CITY OF PERTH

BOLD PARK AND ENVIRONS

PUBLIC ENVIRONMENTAL REVIEW

[redacted]

.L McCOTTER
OSCAPE

BOLD PARK AND ENVIRONS

PUBLIC ENVIRONMENTAL REVIEW

[redacted]

For:

PERTH CITY COUNCIL

August [redacted] 1993

92W41

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STUDY AREA

Study Area Boundary

1:20,000

(Department of Land Administration, Aerial Photography - 1992)

INVITATION

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

The Public Environmental Review (PER) identifies the values and potential land uses for Bold Park and adjacent areas within the City of Perth. In accordance with the Environmental Protection Act, a PER has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 8 weeks from **30 August 1993** closing on **25 October 1993.**

Following receipt of comments from government agencies and the public, the EPA will prepare an assessment report with recommendations to the government, taking into account issues raised in public submissions.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions may be fully or partially utilised in compiling a summary of the issues raised or, where complex or technical issues are raised, a confidential copy of the submission (or part thereof) may be sent to the proponent. The summary of issues raised is normally included in the EPA's assessment report. Submittors would not be identified to the proponent without the submittors permission.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name
- address
- date

The closing date for submission is **25 October 1993**

Submissions should be addressed to

The Environmental Protection Authority
Westralia Square
38 Mounts Bay Road
PERTH WA 6000

Attention: Simon Smalley

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LIST OF ABBREVIATIONS

AHD	Australian Height Datum
CALM	Department of Conservation and Land Management
CBSHS	City Beach Senior High School
dB(A)	noise level in decibels using the A weighting network which simulates the characteristics of the human ear
DPUD	Department of Planning and Urban Development
EPA	Environmental Protection Authority
LEAP	Landcare and Environment Action Program
MRD	Main Roads Department
MRPA	Metropolitan Region Planning Authority
MRS	Metropolitan Region Scheme
OMH	Other Major Highway
PER	Public Environmental Review
RAOU	Royal Australian Ornithologists Union
RDA	Riding for the Disabled Australia
RRR	Road Reserves Review
SPC	State Planning Commission
TPS	Town Planning Scheme
USDA	United States Department of Agriculture
WAWA	Water Authority of Western Australia
YMCA	Young Mens Christian Association

SUMMARY

INTRODUCTION

This Public Environmental Review (PER) was commissioned by Perth City Council with the aim of providing a broad structure plan for the future of Bold Park and adjoining bushland which addresses the conservation, recreation, landscape, social, scientific and educational values of the area. There has been considerable debate over the appropriate use of various parts of the study area in recent years. Development options such as major regional roads, residential development and educational facilities have been proposed while at the same time there have been calls for conservation of the land for recreational, scientific and educational purposes.

The Environmental Protection Authority (EPA) was concerned about the potential cumulative impacts of a number of development proposals for the area and therefore determined that an overall PER was required. The aim of the PER is to provide information about the proposals and their potential impacts. The study comprised assessment and analysis of the environmental, physical, social and economic characteristics of the area in addition to consideration of land development and management issues.

The community were extensively involved in the process through a Community Advisory Group which liaised regularly with the study team, a public workshop, submissions and a preliminary exhibition of findings. A survey of park users was also conducted to determine the level of community use and community attitudes towards the park.

A major outcome of the study is a preferred structure plan which is intended to guide future land use management decisions in order to protect and enhance the outstanding conservation and recreation values of the study area.

EXISTING ENVIRONMENT

A number of Structure Plan options were developed after an extensive assessment of the study area was completed. The existing environment has been analysed in terms of its conservation, recreational, visual, scientific, educational, social and economic significance. In order to clearly identify the values, a series of high, medium and low rankings were developed and mapped for five variables; flora and vegetation values, fauna values, visual significance, recreational use and scientific and educational use.

The maps indicate that the majority of the study area has outstanding landscape values, high quality flora and fauna, is highly valued by user groups for recreational, scientific and educational activities.

Particular values which were identified include:

- eight major vegetation communities and over 200 native species, generally in good condition with limited weed invasion;
- 18 regionally significant flora species and four priority species;

- 29 species of reptiles which is significant and suggests that the reptile fauna has been relatively unaffected by European settlement;
- 77 species of birds and the study area is the only location in Perth where three species of Fairy-wrens occur together;
- considerable soil and topographic variability which has experienced limited disturbance;
- the large size of the area of natural bushland and its location in the metropolitan region;
- the significant regional linkages which are provided to adjoining open space bushland;
- outstanding landscape values which can be viewed from a large area and significant coast and city views;
- the area is highly valued by recreational users for its natural feel; and
- the area is a major location for educational and research programs by the WA Museum, schools and other organisations.

The overall conservation value of the area was determined by synthesizing the results of all the investigations and rankings. A map of Composite Values (Figure 3.5) was produced which identifies those parts of the study area exhibiting high, medium and low composite values.

The majority of the study area falls within the high composite value ranking, thus emphasizing the considerable local and regional significance of the area for conservation, landscape, education and recreational purposes.

OWNERSHIP, PLANNING AND MANAGEMENT

With a few exceptions the study area is owned by the City of Perth. A number of leases cover parts of the study area including the Quarry Amphitheatre, Perry House, City Beach Bowling Club and First City Beach Scout Hall.

Both the Metropolitan Region Scheme (MRS) and the City of Perth Planning Scheme provide for a highway reserve for the proposed Stephenson Highway which crosses the study area. They also provide that part of the study area is reserved for parks and recreation and other areas are zoned to permit residential development.

The EPA and the Department of Conservation and Land Management have both made recommendations which directly affect the study area.

- System 6 Recommendations

The 1983 System 6 Report prepared by the Department of Conservation and Land Management (CALM) identified areas of conservation significance. The study area

comprises area M47 and part of area M46. The report suggested that the Perth City Council prepare a management plan for land within the M46 area and, in relation to M47, endorsed a policy to maintain and extend Bold Park. It also made specific mention of Bold Park as an example of a central park of regional significance and makes two recommendations relating to Regional Parks:

1. Areas identified through planning procedures as open space of regional significance should, where appropriate, be designated as Regional Parks.

2. The National Parks Authority be given the responsibility for co-ordinating the planning and management of areas identified as Regional Parks, providing technical advice, and examining the present funding and co-ordination of development programs.

- Recommendations of the EPA

The EPA has produced three reports relating to the study area with the first, Bulletin 322, identifying the need for this study. The reports emphasised the EPA's commitment to System 6 proposals, specifically with regard to Regional Parks.

They identified the regional values of the M47 area and considered the range of development pressures which could threaten the integrity of M47, specifically:

- the Stephenson Highway Reserve;
- the westward extension of Underwood Avenue;
- the development of land owned by the City of Perth; and
- the realignment of dangerous curves in the West Coast Highway near Challenger Drive.

The EPA concluded that it would be unable to support all four proposals within the M47 area on the grounds that the cumulative impacts would be considerable and environmentally unacceptable.

In response to this Perth City Council proceeded with a Stage 1 PER which considered the impacts of realigning the dangerous curves on the West Coast Highway (Dames and Moore, 1992) and committed to the preparation of this Stage 2 PER to consider the remaining issues.

DEVELOPMENT ISSUES AND IMPACTS

A range of development proposals including those mentioned above were investigated so as to determine their impacts on the values of the study area. The proposals include:

- Stephenson (Western Suburbs) Highway Route

The need for the proposed Stephenson Highway, which intends to provide for a north-south regional link, is supported by the Road Reserves Review (RRR).

There are currently two route options, one identified in the MRS and an alternative suggested in the RRR. Both would have significant impacts on the study area in terms of flora, fauna, recreational value, educational and scientific value, landscape value, noise, size and linkages.

The MRS option would have the greatest impact on the study area due particularly to severance, the loss of flora, interruption to the landscape and noise intrusion. The RRR route would have significantly less impacts on the study area although impacts on adjoining residential areas would be correspondingly higher. The community consultation program indicated that there is strong opposition to any new highway alignment through, or adjoining, the study area.

- Knightsbridge

This proposal provides for residential development on Lot 1 Stephenson Avenue which adjoins the study area and falls within the City of Nedlands. Two previous proposals have been deemed unacceptable by the Minister for Environment. A third proposal has been considered through the environmental impact assessment process and is now awaiting the outcome of negotiations being pursued by the State government.

The impacts of the proposal on the study area are limited to those which can spread to the study area and result from urban development of adjoining bushland. However urban development of Knightsbridge will have an adverse impact on the study area through indirect impacts on flora and fauna and through the public perception created by having development adjacent to Bold Park.

The addition of the Knightsbridge land to the study area would be beneficial in terms of added flora, fauna, landscape and recreational values and would protect the integrity of Bold Park.

- Urban Development in Mt. Claremont Bushland

Although the southern part of the study area, or Mt. Claremont Bushland, is owned by the City of Perth and zoned for residential development, no applications have been made. The impacts of possible development have been considered at three levels.

Full Development, comprising development of the entire area with 10% public open space.

This would result in the loss of 37 hectares of bushland resulting in the loss of valuable flora, significant habitat for birds and habitat and resources for plants and animals.

Partial Development, development of an area of 6.5 hectares.

The impacts of partial development are similar to the scenario of full development, although they are less significant due to the much smaller area affected. Indirect impacts which result from siting urban development directly adjacent to natural bushland could result in further degradation.

Minor Development, development of 1.4 hectare area fronting Fortview Road.

The impacts of minor development would be relatively low and insignificant. They could be catered for with sensitive and appropriate management.

- Rochdale Road

Over many years there has been discussion of improving the road link between Underwood Avenue and the West Coast Highway, as identified by the EPA in Bulletin 322. An objective of these proposals has been to alleviate the impacts of traffic on the residential areas of Mt. Claremont. Recently this discussion has focussed on realigning or improving the northern section of Rochdale Road.

There are however a variety of options available for the upgrading and/or re-alignment of Rochdale Road. A single route option was assessed. It may provide for the closure and revegetation of the existing route.

After analysis it was determined that closure of the existing alignment would provide a benefit in rejoining the Mt. Claremont Bushland with the central Bold Park area, however the realignment would have a negative impact on existing flora, fauna and landscape values. Impacts on the scientific and educational values of the area were seen to be manageable.

- Degraded Areas

Six degraded sites within the study area were considered in terms of their land use options and possible development impacts.

i. Drive-in

Three development options have been proposed for the former Skyline drive-in site, most of which is degraded.

- Total revegetation including regeneration with local indigenous species. This option would have obvious biological benefits and was preferred by the Community Liaison Group and by the public who lodged submissions.

- Partial revegetation including revegetation of areas next to regionally important vegetation communities combined with a depot/nursery development of approximately five hectares. This option was generally accepted by the Community Liaison Group and in the public submissions.

- Institutional development (educational facility) is an option that could be catered for provided it is non-residential, has low human impact, is integrated into the landscape and involves extensive re-vegetation of the immediate gardens of the institution with indigenous species so that they blend with the surrounding area. This option received very little support from the Community Liaison Group and members of the public who lodged submissions.

ii. Turf Farm

A range of uses were presented as being appropriate, however, it appears preferable that the area is managed in such a way that contributes to the natural values and image of Bold Park, through rehabilitation or development as an entry location.

iii. St. Brendan's Drive Area

This area is a partly rehabilitated area where degradation is relatively low. It is recommended that it should be managed as part of Bold Park with some additional rehabilitation.

iv. Northern Area

This area of land is regarded as degraded and includes the WAWA reservoir, a former quarry used for recreation purposes and adjoins the retirement village and swimming pool.

Due to the level of development within the area the unused land is unlikely to regain its full natural values and could be designated for some form of development. The local community are opposed to any form of residential development within the area.

v. West Coast Highway Quarry

This former quarry has been disturbed in parts and has not revegetated. It is recommended that the location be considered for an entry point, however, if this is not feasible it should be revegetated.

vi. Pine Plantation

The plantation is currently not under any management procedure bar fire control. Retention and management of the pines for landscape amenity and fauna values is considered to be a desirable option.

STRUCTURE PLANS

The structure plans were developed by defining broad land use categories for different parts of the study area and proposing management structures which can be refined in a series of detailed management plans.

The objectives of the structure plans include:

- to protect or enhance areas of significant conservation, scientific, educational or landscape value;
- to provide for and promote appropriate recreational use; and
- to take advantage of economic values where they do not conflict with the above.

Areas of high composite values, as indicated in Figure 3.5, should be managed in order to retain and enhance their natural value. Appropriate uses include conservation, scientific, educational and passive recreation purposes.

Areas of moderate composite value should be managed in sympathy with adjoining lands and could incorporate uses such as regeneration for scientific or educational purposes, passive recreation, active recreation and facilities such as public toilets, car parking, interpretive and management centres and a rangers residence.

Low composite value areas are considered appropriate for more intensive development if it does not threaten areas of high composite value. Suitable land uses include above carefully controlled low scale built development in addition to the uses previously listed.

The values of the study area were combined with the effects and impacts of the development issues listed above in order to produce structure plan options. It must be noted that some of the development issues, namely the Stephenson Highway Route and the proposed urban development of Knightsbridge lie within the jurisdiction of other authorities and because there have been no firm decisions on their future, it is difficult to account for the possibility that they may proceed in the structure plans.

