumea articulata occurs in minor areas at both Thomsons and Banganup Lakes. *Schoenoplectus validus* occurs as a minor community at Little Rush Lake. It is uncommon and is worthy of protection. There is a community of *Isolepis species*, which is also uncommon in the southern wetland at The Spectacles.

- **Low Woodland to Low Open Forest of *Melaleuca rhaphiophylla* with an understorey of sedgeland and open shrubland**
  Occurs in all of the reserves of the eastern chain but is best exemplified at Brownman Swamps.

- **Low Forest of *Melaleuca cuticularis* along with shrubland of *M. cuticularis* and *M. rhaphiophylla* and Low Samphire Heath, comprised of *Sueda australis, Atriplex pseudosum* and *Sarcocornia spp.,***
  Occur at both Lake Coogee and Market Garden Swamps, but are disturbed in both locations and in need of rehabilitation and protection.

THE COASTAL VEGETATION COMMUNITIES AND ASSEMBLAGES

There are four types of coastal communities or assemblages In the Park:

- **Low Open Woodland Eucalypt species**
  Occurs in minor patches at Manning Reserve and the M 91 Henderson Reserve, being *Eucalyptus decipiens*, which, whilst having been disturbed, is an important representative.

- **Scrub of Acacia**
  Present as *Acacia rostellifera* along with *Melaleuca hugelii* at Manning Reserve, the Henderson Foreshore Reserve (M91) and the Brownman Swamps. All in juxtaposition with Low Heath Communities as described below.

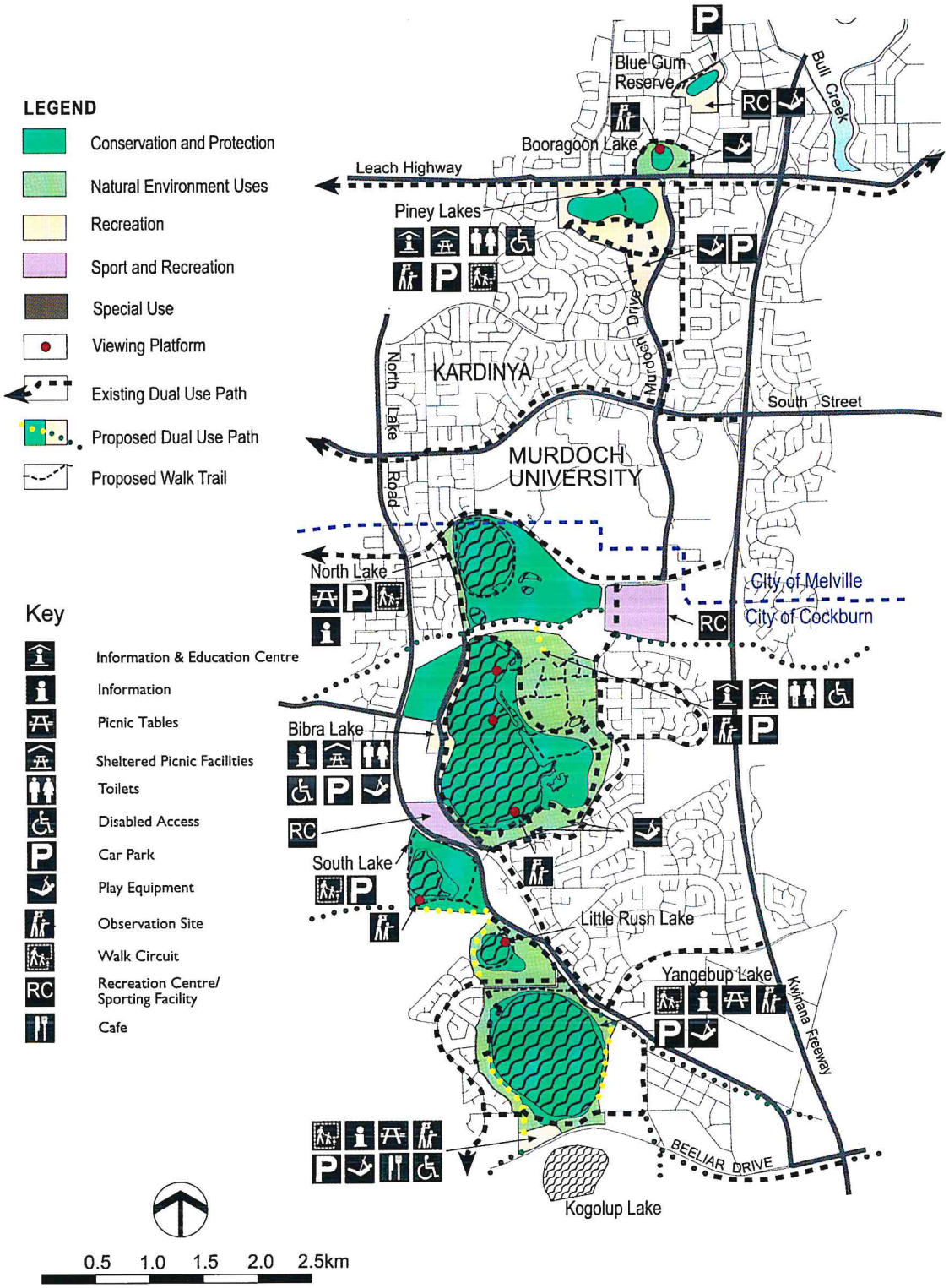
- **Low Heath Communities**
  Present at Manning Reserve, the Henderson Foreshore Reserve and the Brownman Swamps incorporating, amongst others, *Melaleuca hugelii, M. acerosa, Grevillea thelemanniana* and *Hibbertia hypericoides*, with the highest diversity heath community being at the Henderson Foreshore. A further Low Heath community also occurs in restricted areas at the Henderson Foreshore and that comprises a dominance of *Acanthocarpus preissii* and *Frankenia pauciflora*, in fair to good condition.