STRUCTURE PLAN OPTIONS

- Option 1 - Conservation Option

  This option embraces and expands the concept of retaining and promoting Bold Park as a major natural area. Any development would be limited to providing park facilities and a significant rehabilitation effort would be made. Under this option no land sales or commercial development would occur.

- Option 2 - Strategic Development Option

  This option advocates controlled development in those parts of the study area which are of less value than others, and which would have insignificant environmental impact on surrounding areas. Two sites are identified:

  - 1.4 hectares of land on the south side of Fortview Road; and
  - 12 hectares of land adjacent to the WAWA reservoir on The Boulevard.

  This would result in some reduction of the size of the natural bushland, however these areas are not of great significance. Fears that exist within the community that any development now may lead to further proposals could be alleviated by securing tenure of the remaining study area in some form of reserve or park.

  The option also provides for the development of a park management and interpretive centre on part of the former drive-in site which would include a depot and nursery, and revegetation of the remainder of the site for use as an educational example. It would also provide for the possible integration of the City Beach Senior High School and the educational/management facility to promote environmental studies.

- Option 3 - Rochdale Road Realignment Option

  This option takes advantage of improving Rochdale Road to integrate Mt. Claremont Bushland with the central area of Bold Park.

  It provides for development of 6.5 hectares which would:

  - allow the existing alignment to be removed and revegetated and thus effectively increase the uninterrupted area of natural bushland;
  - involve the loss of natural bushland including some rated as having high composite value;
  - cut current linkages between Mt. Claremont Bushland and Cottesloe Golf Course;
  - provide for a management and education centre at the former drive-in site; and
  - provide for revegetation of a range of priority areas.

These options were discussed with the Community Advisory Group and put on public exhibition for one week after which a preferred Structure Plan was identified by the study team on the basis that it provided for the most appropriate long term land uses. It is based on the premise that the preferred long term use of the majority of the study area is for conservation and recreation purposes.

The preferred Structure Plan, which is shown at Figure 6.4, it provides for the following key elements:

- preservation of most of the study area for conservation and recreation purposes;
- rehabilitation of important degraded areas;
- residential development of 1.4 hectares on the south side of Fortview Road;
- development of part of the northern area for active recreational purposes; and
- development of part of the drive-in for a park management and education centre.

This option provides for the preservation of a unique area of natural bushland within the suburbs of Perth. It would allow the outstanding conservation and recreation values of the area to be preserved and promoted as a key attraction of the region.

MANAGEMENT

Options for the on-going management of the study area include continued management by the Perth City Council, management as a Regional Park, management on the Kings Park model, and management as a Crown land reserve which would entail a transfer of ownership from the Council to the Department of Land Administration (DOLA). The preferred option is for the City of Perth to propose that Bold Park be designated as a Regional Park.

The adoption of the Regional Park model would:

- give security of purpose to the area by ensuring that the area is used for recreation and conservation;
- allow the City of Perth to retain ownership of the land;
- provide for a joint management agreement between Perth City Council and the relevant government department in order to obtain outside expertise;
- possibly provide access to government funds after a management plan has been developed; and
- provide the opportunity for community involvement in management through advisory boards and other similar organisations.

The park would be managed by a management board which may comprise Council representatives, CALM, landholders such as WAWA and the City Beach Senior High School and representatives from interested community groups.

A detailed management plan would need to be developed by the Board and should include management objectives, essential resource information on the physical, biological and cultural environment, management strategies for issues such as fire and weed control, a concept plan, summary and recommendations and an implementation process including a period of public consultation. Funding will be required at all stages of the management process.

Key management issues for the study area include control of fire and weeds. The major steps required to implement the preferred structure plan and preferred management option will include the rezoning of certain land, making submissions to the Government in relation to Regional Park proposals and setting up an appropriate management structure.

COMMUNITY CONSULTATION

A significant community consultation program was implemented as part of the study process. Its aims were to:

- inform the community and involve them in the study;
- educate the community in the issues involved;
- access information on the study area available in the community;
- identify the values placed on the study area by members of the community; and
- involve the community in the decision-making process including representatives of community groups and residents associations.

A Community Advisory Group was established to liaise with the study team. The committee met on seven occasions throughout the study period and a wide range of issues

was discussed. Submissions were invited from the public on the broader issues and on the proposed structure plans.

The key concerns and views which were expressed included the following:

- an overall opposition to any form of residential or other major development in the study area;
- the size and uniqueness of the study area are widely appreciated;
- conservation and passive recreation values of the area are sufficient to justify retention of the study area in its entirety as natural bushland park;
- recommendations of the System 6 report (1983) should be implemented;
- almost unanimous support for Structure Plan No. 1 - Conservation;
- the Knightsbridge land should be incorporated into the study area;
- opposition to the highway proposals on the basis that the environmental impacts would be unacceptable;
- concern over the impacts of realigning Rochdale Road and suggestions that other options may be available to achieve the desired ends;
- concern to ensure that the values of the study area are secured permanently;
- reiteration of the need for a management plan and urgent need for management actions to control weeds and track degeneration; and
- the need for sensitive bushfire management measures.

The submissions provided an indication of the high value of the study area to private individuals, interest groups, and schools. Community views have strongly opposed all development proposals while supporting the establishment of a secure park or reserve over the study area to promote the long term use of the area for recreation and conservation of flora and fauna.

CONCLUSIONS

The study area is regionally significant in conservation, recreation, landscape and educational and scientific terms, and represents a unique resource to the people of the metropolitan area. Significant development would detract from its value, however some minor development would be acceptable and this has been identified.

Regional Park status is the most appropriate option for management, acknowledging the regional role of the area and providing assistance to the Council. It will also secure the future of the area, which is a major concern to the community.

Chapter 1

INTRODUCTION

This Public Environmental Review has been commissioned by the Perth City Council to provide recommendations relating to Bold Park and adjoining bushland.

1.1 STUDY AREA

The study area referred to in this report is shown in Figure 1.1. It comprises an area of 490 hectares, located approximately eight kilometres west of the central business district of Perth, and is wholly contained within the boundaries of the City of Perth. It comprises the area known as Bold Park, including land between Oceanic Drive and The Boulevard, adjacent land which is known as the Mt. Claremont Bushland, and the City Beach foreshore.

The study area is surrounded by the residential suburbs of Mt. Claremont, Floreat and City Beach. The regional context of the study area is shown in Figure 1.2.

The study area includes those parts of the M46 and M47 areas, as defined in the System 6 Study Report (Department of Conservation and Environment 1983), that fall within the City of Perth. The implications of that report will be discussed in detail in later chapters.

It is important to note that some adjoining areas of bushland fall within the City of Nedlands and are therefore outside the terms of reference of this study. These include Lot 1 Stephenson Avenue (the site of the Knightsbridge proposal) and the Department of Defence Rifle Range which fronts City Beach. Both the City of Nedlands and the Department of Defence were approached by the EPA to involve their land in this study, however, the City of Nedlands declined and the Department of Defence is currently preparing its own management plan.

The study area generally comprises land owned by the City of Perth which is currently in a natural state and is available for recreational use.

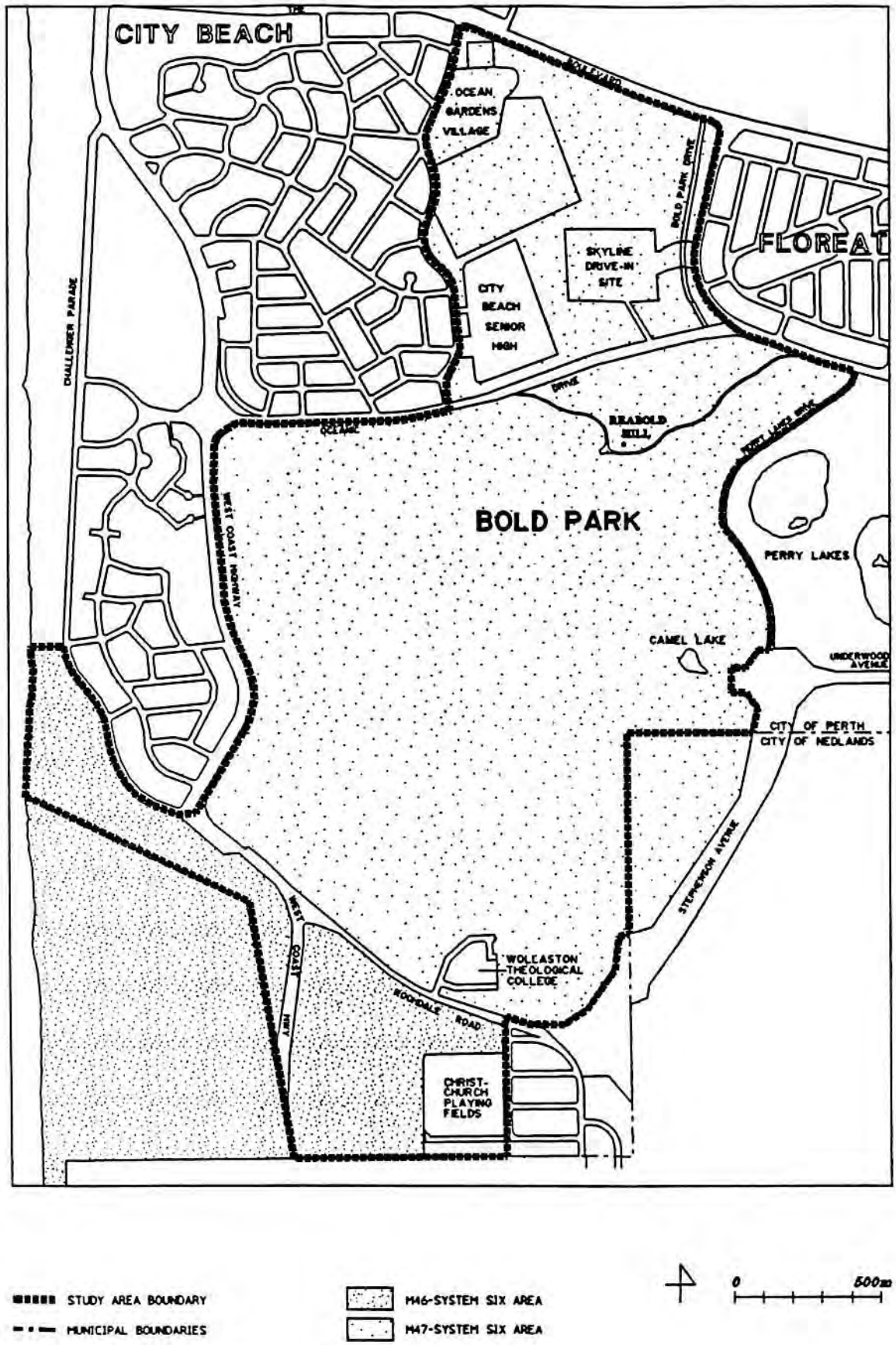


Figure 1.1 STUDY AREA

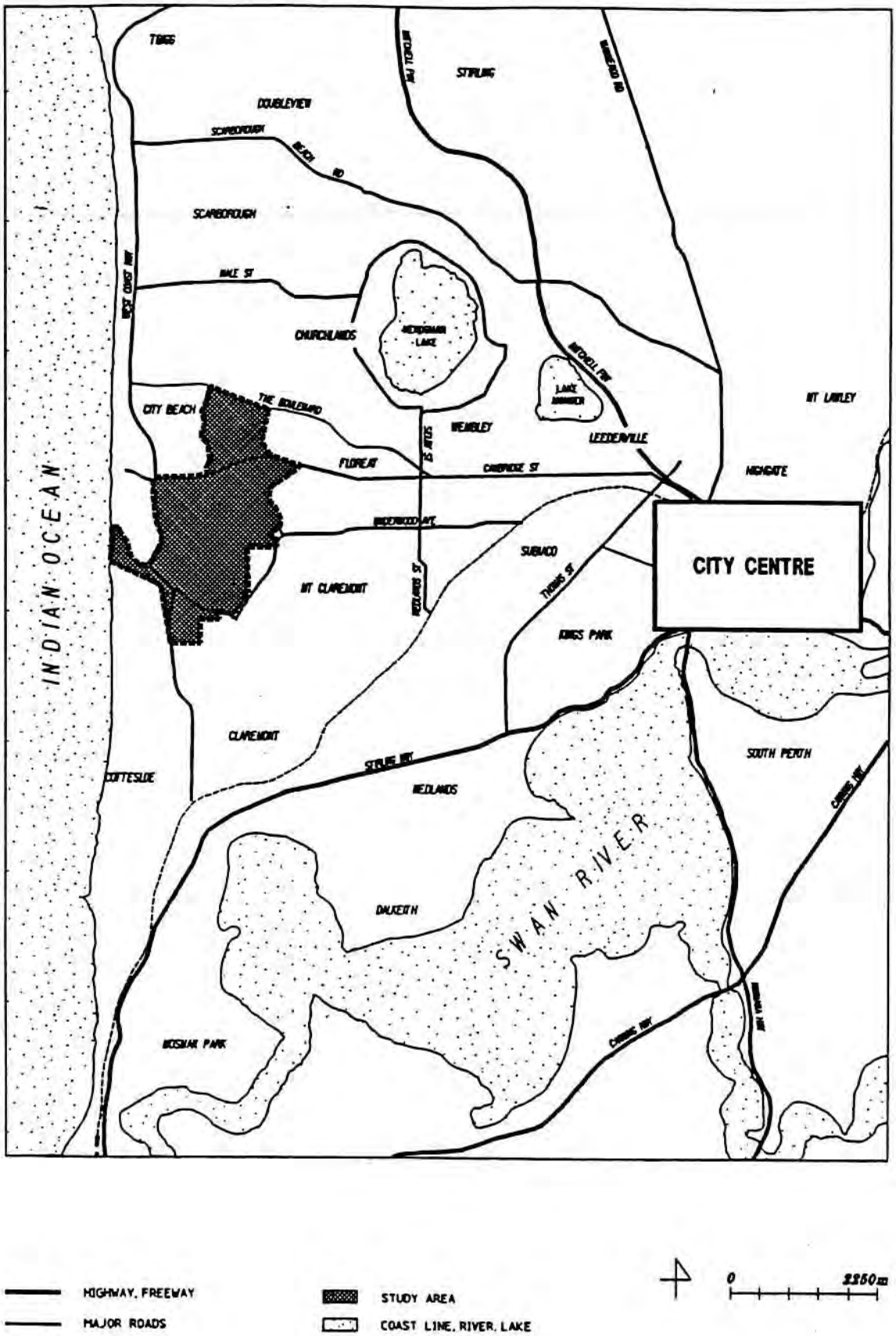


Figure 1.2 REGIONAL CONTEXT

1.2 OBJECTIVES OF THE PER

In recent years there has been considerable debate over the appropriate uses for various parts of the study area. It has been the subject of competing land use demands with development options such as major regional roads, residential development and additional educational facilities being proposed for the area. However, there have also been calls for conservation of the land for recreational, scientific and educational purposes.

A Public Environmental Review (PER) is usually carried out for the purpose of assessing the impacts of a development proposal under the terms of the Environmental Protection Act, 1986. This PER is somewhat different in that it is not assessing a single development proposal.

The Environmental Protection Authority considered that the range of development pressures potentially affecting the study area could not be considered in isolation from each other, and that an integrated planning process was needed to provide for the long term management of the study area.

Consequently this PER aims to provide a broad structure plan to guide the future of the study area. It includes a consideration of the environmental impacts arising from the various development proposals, but only for the purpose of formulating the broad structure. Detailed consideration of the impacts of any particular proposal may be required by decision-makers at a later date.

In this context the objectives of this Public Environmental Review (PER) is to identify and address all of the issues which could potentially affect the land covered by System 6 areas M46 and M47 within the City of Perth. The method that has been adopted is based on four stages:

i. assess the values of the study area;
ii. consider these within the context of regional planning issues;
iii. propose a range of appropriate land uses for the study area; and
iv. make recommendations on the future management of the study area.

The proponent for this PER is:

City of Perth
Council House
27-29 St. Georges Terrace
PERTH WA 6000

1.3 BACKGROUND TO THE PER

The need for the PER arose when the area was identified by the System 6 Study in 1983 (Department of Conservation and Environment, 1983). That study which is discussed in greater detail in Section 4.5, recommended that the adjoining M46 and M47 areas be designated as a Regional Park. The study area comprises those parts of M46 and M47 that lie within the City of Perth, which are indicated on Figure 1.1.

Some of this land was at that time, and remains, undeveloped land which is zoned for residential purposes, and is owned by the City of Perth.

While the City of Perth has not actively moved to develop its land, proposals for the residential development of adjoining land have proceeded. In 1986 a development application was lodged for the Knightsbridge residential estate on Lot 1 Stephenson Avenue. This land, which is within the City of Nedlands, adjoins the study area and is also zoned for development and included within the M47 area. This proposal created a significant controversy and many voiced the opinion that the recommendations of the System 6 report should be implemented and the area declared a Regional Park. The EPA subsequently recommended that the proposal not proceed as it was environmentally unacceptable in its current form.

The debate and the Report and Recommendations of the EPA (EPA 1988) focussed attention on a number of issues affecting the study area. Firstly, the Perth City Council lands also had development potential. Secondly, the route for a major highway traversed the study area, and if constructed would have significant effects. Thirdly, in the past, there has been discussion of the extension of Underwood Avenue through the study area to link with the West Coast Highway. Finally there has been long-standing concern over the alignment of the West Coast Highway near Challenger Parade, and consequent pressure for a realignment of this section of the highway. The EPA expressed concern over the cumulative impacts of these development proposals on the M47 area.

Perth City Council wished to proceed with planning the realignment of the dangerous curves on the West Coast Highway as a matter of public safety. Due to the concerns of the EPA, the Council resolved to follow a two stage process. Stage 1 was a PER relating specifically to the realignment of the West Coast Highway (Dames and Moore, 1992). This was prepared and placed on public exhibition early in 1992. In recognition of the cumulative impacts of the different development proposals, Perth City Council committed itself to carrying out this Stage 2 PER to identify and address all of the issues which could affect the study area.

1.4 STATUTORY PROCESS

This PER is being prepared pursuant to the Environmental Protection Act 1986. The aim of the process is to provide information to the EPA and the public about the proposals and their potential impacts.

The EPA has considered the issues involved in this study and determined that a PER is required. This is an intermediate level of assessment, falling between the lowest, a Consultative Environmental Review, and the highest an Environmental Review and Management Plan. A copy of the guide-lines issued by the EPA are included in Appendix A.

The purpose of the PER is to provide clear information on the proposals and their environmental impacts, in a format which encourages public discussion. The PER will be placed on public exhibition for a period of eight weeks and during this period any interested person or organisation can make submissions to the EPA. After the submission period the EPA will assess the proposal and make a recommendation to the Minister for the Environment on the environmental acceptability of the proposal. The final decision on the project will be made by the Minister for the Environment

1.5 PUBLIC INPUT

The study process was carried out in an open manner and community input was encouraged throughout the process. A number of opportunities were provided for members of the public to consider the issues and to make submissions or comments to the study team. In addition a community advisory group was established at the outset and this met regularly with the study team.

Full details of the community consultation program and its results are included in Chapter 8.

1.6 FORMAT OF THE PER

The PER describes the values of the area, before considering development issues and suggesting a structure plan and management structure.

Chapter 2 describes the existing environment in terms of its physical, biological and social characteristics in order to assess the significance of the area. It also considers these characteristics in the regional context.

Chapter 3 assesses the values of the study area by analysing characteristics described in Chapter 2 and assigning different areas with low, medium or high value ratings. The final combined conservation rating is expressed in a map of composite values which provides an overall value ranking for different regions of the study area.

Chapter 4 details land ownership and the implications of various town planning schemes, the System 6 Report and the EPA recommendations that have been made regarding the study area. The chapter also looks at current management issues, management structure and recent management plans.

Development issues and their impacts on the study area are described in Chapter 5. The background to each issue is provided and the current and likely future impacts are assessed.

Having established the nature of the existing environment, its values and the various development, land ownership and management issues which currently affect the study area, the PER goes on to present three structure plan options. These are based on the data analysis and information provided in the previous chapters. A preferred structure plan is outlined at the end of Chapter 6.

Chapter 7 identifies a preferred management option after reviewing the options that are available. Management structure, plans and funding are discussed in addition to identifying key management issues and methods of implementing management plans.

Chapter 8 provides a detailed description of the community consultation process and the methods employed to obtain a broad spectrum of community views. A description of the Community Advisory Group and a detailed discussion of community concerns is included.

Chapter 9 provides conclusions while Chapter 10 details the commitments that have been made by the City of Perth in relation to the study area.

Chapter 2

EXISTING ENVIRONMENT

This chapter documents the relevant physical, biological and social characteristics and values of the study area. Major characteristics are considered both in terms of their local and regional significance.

2.1 PHYSICAL

2.1.1 Soils and Topography

The soils and topography of the study area are shown on Figure 2.1. The study area is comprised primarily of deep calcareous sands of aeolian origin. These sands differ in particle size and organic content depending upon the local topography. The youngest soils occur along the coast line west of Challenger Parade. These soils are of marine origin, and consist of fine to medium size quartz and shell debris and lack well defined soil horizons.

The deeper sands which occur in the south and west of the study area are collectively known as the Quindalup association. These aeolian soils are strongly calcareous and composed of fine to medium grained, sub rounded quartz and shell debris (Gozzard, 1983). Typical Quindalup soil horizons as surveyed in Bold Park consist of 0-10 centimetres of pale grey sand underlain by 10 centimetres or more of cream to white sands (George, 1976). Interspersed with the Quindalup sands are soils of the Spearwood association, these are also of aeolian origin and consist of medium to fine grained quartz.

The Spearwood association can be further divided into the Cottesloe and Karrakatta soil types. Cottesloe soils are found along the eastern boundary of the study area adjacent to Perry Drive, in two small pockets within Bold Park and in much of the area north of Oceanic Drive. The Cottesloe formation is shallowest in the vicinity of Reabold Hill and on the limestone spur north of Oceanic Drive where there are numerous exposures of the underlying Tamala limestone. This limestone also out-crops adjacent to West Coast Highway and both of these limestone exposures have been mined in the past. Typical Cottesloe soil horizons consist of 0-15 centimetres of dark grey/brown sand over 15

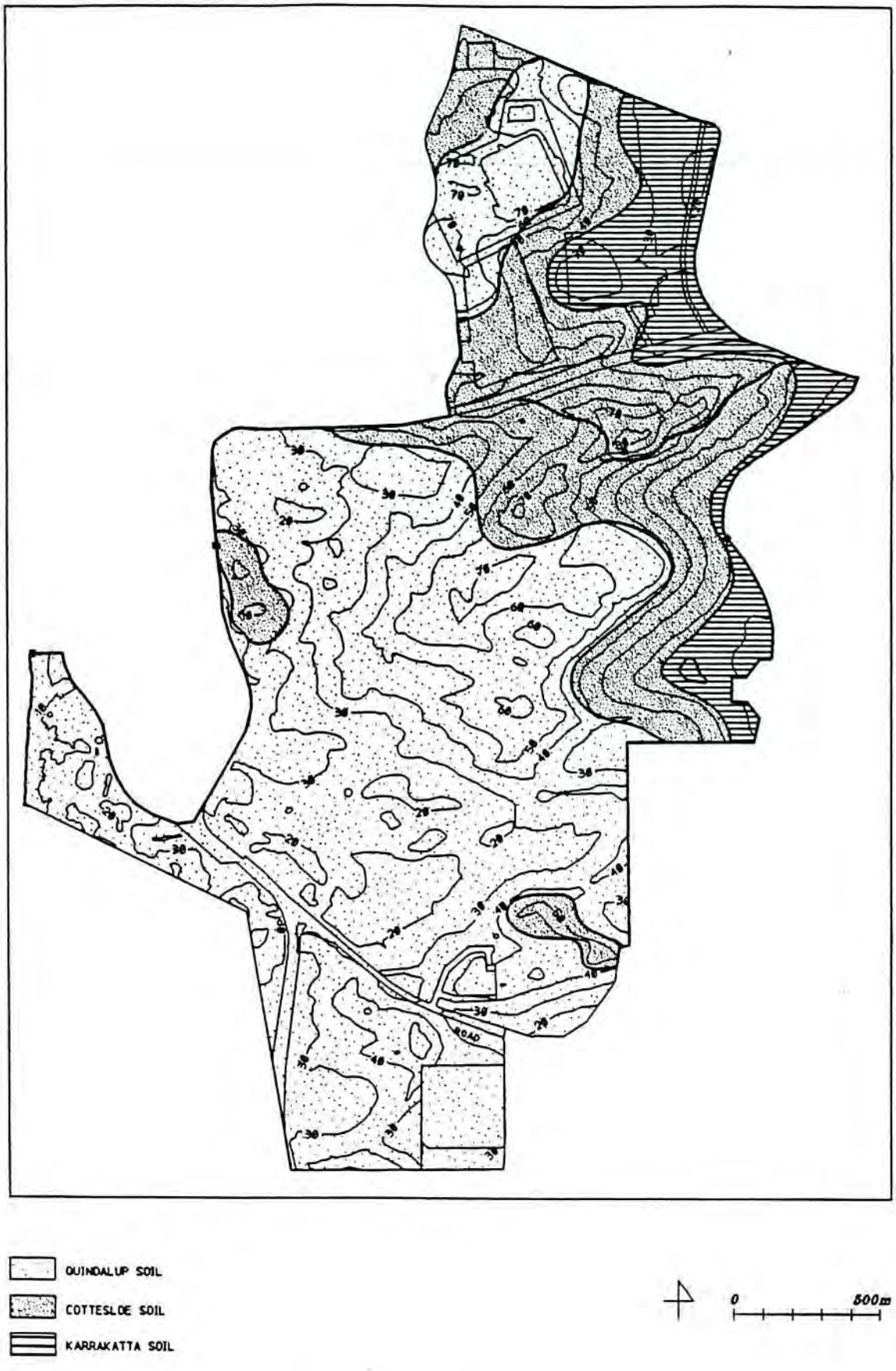


Figure 2.1 SOILS AND TOPOGRAPHY

centimetres of bright yellowish/brown sand over limestone at variable depth. The adjoining Karrakatta formations by comparison are generally found in interdunal depressions, and are deeper with 0-15 centimetres of siliceous sands over 15-40 centimetres of pale yellow sands becoming more yellow with depth (George, 1976). The soils of the study area form a mosaic of different types and depths which reflect both the strongly undulating topography of the area and the general aging of the soils towards the east.