- **Scrub of Parrot Bush**
  Occurs in patches at Manning Reserve, the Henderson Foreshore and Brownman Swamps being *Dryandra sessilis* in association with *Hakea prostrata*.

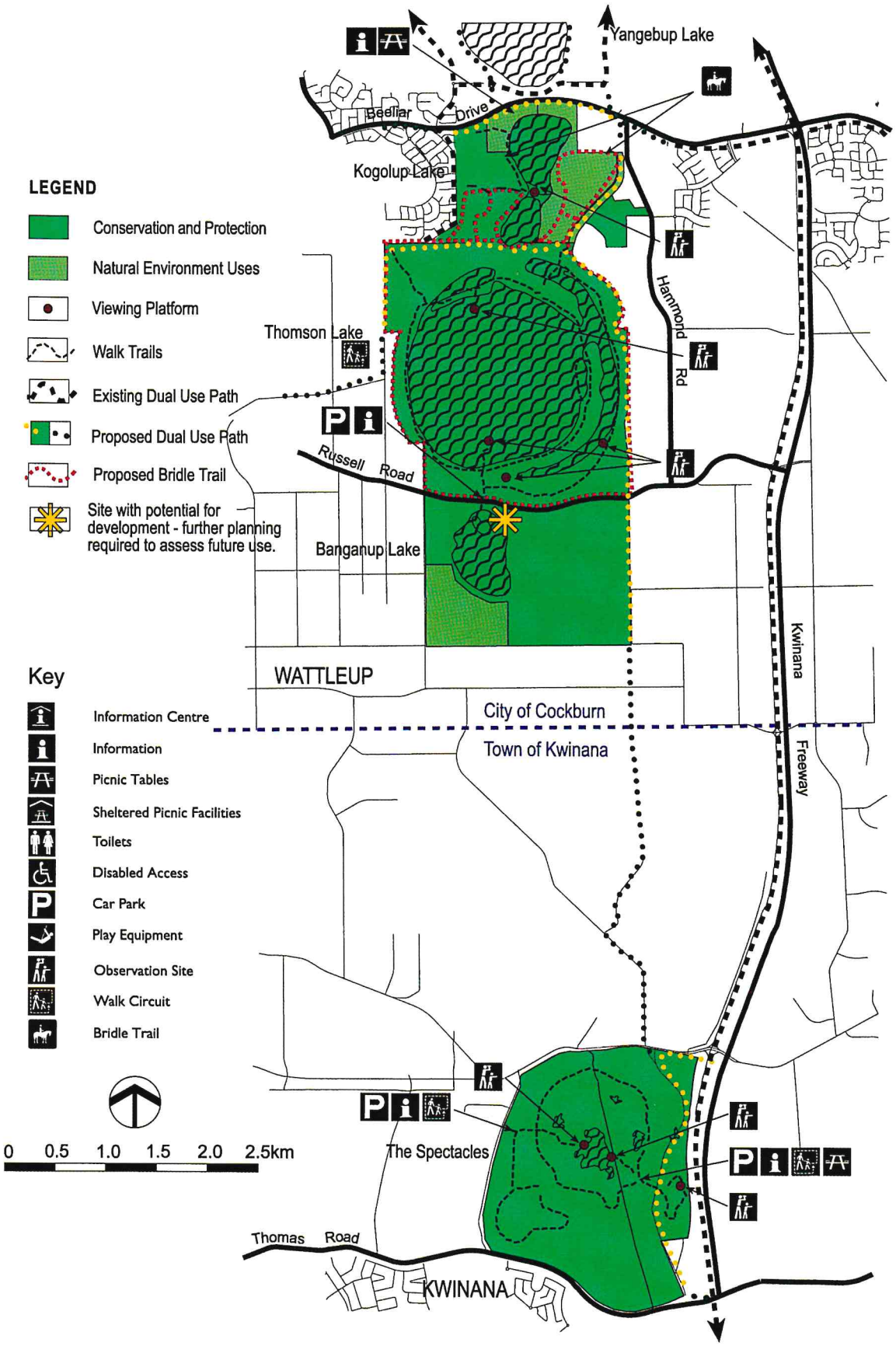
Appendix C - Swan Coastal Plain Landscape Character Type