The local topography is extremely variable ranging from 10 metres AHD (Australian Height Datum) to over 80 metres AHD. This reflects the origin of the area as wind blown dunes and their subsequent erosion. The Quindalup dunes consist of parabolic and nested parabolic dunes interspersed with interdunal depressions and hollows. Typical slopes are in the order of 3-10% throughout much of Bold Park. However slopes of up to 20% occur in the Quindalup dunes adjacent to Challenger Parade and on the eastern ridge line west of Perry Lakes (Gozzard, 1983).

The steep topography and fine particle size of the Quindalup sands make these prone to wind erosion if the protective vegetation cover is removed. The soils in the study site have, as a whole, very low water and nutrient retention capacities.

The major topographic feature of the study area is undoubtedly Reabold Hill, at a height of 84.8 metres (AHD). This hill forms a well defined ridge which runs south-west to north-east across the north-east section of Bold Park, south of Oceanic Drive. North of Reabold Hill the Water Authority's reservoir is at almost the same height, at around 70 metres AHD. Reabold Hill stands out in the western suburbs as a major regional landmark. It provides excellent views of the coast and surrounding hinterland.

2.1.2 Hydrology

Within the study area there are no natural drainage channels, and only one small area of semi-permanent surface water. There are however a number of areas of impermeable surfaces such as roads and car parks which concentrate run-off on a local scale and contribute to gully erosion. Gully erosion was also observed on and around the limestone paths through the study area. The sandy soils of the study area are highly permeable and rainfall generally infiltrates very quickly.

The groundwater table in the study area generally follows the surface contours. Groundwater depths vary from zero metres at Camel lake to five metres near the coast and over 20 metres at Reabold Hill (Gozzard, 1983). There is a regional groundwater flow in the study area towards the south-west, of between 50 and 100 metres per year (WAWA, 1987).

Within the study area there is localised groundwater extraction for irrigation purposes. Bores are located north of the Quarry amphitheatre adjacent to Oceanic Drive and east of Reabold Hill at the start of the Camel Lake trail. There is also a groundwater bore in the turf farm area and one just north of Wollaston Road. These bores are used to extract groundwater for local irrigation purposes and do not have a significant draw-down effect on the regional ground water table. The Water Authority of Western Australia has a production artesian bore located in the northern part of the study area near the old Skyline Drive-in site. It produces artesian water from confined aquifers 500 - 600 meters below ground level and due to its depth this extraction has no effect on the local, near surface, groundwater levels.

Within the study area there is one small area of semi-permanent surface water. This wetland area was known as Hidden Perry in the early part of the century, and more recently as Camel Lake. The wetland area has been modified in the past by excavation and the mounding of a one metre high bund to the east of the present water body (Kinhill, 1987). This excavation was apparently done to provide a permanent watering point for camels (Keighery et al, 1990). Camel Lake currently represents a surface expression of the groundwater table, and as such water levels in the lake vary by about 0.8 metres annually (Kinhill, 1987). Currently there is no surface drainage into Camel Lake and consequently the water quality remains relatively high in comparison to wetlands that receive stormwater drainage.

Within a local context Camel Lake is significant due to its small size and shape particularly as many of the smaller wetland areas have been filled in the metropolitan area. Camel Lake also has historical significance due to its role as a camel watering point. While Camel Lake retains its surrounding natural vegetation the wetland area is degraded as a result of weed invasion and changes to its original surface contours. The surrounding overstorey is intact, however, the understorey has been invaded by introduced weeds and grasses.

Camel lake is significant due to its relatively undisturbed state compared to other metropolitan wetlands and the presence of the regionally significant species, *Sonchus aff asper.*

2.1.3 Climate

The study area is characterised by a mild Mediterranean type climate with hot dry summers and mild wet winters. Whilst no climatic data is available for the study area, records are available for both the Perth station of the Bureau of Meteorology, located eight kilometres east of the study area and for Fremantle, 12.5 kilometres south of the study area.

The climate shows a marked seasonality, with rainfall, temperature and winds following a well defined annual cycle. Rainfall is concentrated in the winter months with 90% of all rain falling between April and October, and 80% concentrated between May and September. The wettest month on average is July with 18 raindays closely followed by June and August with 17 raindays each. The summer period between November and March receives very little rain generally, with only 9% of the average annual rainfall falling in these months. The average annual rainfall for Perth is 869 millimetres, which falls on an average of 119 raindays per year (Bureau of Meteorology, 1990).

Temperatures are lowest in July, with both the lowest average daily minimum and maximum of 9.2^{o}C and 17.7^{o}C respectively (Bureau of Meteorology, 1990). The highest average daily maximum and minimum temperatures are recorded in February, these are 30.5^{o}C and 18.7^{o}C respectively. Evaporation is highest during the summer months and exceeds the rainfall for eight months of the year from September through to April.

The winds are strongest during the summer months with 51% of the winds in December exceeding 20 kilometres per hour at 1500 hours compared to only 20% in May and 25% in June, July and August (Bureau of Meteorology, 1990). A typical summer wind pattern exists, with strong easterly winds in the morning swinging to strong south-westerly in the afternoons.

In the winter months the winds are generally much lighter, with westerly and north-westerly winds associated with rain bearing depressions being the strongest.

Climate records for Fremantle show some differences due to Fremantle's coastal location. The mean summer maximum is a degree and a half lower than Perth's, its mean winter minimum, a degree higher and its mean daily range narrower over both seasons. Summer humidity is nearly 8% higher at 56.3% and rises during the day with the sea breezes, unlike Perth's which falls.

However the higher humidity is probably outweighed by the increase in wind on the coast. Fremantle's mean annual rainfall is 773mm which is almost 100mm less than Perth's.

The climatic condition of the study area would reflect those of both Perth and Fremantle. Whilst the general climatic pattern is well established there are isolated anomalies such as the record rainfall in February 1992, in which 120 millimetres of rain fell in 24 hours.

2.2 BIOLOGICAL

2.2.1 Vegetation and Flora

Vegetation

The vegetation of parts of the study area has been described to a varying extent by: City of Perth (1974), City of Perth (Wycherley Report, 1976), Scott and Furphy (1976), Dames and Moore (1986), EPA (1988), Keighery et al (1990) and Dames and Moore (1992). Kinhill (1987) described the vegetation and flora on land contiguous to the study area - Lot 1, Stephenson Avenue.

Some variation exists in the terminology for classifying the vegetation. For example, the Wycherley report (1976) uses geomorphic elements as a basis of classification (ie. limestone ridge community), Scott and Furphy (1976) use both geomorphic and vegetation structural terms (ie. foredune community, open woodland) whilst Keighery et al (1990) use structural and floristic terminology.

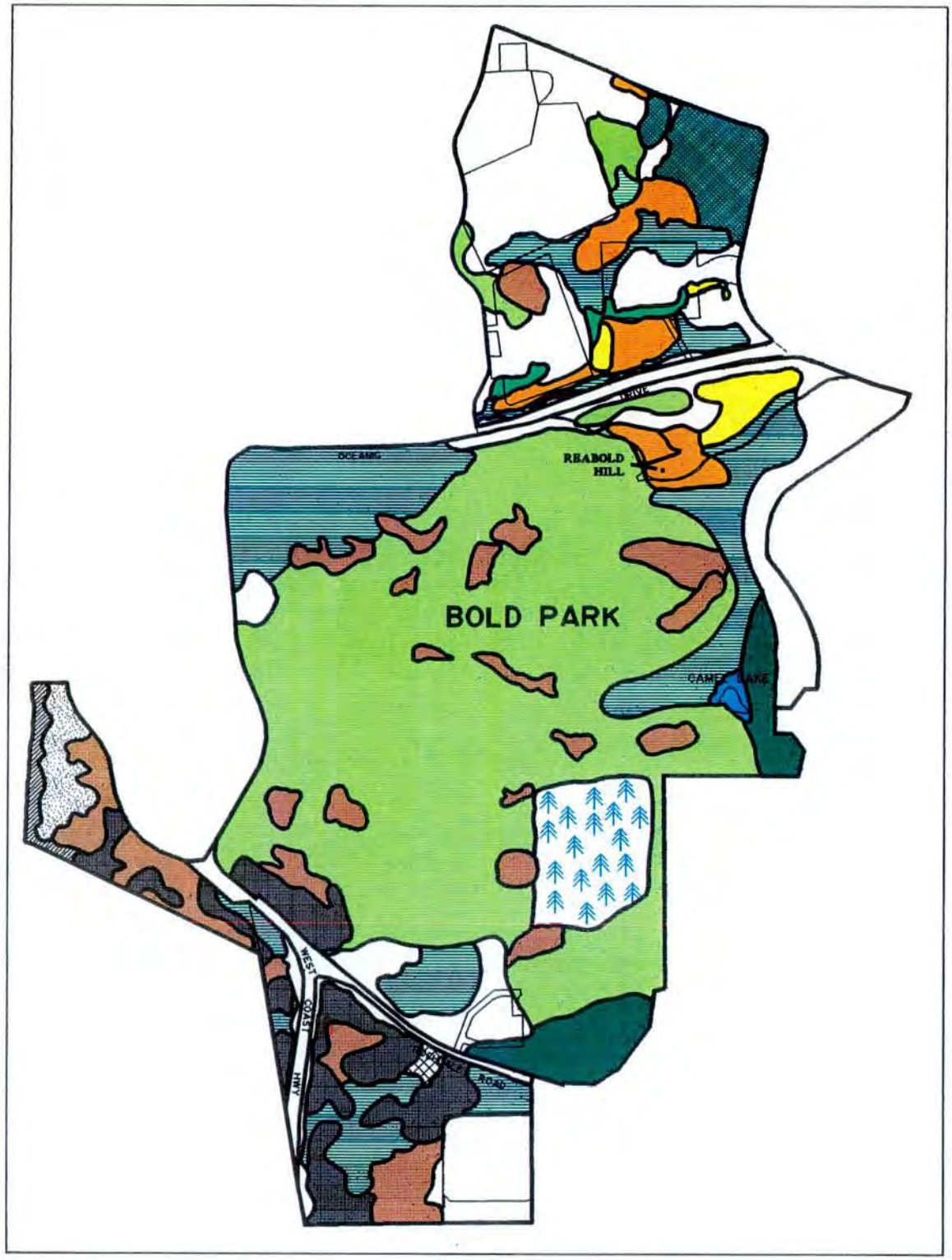
Dames and Moore (1986) and Keighery et al (1990) provide the most comprehensive descriptions and analysis of the vegetation. Information from these studies was used to develop the vegetation map (Figure 2.2) and describe vegetation types. The vegetation of the northern part of M47 (between Oceanic Drive and The Boulevard), which was not covered by previous studies, was mapped and described as a part of this study.

A total of eight major native vegetation formations were identified with two other formations representing introduced species and degraded lands. Within these considerable floristic variation occurs. Table 2.1 provides details of the formations.

Vegetation Condition

Scott and Furphy (1976), Dames and Moore (1986) and Keighery et al (1990) have commented on the condition of sections of the vegetation found in the study area. They found the condition varied from poor in highly disturbed areas, to good in certain community types, especially heath communities. The condition of woodland communities, particularly some of the Eucalypt woodlands, was only moderate compared to the heath communities.