SCENIC QUALITY	LANDFORM	VEGETATION	WATERFORM
HIGH	• Rounded foothills with steep slopes. • Dunal formations of distinctive height, configuration or combination which provide obvious contrast to the landform patterns common in the character type (e.g. Spearwood dunes). • Dissected calcareous dunes featuring rugged limestone cliffs, caves and outcrops (e.g. Blackwall Reach). - Gently inclined or level areas with distinctive drainage patterns (e.g. Pinjarra Plain). • Large stretches of coastal landscape free of disturbance (coastal heath). Coastal dunes which display areas of active weathering, steep and irregular slopes and ridges (e.g. Lancelin). - Prominent limestone cliffs and headlands (e.g. Cape Peron). - Offshore estuarine sandbars and reefs.	• Scattered remnant vegetation forming an open parkland. • Remnant or other areas of native vegetation exhibiting an unusual diversity of colour, height or species. • Distinctive displays of seasonal colour. • Wind-shaped, gnarled or dwarfed vegetation unusual in form, colour or texture. • Strongly defined patterns of woodland, dune and wetland vegetation.	• All estuaries, wetlands and swamps. • Watercourse of permanent or intermittent flow with continually changing flow character. • Reservoirs with dominant natural characteristics.
MODERATE	• Expanses of beach with uniform width and colour. • Regular coastal edges without bays, inlets or cliffs. • Areas of plains with common patterns of dissection evident but not distinctive. • Areas of uniform undulation with less distinct drainage. • Dunal formations and uniform height and configuration.	• Less diversity in vegetation with regular patterns in height, colour and texture evident. • Vegetation patterns found commonly in the surrounding landscape (coastal heath).	• Intermittent watercourses with long stretches of unchanging flow characteristics. • Reservoirs with some natural characteristics.
LOW	• Areas of uniform indistinctly dissected plains with few features of visual interest. • Coastal landscapes which are of special visual significance and therefore rate no lower than moderate scenic quality.	• Extensive areas of vegetation with repetitive patterns or showing little variation or diversity (coastal heath).	• Waterbodies with little evident natural characteristics. • Irrigation and drainage.