Keighery et al (1990) provide some empirical evidence on the condition of the bush, using species richness and weed invasion as an indication of disturbance levels. Their data, from



1.FOREDUNE COMMUNITY
2.MOBILE DUNE COMMUNITY
3A.DUNE HEATH
3B.LIMESTONE HEATH
4A.ACACIA ROSTILLIFERA SHRUBLAND
4B.ACACIA XANTHINA SHRUBLAND
4C.ALLOCASUARINA LEHMANNIANA SHRUBLAND
5.AGONIS FLEXUOSA LOW WOODLAND
6.BANKSIA WOODLANDS
7A.EUCALYPTUS GOMPHOCEPHALA (TUART) WOODLANDS
7B.EUCALYPTUS CALOPHYLLA/MARGINATA WOODLANDS
7C.EUCALYPTUS GOMPHOCEPHALA/MARGINATA WOODLANDS
7D.EUCALYPTUS DECIPIENS WOODLANDS
8.WETLAND
9.PINE PLANTATION
10.DISTURBED

0 500m

Figure 2.2 VEGETATION MAP

Table 2.1 VEGETATION FORMATIONS

Major Vegetation Formation	Variation	Location	Characteristics
1. Foredune		Dunes closest to beach only in M46	Dominated by hardy native and introduced species such as *Spinifex hirsutus, Spinifex longifolius, Cakile maritima, Ammophila arenaria, Isolepis nodosa, Thinopyrum distichum* and *Tetragonia decumbens*.
2. Mobile Dune		Lee side of dunes in M46 on western side of West Coast Highway	Low shrub, sedge and grass species such as *Olearia axillaris, Pelagonium capitatum, Acacia cylops, Oenothera drummondii, Lepidosperma gladiatum* and *Spinifex longifolia*. Again this community is restricted to the M46 area on the western side of West Coast Highway.
3. Heath		M46 and M47	Varies in size from 0.5 metres to 3 metres depending on soil type and depth, slope and aspect. Keighery et al (1990) noted it as the most variable vegetation formation and divided it into dune heath associated with deep sands and limestone heath associated with shallow soils over limestone. It is species rich with few weeds.
	a. Dune Heath	Deep sands	
	i. *Olearia axillaris* dominated		Dominated by *Olearia axillaris*, other species include *Acacia lasiocarpa, Templetonia retusa, Chamelaucium unicinatum, Calothamnus quadrifidus* and *Cassytha flava* along with small shrub and herbs which make up the understorey.
	ii. *Allocasuarina humilis* dominated		Dominated by *Allocasuarina humilis*, other species include *Hakea prostrata, Helichrysum cordatum and Mesomelaena stygia, Calothamnus quadrifidus* and an understorey of shrubs, herbaceous perennials and herbs.
	iii. *Dryandra sessilis* dominated		*Dryandra sessilis* is dominant with an understorey composed of *Melaleuca acerosa, Olearia axillaris, Grevillea crithmifolia, Lechenaultia linarioides, Hemiandra pungens* along with herbaceous perennials and herbs.
	iv. *Chamelaucium uncinatum* dominated	Occurs on western grey sand dunes	Dominated by *Chamelaucium uncinatum* with *Calothamnus quadrifdus, Olearia axillaris, Acacia cochlearis* and an understorey of shrubs, herbaceous perennials and herbs.

Table 2.1 VEGETATION FORMATIONS (Continued)

Major Vegetation Formation	Variation	Location	Characteristics
	b. Limestone Heath	Shallow soils over limestone in M47 area	Dominated either by *Acacia truncata* or *Eucalyptus foecunda*
	i. *Acacia truncata* dominated		Dominated by *Acacia trucata* with *Templetonia retusa, Trymalium ledifolium, Dryandra sessilis* and an understorey of shrubs and perennial herbs.
	ii. *Eucalyptus foecunda* dominated		The Fremantle mallee is dominant with an understorey of *Olearea axillaris, Dryandra sessilis, Melaleuca acerosa* and perennial herbs, sedges and herbs.
4. Shrubland			Dominated by *Acacia rostellifera* or *Acacia xanthina*
	a. *Acacia rostellifera* community	On dune sands extensively throughout M46 and the south west corner of M47	According to Keighery et al (1990) this is thought to be a fire climax community. Two distinct stands were found by Keighery et al: **Type A:** - Low closed shrubland which occurs on upper slopes. Here the Summer-scented Wattle range in height from 2-4 metres with an understorey of *Acacia lasioscarpa, Melaleuca acerosa, Templetonia retusa, Helichrysum cordatum* and other shrubs and herbs. **Type B:** - Low open woodland which occurs in the interdunal depressions. Here is forms a low open woodland (5-6 metres) with scattered peppermints appearing as co-dominants. The understorey is composed of *Spyridium globulosum, Melaleuca acerosa, Rhagodia baccata, Euphorbia peplus, Ehrharta longifolia, Myrsiphyllum asparagoides* and herbaceous perennials, sedges and herbs.
	b. *Acacia xanthina* community	Eastern slopes of Reabold Hill and on limestone ridge between Oceanic Drive and the former drive-in	A tall (2-4 metres) often closed shrubland. *Melaleuca huegelii* occurs as part of the shrub understorey along with *Trymalium ledifolium, Templetonia retusa, Acacia lasiocarpa* and other shrubs, herbaceous perennials and herbs.
	c. *Allocasuarina lehmanniana* community	M46 only	Dominated by *Allocasuarina lehmanniana* with an understorey of *Melaleuca acerosa, Acacia lasiocarpa, Olearia axillaris, Acanthocarpus preissii* and herbaceous perennials, sedges and herbs.

Table 2.1 VEGETATION FORMATIONS (Continued)

Major Vegetation Formation	Variation	Location	Characteristics
5. *Agonis Flexuosa* Low Woodland		Found in M47 at the base of deep valleys it also occurs in M46 area	A rare formation, it was not mapped by Keighery et al (1990) due to its size. The peppermint exists in mallee form (up to six metres) with understorey with *Spyridium globulosum, Olearia axillaris, Melaleuca acerosa* and herbaceous perennials, herbs and introduced aliens.
6. Banksia Low Woodlands		Extensively in M47 area	This is a most common formation. Tuarts and to a lesser extent Jarrah are occasionally found emergent in the Banksia stands.
	i. *Banksia attenuata* and *B. menzesii* community	Central and eastern dunes of Bold Park	In this community both banksia species appear as co-dominants with a species rich understorey which includes *Calothamnus quadridifus, Allocasuarina humilis, Grevillea crithmifolia, Lechenaultia linarioides* and other herbs and grasses.
	ii. *Banksia menzeisii* community	Western dunes of Bold Park	Dominated by *Banksia menzesii* with some *Agonis flexuosa*. The understorey is species rich with *Hakea prostrata, Hardenbergia comptoniana, Olearia axillaris, Hemiandra pungens* and other shrubs, herbs and grasses.
	iii. *Eucalyptus decipiens* stand		Composed of mallee or low trees to five metres and is dominated by *Eucalyptus decipiens, Banksia attenuata, B. menziesii and Allocasuarina fraseriana.*
	iv. *Banksia prionotes* stand	Limited areas, one on eastern side of pine plantation and the other in mixed Banksia woodland near Wollaston College.	
7. Eucalyptus Woodlands			This formation is characterised by the presence of dominant Eucalypt species either Tuart, Marri, Jarrah, Limestone Marlock, or Flooded Gum occurring as pure or mixed stands with a variable understorey. It can be further divided into dominance groups:

Table 2.1 VEGETATION FORMATIONS (Continued)

Major Vegetation Formation	Variation	Location	Characteristics
	a. *Eucalyptus gomphocephala* (Tuart) community		
	i. Pure Stands	In deep interdunal valleys, a good example is found in M47 north of Oceanic Drive	The understorey is variable with some areas dominated by exotic grasses and others with a mixture of *Xanthorrhoea preissii, Hardenbergia comptoniana, Grevillea vestita, Macrozamia reidlei* and *Ehrharta calycina.*
	ii. Mixed Stands	In Quindalup interdunal depressions	Tuart occurs in a mixed stand with an understorey of Banksia species, *Acacia rostellifera* and various shrub, herbaceous perennials and herbs.
	b. *Eucalyptus marginata* (Jarrah) community	Southern and eastern margins of Bold Park and in pure stands near Wollaston College.	
	i. Mallee Jarrah		Trees growing to six metres and contains upper stratum of Jarrah, *Banksia grandis* and *B. menziesii.*
	ii. Marri-Jarrah Woodland		The marri is more dominant (90% of cover), also contains Jarrah, *Jacksonia furcellata and Acacia saligna.* It occurs in areas surrounding Camel Lake.
	c. *Eucalyptus gomphocephala E. marginata* community	On the Cottesloe soils north of Oceanic Drive	Tuart and Jarrah occur in a mixed stand that contains a diverse understorey consisting of *Macrozamia riedlei, Xanthorrhoea preissii,* shrubs, herbaceous perennials and herbs.
	d. *Eucalyptus decipiens* community	North of Oceanic Drive	Found in pure stands that are among the best in the metropolitan area. It is dominated by *E. decipiens* with an understorey of *Melaleuca huegelii, Hardenbergia comptoniana, Xanthorrhoea preissii, Pelagonium capitatium* and exotic grasses.
	e. *Eucalyptus gomphocepha* (Tuart) *Eucalyptus calphylla* (Marri) community	North of Oceanic Drive, west of Perry Lakes Drive and east of Reabold Hill	Small stands of this community occur with a variable understorey. In some cases only introduced species are found in the understorey whilst other areas have a mixture of native and exotic species.

Table 2.1 VEGETATION FORMATIONS (Continued)

Major Vegetation Formation	Variation	Location	Characteristics
8. Wetland		Around Camel Lake	
	i. *Eucalyptus rudis Acacia saligna* community		With *Eucalyptus rudis* varying in numbers the understorey is quite species poor and composed mainly of exotic species. This community also contains one of the two only known populations of *Sonchus aff. asper* in WA.
	ii. *Bulboschoenus caldwellii Typha orientalis* community	Within Camel Lake	Dominated by *Typha orientalis* and *Bulboschoenus caldwellii*. The Typha dominates the central portion of the lake and the *Bulboschoenus caldwellii* lake and the *Bulboschoenus caldwellii* on the shallower fringes.
9. Pine Plantation			Dominated by *Pinus pinaster* with an understorey of exotic species along with some native colonising species.
10. Disturbed Lands		Along road verges, adjacent to ovals, former quarries, Skyline Drive-in site, turf farm	Heavy infestation of exotic species dominate these areas particularly *Pelargonium capitatum* and thick swards of veldt grass (*Ehrharta calycina*). In some degraded areas natural regeneration was observed, for example, on the fringes of the old Skyline Drive-in site.

quadrants (sample areas) placed in different vegetation types, shows that species richness ranged from 8 to 42 species per 100 square metres sample area. The average species richness was 30 species per 100 square metres of which 76% were native and 24% were exotic. Exotic species levels for different community types ranged from: heaths (15-32%); shrublands (24-26%); Banksia woodlands (24-27%); Eucalypt woodlands (23-25%); and the pine plantation (50%). Highly disturbed perimeter areas were not sampled however it can be assumed that these areas would contain the highest levels of exotics (80-100%). Whilst Keighery et al (1990) indicated the level of invasion of exotic species, their data does not show the relative abundances of weed species.

Field observation indicated that the abundance of weeds was low in heaths and some banksia woodlands, compared to the open woodland communities, and much higher in disturbed areas near roads, ovals and tracks. Recruitment levels of indigenous seedlings, or natural regeneration, were variable. Those areas with the least disturbance generally had higher levels of natural vegetation than more disturbed areas.

Dames and Moore (1992) noted visual evidence of the presence of the dieback disease, *Phytophthora cinnamomi* in their project area. This evidence was not verified by laboratory tests. During the 1990/91 summer high levels of drought deaths occurred in that area (G. Keighery, pers. comm.). As dieback disease is more likely to occur in the deep interdunal valleys (G. Keighery, pers. comm.) rather than upland slopes which dominate the area, drought may have been the cause of the deaths observed.

Flora

The flora of the study area has been extensively studied by Dames and Moore (1986), who listed 180 species of which 67 were established aliens, and by Keighery et al (1990) who found 356 vascular plants of which 130 were established aliens. Some of the species listed by Dames and Moore (1986) were not included in Keighery et al (1990). Additional species to Keighery et al (1990) are shown in Appendix B. The total number of species recorded so far is 361 species (228 native, 133 exotic).

Flora classed as significant have been previously listed by the EPA (1987), Keighery et al (1990) and Dames and Moore (1992). No species gazetted as endangered under the Wildlife Conservation Act, 1950 are found in the study area. However eighteen significant species have been recorded in the study area including four species which are listed as Priority Species (see Table 2.2) by the Department of Conservation and Land Management. Species which are of regional significance are described in Table 2.2.

Table 2.2 SPECIES OF REGIONAL SIGNIFICANCE

Species	Comm*	Location	Significance
White Stemmed Wattle (*Acacia xanthina*)	4(ii)	M47	Near the southern limit of its distribution. The stand is one of the highest in the metropolitan area.
Peppermint (*Agonis flexuosa*)	5	M46 & M47	At its northern most limit. Poorly represented in inner metropolitan reserves
Dune Sheoak (*Allocasuarina lehmanniana*)	4(iii)	M46 - A good stand on a northern dune slope on south side of Rochdale Road opposite Wollaston College	Occurrence of this species are limited in metropolitan reserves
Firewood Banksia (*Banksia menziesii*)	6(ii)	M47 - in central and eastern Bold Park	An uncommon yellow flowering form
Beyeria cynorum	6	M47	Listed as a Priority 1* species
Wembley Wax (*Chamelaucium uncinatum*)	3(d)	M46 & M47	This natural form of Geraldton Wax is at its southern most limit of distribution. This form is poorly conserved in the metropolitan area with the nearest known stands occurring in the Moore River area. According to Keighery et al (1990) this form is of horticultural significance
Limestone Marlock (*Eucalyptus decipiens*)	7(iv)	M47 with good stands in northern M47	It is poorly conserved in the metropolitan area
Fremantle Mallee (*Eucalyptus foecunda*)	8	M47 with good stands in northern M47	Listed as a Priority 4 species. This is the only recorded occurrence between Woodman Point and Quinns Rocks apart from two specimens surviving on the cliffs in East Fremantle
Tuart (*Eucalyptus gomphocephala*)	7(i)	M46 & M47	One of the most important Eucalypt species in terms of associated fauna. Good stands are found in the study area which are otherwise limited in occurrence in the inner metropolitan area
Rock Mallee (*Eucalyptus aff. falcata*)	3(ii)	M47 - occurring on a limestone ridge near Skyline drive-in site	Limited in reserves in the inner metropolitan area

Table 2.2 SPECIES OF REGIONAL SIGNIFICANCE (Continued)

Species	Comm*	Location	Significance
Corky Bark (*Gyrostemon ramulosus*)	6	M47	At its southern most limit of distribution. It is not well represented in reserves in the metropolitan area
Hakea ruscifolia	3(i)	M47	One of few stands in the metropolitan area
Jacksonia sericea	3(i)	M47	Listed as a Priority 3 species. Occurrences in the study area are towards the northern limits of this species
Limestone Banjine (*Pimelea calcicola*)	3(ii)	M47	Uncommon in reserves in the metropolitan area
Cheesewood *(Pittisporum phylliraeoides)*	3(i)	M46, M47	Two of four occurrences in the metropolitan region
Sonchus aff. asper	8	Camel Lake	One of only two known populations of this native Sonchus
Stylidium aff. affine	3(ii)	M47	An important Restricted Species confined to the Swan Coastal Plain. Apart from the population in the study area it is only known at Yanchep and Yalgorup National Parks
Cockie's Tongues *(Templetonia retusa)*	3(i)	M46, M47	A yellow-flowered form occurs in M46

Notes:

Source: *CALM, 1990*

* *Comm = Community - For community name refer to numbers on Table 2.1 or Figure 2.2*

Dames and Moore (1992) listed Eucalyptus 'petrensis' as a significant (Priority 3) taxon found in the study area, however it is thought to have been planted.

* *Priority One* *taxa with few poorly known populations on threatened lands*

Priority Two *taxa with few poorly known populations on conservation lands*

Priority Three *taxa with several poorly known populations, some on conservation lands*

Priority Four *taxa in need of monitoring*

Priority Five *taxa presumed extinct*

2.2.2 Fauna

Studies of the vertebrate fauna have been carried out by the Western Australian Museum, the Royal Australasian Ornithologists Union and private consultants in various parts of the study area.

The fauna of the northern area between Oceanic Drive and The Boulevard has not been researched, and similarly the Mount Claremont Bushland (M46) has never been intensively surveyed for herpetofauna. Some opportunistic observations have been made, however the deficiency in information for this potentially species rich area has been noted (Wykes, 1990). While a comprehensive ground fauna survey of the areas not covered by the WA Museum's survey would be desirable, this study will be confined to existing information and limited field work. However, it is possible to extrapolate faunal records between areas of similar vegetation, soils, landform and environmental history, which are geographically adjacent.

Invertebrates

The invertebrate fauna of the study area has not been researched to the same extent as the vertebrate fauna. This is typical of most areas in WA and is due in part to the relatively specialised nature of invertebrate survey and research. However some studies of invertebrate diversity, seasonal activity and relative abundance have been carried out on a site at Reabold Hill (Koch & Majer, 1980 and Majer & Koch, 1982).

The study site was located in a mixed Tuart, Jarrah and Marri woodland with an understorey dominated by veldt grass which had been burnt approximately five years previously. Koch and Majer found the invertebrate abundance and diversity to be similar to two other sites they were studying in Jarrah forest near Dwellingup and Manjimup respectively. Of interest was the finding that invertebrate diversity is reduced for a period of at least three years following fire (Koch & Majer, 1980). Little is known about the invertebrates in other parts of the study area. During field surveys conducted as part of this study numerous feral honey bee hives were seen in hollow limbs and crevices in mature trees. Feral bees have been found to have a deleterious effect on native animals which could otherwise use these areas for nesting or roosting places (Douglas, 1977).

Mammals

Apart from introduced species only one native mammal has been found in the study area, the Common Brushtail Possum *(Trichosurus vulpecula)* (How and Dell, 1990). It is one of the few native mammals to adjust to European colonisation. The Common Brushtail Possum inhabits the Tuart woodland areas north of Oceanic Drive, south-east of Reabold Hill and in flooded gums surrounding Camel Lake. Two bat species, the White Striped Mastiff Bat *(Tadorida australis)* and Goulds Wattled Bat *(Chalinolobus gouldii)* were suspected in the study area by the WA Museum, though not confirmed (How and Dell, 1990). The possibility of bat depletion in the study area apart from *Tadarida australis* which has been recorded by its audible call was highlighted during the Perth Wildlife Watch. A survey team did not record any other species using netting and call monitoring with ultra-sonic detectors at Perry Lakes and in the M46 area in the summary of 1990-91 (Wykes pers. comm.). A small number of Western Grey Kangaroos lived in the park up until 1986 when they were killed by dogs or vehicles (How and Dell, 1990).

Introduced species found in the study area, include cats, rabbits, foxes, house mice, and the black rat. Horses and domestic dogs, though not resident in the study area, are regularly exercised there. A list of known mammals found in the study area is included in Appendix C.

Herpetofauna

The study area supports a wide variety of reptiles and a smaller number of amphibians. Between 1986 and 1989 the WA Museum recorded three species of frogs (How and Dell 1990). Two of these, *Limnodynastes dorsalis* and *Heleioporus eyrei* require surface water for breeding, however the third, *Myobatrachus gouldii* is unique in that it can breed away from water and spends much of its life buried underground (How and Dell, 1990). The most widespread species was the Banjo Frog, *Limnodynastes dorsalis*, which was recorded in all four sampling sites.

Although no detailed survey of the northern area of M47 between Oceanic Drive and The Boulevard was carried out, all three species of frog can be expected to occur in this northern area. Both *Limnodynastes dorsalis* and *Heleioporus eyrei* are known to be able to travel up to three kilometres from permanent water bodies. A list of amphibians found within the study area is included in Appendix C.

The WA Museum has recorded a total of 29 reptile species in Bold Park. This is comprised of 22 species of lizard, one species of blind snake and six species of elapid snake (How and Dell, 1990). The Carpet Python and Tiger snake have also been sighted in the study area but not recorded by the Museum's survey, presumably because of their low population

levels. The diversity within different reptile groups in the study area is high and suggests that the reptile fauna has been relatively unaffected by European settlement and the subsequent habitat alteration and fragmentation (How and Dell, 1990).

The greatest diversity of herpetofauna was found by the WA Museum in Banksia woodlands with 26 species, this was closely followed by coastal heath with 24 species and Dryandra thicket with 21 species.

The Mount Claremont Bushland has never been intensively surveyed for ground fauna. However the Perth Wildlife Watch bird banding project recorded seven reptile species in this area during opportunistic observations. This area was also briefly surveyed as part of a study of the Alfred Road to West Coast Highway Link (Dames and Moore, 1986). One additional species, *Lerista lineata* was reported in this survey, however this record would need to be verified by further survey work as *Lerista lineata* has previously only been known from coastal areas south of the Swan River (Cogger, 1975; R. How, pers. comm.). A total of eight reptile species have been recorded to date from the Mount Claremont Bushland, however the reptile fauna could be expected to be much more diverse with between 25 and 30 species existing in the area.

One species of burrowing snake, the Black Striped Snake *(Vermicella colonotos)* is listed as in need of protection due to its limited geographical range in the northern Swan Coastal Plain (Storr, Smith and Johnstone, 1986; Storr, Harold and Barron, 1978). A complete reptile list for the study area is shown in Appendix D.

Avifauna

The birds of Bold Park and environs have been studied more than any other group of animals. This has provided valuable information on what birds use the study area, how they use it and which are the most important habitats in the study area for birds.

The WA Museum recorded a total of 61 species in Bold Park (How and Dell, 1990). Two additional species were listed in the Environmental Protection Authority Bulletin 322 (EPA 1988). The Royal Australian Ornithologists Union 'Metropolitan Bird Project' (October 1984 to February 1985) recorded an additional 10 species. The most recent research on birds in the study area is that of the Perth Wildlife Watch (Bird Banding Project) which recorded two additional species from the Mount Claremont Bushland (Wykes, 1990). Though this project has now been completed, some participants are continuing the research on the avifauna of the dune heaths and Acacia shrublands of the area.

Two other species the Pacific Gull and Silver Gull were listed by Dames and Moore (1986) due to the inclusion of the coastal strip within their sampling area. This brings the total

number of birds found in the study area to 77. A bird species list compiled from the above reports is included in Appendix E.

The species list includes only two species of waterbirds, the Australian Shelduck and the White-faced Heron, both of which were recorded in bushland areas of the study site. The record of Australian Shelduck is of interest as it was sighted in the Tuart woodland and was though to be nesting or searching for nesting sites at the time.

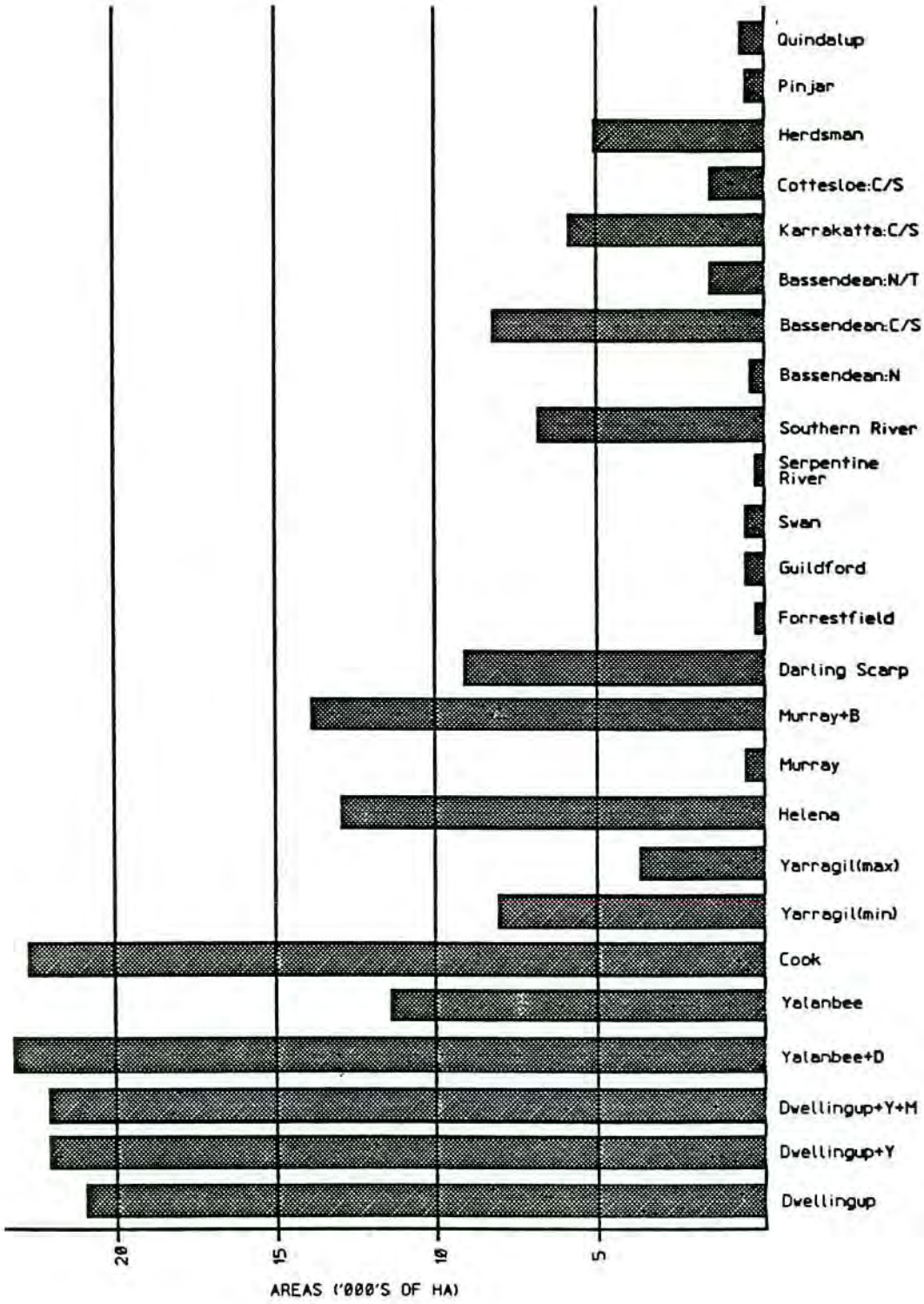
Within the study area there are some specific groups of birds which warrant special interest. The Mount Claremont Bushland supports a unique assemblage of small territorial insectivorous birds (Wykes, 1990). The site supports three species of Fairy wren, The Splendid Fairy-wren, Variegated Fairy-wren and the White-winged Fairy-wren. The Mount Claremont Bushland is the only area in Perth in which all three species occur together.

The area is also an important habitat site for the White-browed Scrubwren, which is sparse within Bold Park. The assemblage of small insectivorous birds is also known to be especially vulnerable to the combined effects of wildfires, weed invasion, predation by feral species, habitat fragmentation and human disturbance.