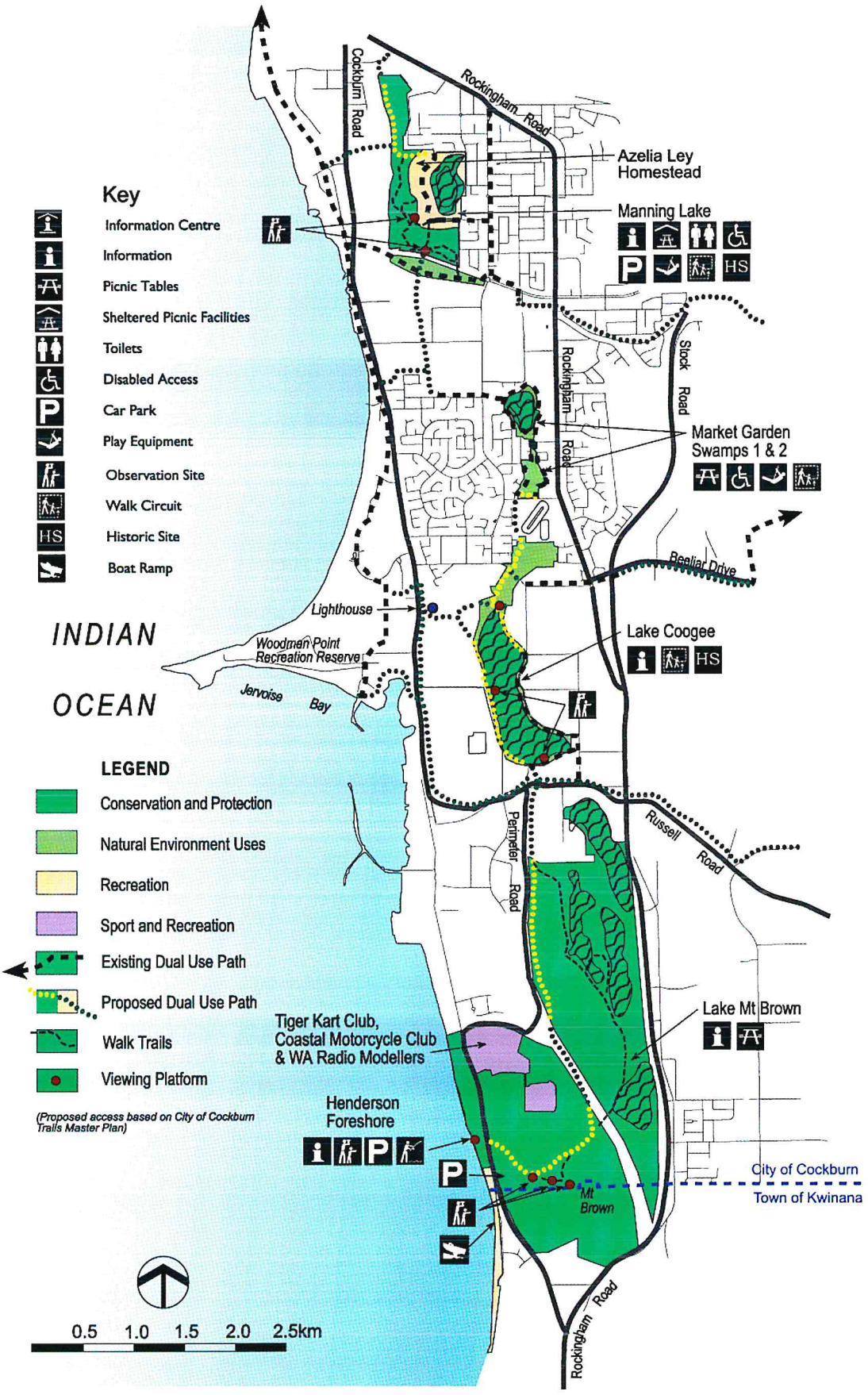
Appendix D - Recreation Masterplan



Recreation Masterplan - Section 1 Blue Gum Lake to Yangebup Lake



Recreation Masterplan - Section 2: Kogolup Lake to the Spectacles



Recreation Masterplan - Section 3: Manning Lake to Kwinana Foreshore

Appendix E - Glossary of Terms

Aeolian	soil massing formed through deposition by wind blow.
Avian	of or pertaining to birds.
Avifauna	the birds of a given region.
Biota	naturally occurring group of individuals having the same genetic composition.
Calcareous Silt	fine particles of lime/calcium sediment.
Consanguineous	as in 'related by birth'. In the case of Beeliar Regional Park it refers to each of the chain of wetlands having formed from the same or similar event or cause.
Dolomite	common mineral, calcium magnesium carbonate.
Eutrophication	the process of which occurs in waters high in nutrients encouraging the growth of algae.
Geomorphic/ Geomorphology	resembling the earth in form/ the study of the characteristics, origin and development of landforms.
Hydroperiod	the time taken for the drier-wetter-drier cycle to occur seasonally. In this instance a cyclical pattern has been noted whereby some seasons have shorter hydroperiods than others, over a twenty two year span.
Stratigraphy	in this context: '…..complex underlying (layering) of impervious and porous layers….'
Tamala Limestone	formerly known as coastal limestone, consisting of coarse to medium grained calcarenite, composed of skeletal fragments etc it is of the Pleistocene age.
Taxa	from taxonomy, the study of classification of organisms according to their differences or similarities.

Appendix F - Contacts

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