The second group of birds in the study area of special interest are the honeyeaters, which were so numerous in parts of Bold Park during the RAOU's Metro bird project, that the area was termed "Honeyeater Hill" (Van Delft, 1988) during the Perth Wildlife Watch Bird Banding Project. Up to 148 honeyeaters have been netted in a single morning in the M46 area during early summer. Large numbers of honeyeaters move into the study area to feed on flowering shrubs such as *Calothamnus quadrifidus* and *Templetonia retusa*. The resident honeyeaters feed on various Banksia species and in the Dryandra sessilis thickets when in flower (How and Dell, 1990). Honeyeaters banded at Mt. Claremont have been found in Claremont, Cottesloe, and Mosman Park and this indicates that birds from the study area move around the western suburbs.

Parrots, cockatoos and other birds that nest in tree hollows are well represented in the study area. The Tuart woodlands provide many trees of suitable age that have nesting hollows present. Other species that rely upon tree hollows for nesting, are the Striated Pardalote and Tree Martin.

Birds of prey, or raptors, form another special group within the study area . There are nine species present in total, four of which are common. One of these, the Peregrine Falcon, is relatively rare and classified as in need of special protection (CALM, 1990). The larger raptors range over large feeding territories and the large size of the study area is important for these birds (Wykes, 1990).



SOURCE: J.SINGLETON (1986)

Figure 2.3 VEGETATION COMPLEXES IN SYSTEM SIX AREAS

The high diversity of birds within the study area is essentially related to two factors. Firstly, the diversity of habitats found in the study area both in terms of the structural and floristic diversity. Secondly, the study area is part of an extensive corridor which runs from Herdsman Lake, north-east through Bold Park, to the coast and also to the south-east to Lake Claremont. Linkages between or connectivity of areas of remnant vegetation provides for movement of animals and plant material, wildfire survival, dispersal and migration routes and hence greater ecosystem resilience. Though many species within the study area are sedentary, some but not all can move between areas as their seasonal habitat requirements change.

2.2.3 Local and Regional Context

a. Introduction

The coastal dunes on the Swan Coastal Plain, as typified by the study area, have historically been subject to intense development pressure. In order to preserve areas of this rapidly diminishing resource the Environmental Protection Authority has identified and made recommendations for the establishment and management of conservation reserves (Department of Conservation and Environment, 1983). The study area is one of many reserves identified by the EPA. Quindalup Dune areas are poorly conserved in System 6 reserves, as shown in Figure 2.3.

In determining the local and regional significance of the study area's biota the following definitions of local and regional were used:

- Local - within a 10 kilometre radius of the study area; and
- Regional - coastal reserves on the northern Swan Coastal Plain between Mandurah and Two Rocks.

b. Vegetation and Flora

Local Significance

The study area is one of the largest areas of natural bush in the inner metropolitan area and contains a variety of landforms resulting in diverse vegetation types and a species rich flora.

Trigg Dune reserve and Kings Park are useful local areas for comparison. While Trigg Dune reserve contains similar vegetation communities to those found in the study area,

Banksia woodlands are not well represented, nor does it contain *Acacia xanthina*, *Eucalyptus decipiens* or wetland communities. Kings Park, while of similar size to the study area, is further east and therefore lacks the coastal dune communities and the *Eucalyptus decipiens* community. It also does not contain natural wetlands. The study area is of high local significance because no other area has a similar range of community types.

Another significant value of the study area is in terms of its linkages to adjoining open space and bushland areas. These include the linkage to the south to Cottesloe Golf Course and potentially through to Lake Claremont. To the north west there is a linkage through the City of Perth Golf Course to Herdsman Lake.

Connectivity between these areas enhances the biological integrity of the study area and therefore results in a greater range of associated fauna. No other local area has this significant level of connectivity.

Regional Significance

The regional significance of the study area is related to the number of vegetation associations and floristic variations, the diversity of the flora and the presence of flora of special significance.

A total of eight major vegetation associations occur in the study area as described in Section 2.2.1. Furthermore, floristic variations within these associations increases the number of native community types to 24.

The diversity of the vegetation and flora is comparable with regionally distant areas such as Yanchep and Yalgorup National Parks. These areas are used for regional comparison because of the existence of a suitable database and because of their highly regarded conservation values.

To the north, Yanchep National Park (2,799 hectares) has a greater number of vegetation communities and is more floristically diverse. However many of the vegetation associations are related to the extensive wetlands found there. It does not contain Acacia shrublands or foredune communities. To the south Yalgorup National Park (11,545 hectares) contains similar vegetation associations to that found in the study area but does not contain freshwater wetlands or *Acacia xanthina* shrublands (Keighery et al, 1990).

The diversity of the flora of the study area compares favourably with these areas as shown in Table 2.3.

Table 2.3 COMPARATIVE DATA ON FLORA

Site	Area(ha)	No. Native Species	No. Introduced Species
Study area	500	228	133
Yanchep National Park	2,799	405	105
Yalgorup National Park	11,545	295	55

Source: *Keighery et al (1990).*

Note: *According to Keighery et al (1990). Yalgorup is undersampled and the number of species could be expected to be double that shown.*

While no rare or endangered flora occur or are likely to occur in the study area, 18 significant flora of regional and state value have been previously described (see Section 2.3.1). These include four species listed as Priority species by the Department of Conservation and Land Management. From present information it is unlikely that Yanchep or Yalgorup National Parks contain the same number of significant flora species as found in the study area, however further research is required to substantiate this claim.

In summary the study area has both local and regional significance attributable to its large size, position in the metropolitan region and soil and topographic variability which has resulted in both a limited disturbance, considerable variety of plant communities, and a variety of species within these communities.

c. Fauna

Local Significance

Table 2.4 below sets out the results of fauna surveys that have been carried out in two local and two regional conservation areas.

Kings Park has comparable numbers of amphibians and mammals, though less bird and reptile species which could be due to its regular fire history. The Trigg Dune reserve has comparable vegetation associations though it has only been briefly surveyed and found to support less species in all categories. The paucity of fauna in the Trigg Dune reserve reflects the greater degree of habitat alteration that smaller reserves experience due to their proportionally higher edge length to area ratio. The Trigg Dune reserve also lacks the connectivity of the study area mentioned previously, this reduces fauna dispersment and the capacity of the area to absorb environmental disturbance.

Reserves which have comparable soils, land forms and vegetation associations have recorded fewer bird species. Pinnaroo Valley and the Star Swamp reserve to the north have only recorded 45 and 38 species respectively (Van Delft, 1988).

Table 2.4 KNOWN FAUNA OCCURRENCE - COMPARATIVE ASSESSMENT

Location	Study Area	Kings Park	Trigg Dunes	Yanchep National Park	Yalgorup National Park
Size (ha)	490	400	98	2,799	11,545
Reptiles	29	18	10+	35	19 (30)*
Amphibians	3	3	0	6	8
Birds	72	48	30+	85	70
Native Mammals	2	1	0	15	10
Introduced Mammals	6	3	4	5	7
Special Interest Species	Wrens Raptors Honeyeaters		Wrens	Waterbirds Raptors	

Note: ** Limited surveying in Yalgorup has recorded 19 species, however up to 30 species may occur in the area.*

Regional Significance

Both Yanchep and Yalgorup National Parks are much larger than the study area and have extensive surrounding areas of natural vegetation and major connecting corridors.

Yanchep National Park has a greater diversity of fauna than the study area in all groups except introduced mammals. This is not surprising as the study area is surrounded by urban areas, whereas Yanchep national park is in a predominantly natural area. Yalgorup National Park to the south has extensive areas of vegetation similar in form and species to the study area. It supports similar numbers of bird species (excluding water birds), though has many more amphibians and native mammal species. Yalgorup however recorded a lower diversity of reptile species which is unexpected and is probably due to the lack of an intensive reptile survey of the Park in recent years.

In summary the fauna of the study area is of major local importance to all fauna groups. On a regional scale the study area is also significant as it contains many species only found in much larger, less disturbed areas. The fauna values of the study area are closely linked to the diverse vegetation associations of the area.

2.3 SOCIAL

2.3.1 Landscape

i. Landscape Management Zones

In assessing the landscape value of the study area, a technique known as visual resource analysis was applied. This technique was originally developed by the United States Department of Agriculture (USDA, 1974).

Visual resource analysis involves initially defining characteristic landscape types, then determining the relative visual appeal or scenic quality of each landscape type. Sensitivity levels are then assigned to each landscape by combining viewer types and locations with the distances to the landscape units involved. Finally landscape management zones are defined by correlating the variables identified above to produce a system of landscape assessment. Full details of the method and its application to the study area are contained in Appendix F.

The method therefore combines a measure of the quality of a landscape with a qualitative measure of the number of viewers. For the study area, those parts which can be viewed from major public roads such as West Coast Highway are seen by many more people than the internal valleys, which are only visible from the walking trails. A change in the landscape in these locations would therefore impact upon a larger number of people.

This does not detract from the impact of a change in the landscape of a sheltered valley. While these may be seen by less viewers, the landscape may be of a higher quality and may be held in higher regard by the viewer.

The approach does however provide a systematic method for defining landscape management units. The results of the analysis are shown on Figure 2.4 and are discussed as follows:

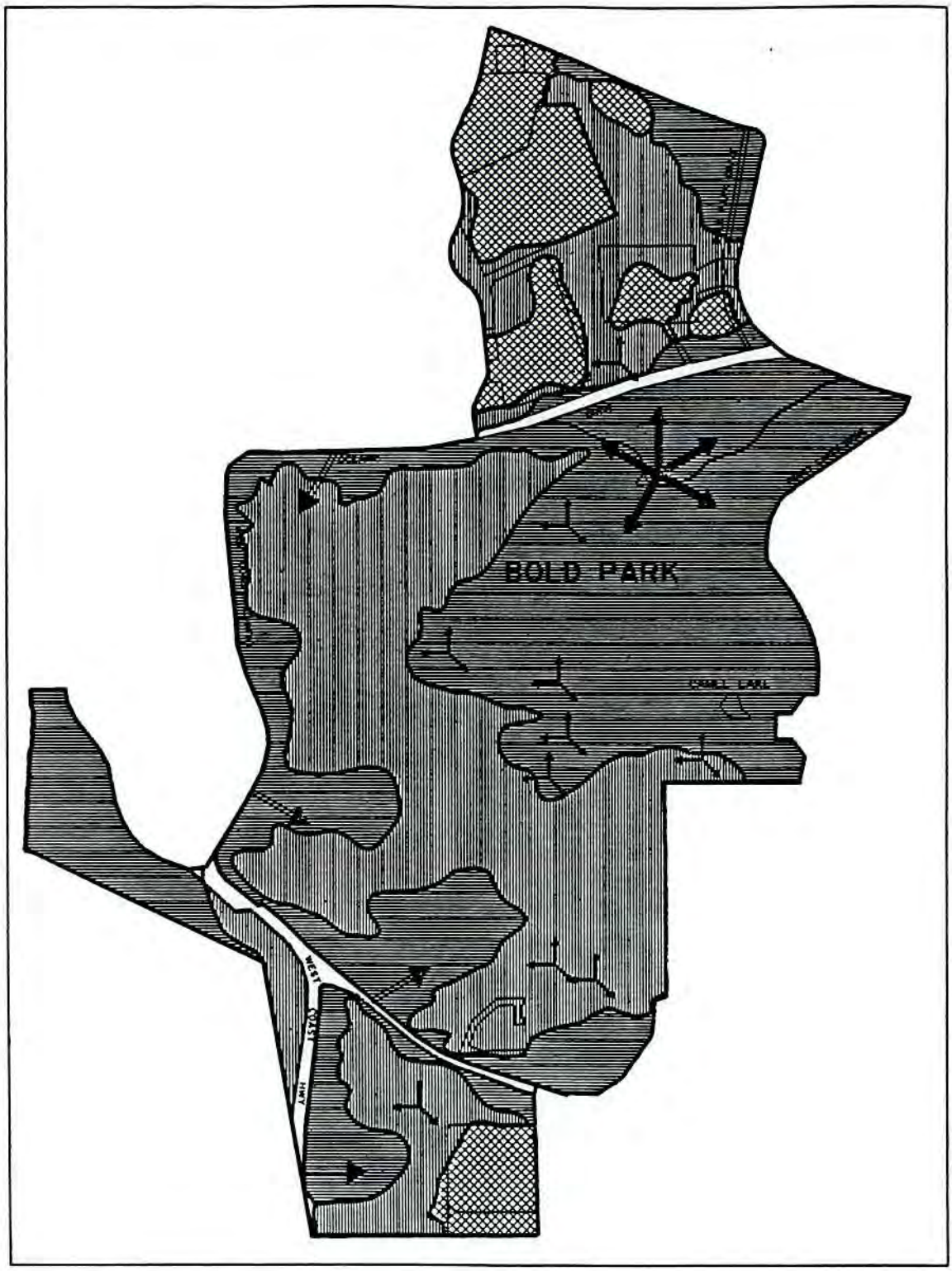


Figure 2.4 LANDSCAPE VALUES

- **Landscape Management Zone A, High Scenic Value Areas**

  This zone includes virtually all bush area that can be seen from the surrounding roads. It also includes the high points and ridge lines that can be seen from surrounding areas. Areas within this zone are generally not suitable for development, unless it is of suitable scale and remains subordinate in form and colour to the basic character of the host landscape.

- **Landscape Management Zone B, Moderate Scenic Value Areas**

  This zone includes those areas which are generally only visible from within the study area, or are slightly degraded. Development in these areas would be seen by fewer viewers, and therefore have less impact. However any development should have scale, form and colour that are sympathetic to the existing features of the study area.

- **Landscape management Zone C, Low Scenic Value Areas**

  This zone covers areas that are generally degraded or do not provide the natural scenic values found in Zones A and B. Development in these areas should be planned to provide a positive impact on the landscape. This could include replanting with indigenous species and use of natural materials such as limestone. Appropriate screen planting could improve the visual appeal of these areas.

ii. Views and Vistas

The significant variation in local topography has a pronounced effect on the scenic values and hence the landscape management zones. In many areas dense vegetation obscures views of the landscape from primary viewing routes. The view from much of West Coast Highway is obscured by foreground vegetation and rising topography except for a small valley which extends into the park adjacent to Saltash Avenue. This valley is visually accessible from vehicles travelling along West Coast Highway and has scenic value. The vistas that are available into the study area are locally very significant and are highly sensitive to landscape alteration. Likewise the view from Perry Lakes Drive has high visual appeal with both foreground and midground areas being visible through the scattered trees and lawn areas.

Views from Reabold Hill are some of the most outstanding in the metropolitan area. Panoramic views are available of the coast and islands and through to the central business district and hills in the east. The study area also provides a number of other significant

look-out points. The landscape of the study area also has high visual appeal from many locations outside the study area. Reabold Hill is one of the highest points in the metropolitan area and as such is regionally significant. It is visible from a wide area extending from Trigg in the north, throughout the western suburbs to Mosman Park. The prominent ridge which includes Reabold Hill forms a major back drop when viewed from the east of the study area especially the nearby suburbs of Floreat, Wembley and Jolimont. The study area also serves to punctuate suburbs to the north and south.

2.3.2 Land Use

i. Study Area

The study area represents a large tract of urban bushland crossed by a number of major roads. It is primarily used for recreational, educational and scientific purposes, however, a number of other land uses occur.

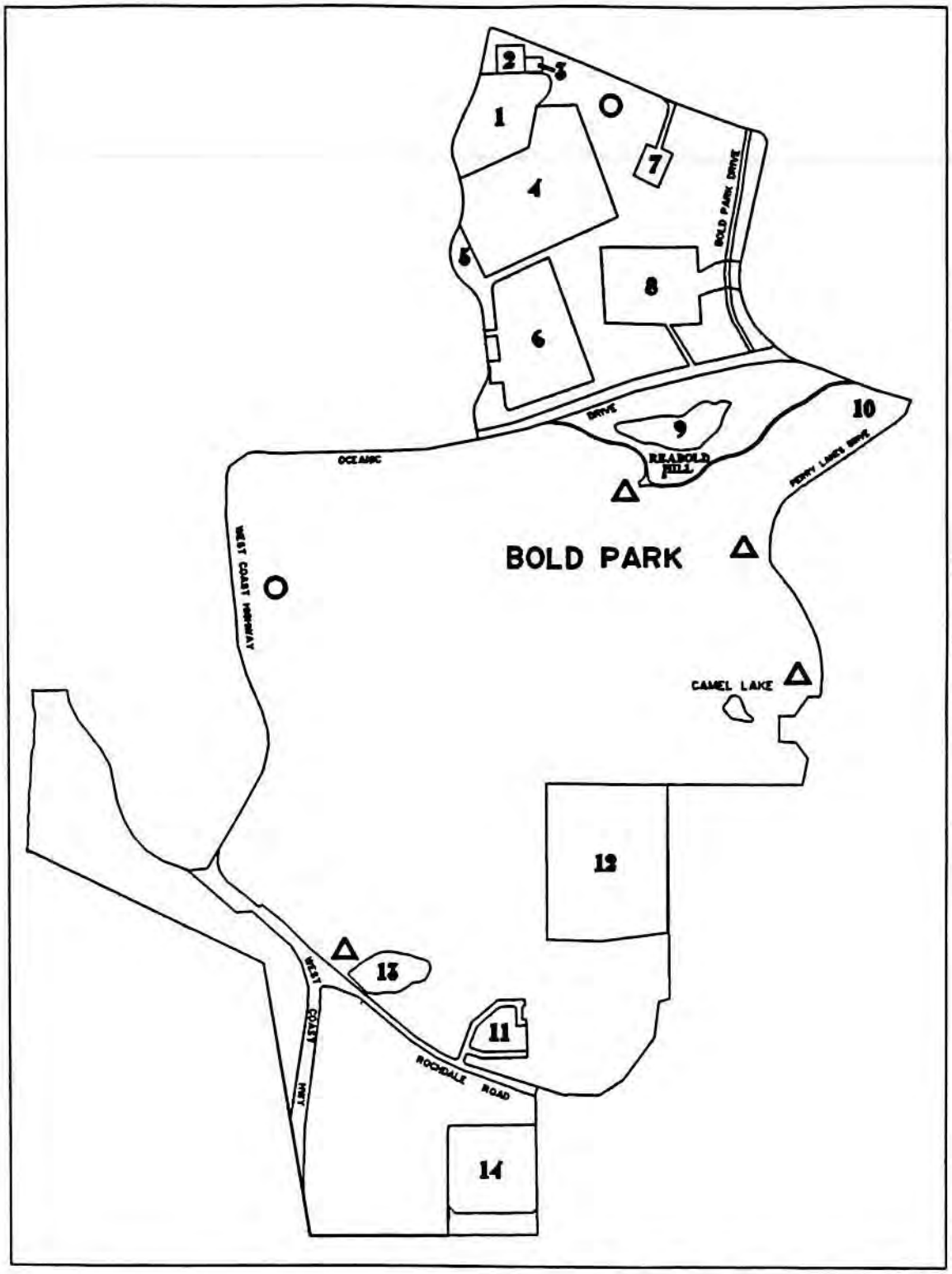
This section describes the major land uses that occur in the area, and these are identified on Figure 2.5.

The northern section of the study area has the greatest range of land uses. The extreme north east of the study area supports the Ocean Gardens Retirement Village, an aged persons housing complex developed on Council owned land in the early 1980s, the City Beach Bowling Club and the First City Beach Scout Hall. Immediately south of these is the site of the Bold Park Reservoir, a Water Authority of Western Australia (WAWA) water storage reservoir. The site includes a large covered reservoir, a pump house and a currently disused caretaker's residence fronting Kalinda Drive. Just outside of the site is another WAWA installation, the City Beach High Level Tower. WAWA has vehicular access to the site from Bold Park Drive and a deep artesian bore is maintained alongside this track.

The City Beach Senior High School site comprises 10.6 hectares of land fronting Kalinda Drive just north of Oceanic Drive. Development on the site includes school buildings, sporting facilities and a caretaker's residence.

The Bold Park Swimming Pool is also located in the northern section of the study area, with vehicular access from The Boulevard. The pool is an outdoor unheated 50 metre pool with associated facilities. It is owned and operated by Perth City Council and closes for the winter months.

A former use of this area was the Skyline Drive-In site. An area of approximately 7.5 hectares east of the high school was leased to a commercial operator who established and



1 OCEAN GARDENS RETIREMENT VILLAGE
2 CITY BEACH BOWLING CLUB
3 FIRST CITY BEACH SCOUT HALL
4 BOLD PARK RESERVOIR
5 CITY BEACH HIGH LEVEL TOWER
6 CITY BEACH SENIOR HIGH SCHOOL
7 BOLD PARK SWIMMING POOL
8 FORMER SKYLINE DRIVE IN
9 QUARRY AMPHITHEATRE
10 PERRY LAKES HOUSE
11 WOLLASTON THEOLOGICAL COLLEGE
12 PINE PLANTATION
13 TURF FARM
14 CHRISTCHURCH GRAMMAR PLAYING FIELDS
FORMER QUARRY SITES
CARPARKS

Figure 2.5 LAND USE

operated a drive-in cinema on the site until 1986. At that time the lease was surrendered and all major installations removed. However the site was not revegetated and some bitumen roads remain. The site is currently fenced although the fence is in poor condition. The site is in a degraded condition and options for its reuse are considered in Section 5.7.1.

The northern section of the study area has a few minor recreational developments. A sealed path provides an east-west link between Kalinda Drive and Bold Park Drive and a second sealed path links this to the Bold Park Swimming Pool and The Boulevard. A former quarry site adjacent to The Boulevard is managed as an active recreation field and is used for archery and other purposes.

The central section of the study area, commonly regarded as Bold Park contains little development and is almost entirely devoted to recreational use. The major exceptions are the Quarry Amphitheatre, Perry Lakes House and the Wollaston Theological College.

The Quarry Amphitheatre was developed in an old quarry site in about 1986 and is currently leased to the Perth Theatre Trust. It is located on the northern slope of Reabold Hill, above Oceanic Drive, and its facilities include an Amphitheatre comprising grass tiers, an orchestra pit, timber stage, kiosk, toilets, office and parking for 220 cars. The Amphitheatre is used during the summer months for drama, music and other performances. It has hosted the WA Symphony Orchestra and other performers of international repute.

Perry Lakes House is a historic house located in the north-eastern corner of the study area close to Oceanic Drive. The house is of significance because it represents an example of an original farmhouse in reasonable proximity to the City. Built around 1916 from locally quarried limestone, the house comprises four rooms surrounded by a verandah. The house was originally associated with a dairy farm and outbuildings and yards were located on a ridge to the south of the house. Water was pumped by windmill from a well, which was dug by hand through 20 metres of limestone.

It has been suggested that this well should be displayed because of the quality of its workmanship (Perth City Council, 1979).

Perry House is currently leased to the Wildflower Society of Western Australia and the Royal Australian Ornithologists Union (RAOU) as an office and Education Centre for Bold Park and Perry Lakes. As part of the accommodation agreement the organisations are required to conduct activities for visitors to Bold Park and Perry Lakes and to assist Council in the development and implementation of management plans. The Wollaston Theological College is located off Rochdale Road. The College is a retreat and conference centre.

The central portion of Bold Park also has a number of areas which have been altered due to current or past uses. Amongst these is the pine plantation located in the south eastern part of the park. While this is not actively managed as a commercial forest at the moment, it is assumed that it was planted in response to a Council resolution of 1917 which proposed the idea and stated:

> *"This forest, in addition to being a great attraction to pleasure seekers, would ultimately be a source of profit to the City. It is considered that the value of the Estate would be considerably enhanced by this proposal, as during the hot summer months the cool shade afforded by a pine forest would undoubtedly be largely availed of by the people, particularly as the forest would be within easy reach of the sea by tram, bus or road".*
>
> (1917 motion of Council as reported in City of Perth, 1979).

The Council currently uses an area of land adjacent to Rochdale Road as a turf farm. Turf is grown there for use on Council sporting fields in other parts of the city. The site is basically undeveloped apart from a bore and irrigation equipment. This turf farm is not the major source of turf for the City of Perth and is only used on an as needed basis.

The only other area in the central part of Bold Park exhibiting any other land uses is a former quarry site near the West Coast Highway.

This part of Bold Park also contains most of the recreational developments that occur in the study area. The most well known is likely to be the look-out and car-park on Reabold Hill, which provides excellent views of the City, the coast and the western suburbs.

Unsealed carparks are located off Perry Lakes Drive near Perry Lakes and near Camel Lake and at the intersection of Rochdale Road and West Coast Highway. There are a number of trails through this area, one of which is designated as a bridle path. These trails are unsealed and are managed by Council as walking trails.

The southern portion of the study area, south of Rochdale Road is undeveloped apart from the Christchurch Grammar School Playing Fields. It contains no formal facilities although a number of trails exist in the area.

The coastal section of the study area is fenced and remains in its natural state apart from a number of developed beach access tracks. The coastal dual use cycle/pedestrian path follows the West Coast Highway and traverses this area.

ii. Surrounding Land Use

The study area is bounded by roads or by the City of Perth boundaries. It adjoins bushland or developed open space on three sides.

Directly north of the study area, on the other side of The Boulevard, is the Wembley Golf Course. To the east, the study area is separated from Perry Lakes Reserve and Alderbury Park by Perry Lakes Drive. To the south and south-east it adjoins Cottesloe Golf Club and the Campbell Barracks Rifle Range. Residential areas generally surround the study area with City Beach to the north-east, Floreat to the north-west and Mt. Claremont to the south-east.

On a parcel of contiguous land which falls outside the study area is Lot 1 Stephenson Avenue. This land lies within the City of Nedlands and is privately owned by the Bond Corporation. It is currently undeveloped and is used for recreational and educational purposes as it is not fenced off from Bold Park. It is the subject of the Knightsbridge proposal and as such residential development has been proposed for the site.

2.3.3 Recreational Use

i. Method

Most of the study area is currently available for recreational use and consequently it was necessary to investigate its value as a recreational area. In this context recreation refers to sport and leisure past-times but does not include education, scientific or conservation activities which are considered in Section 2.3.4.

The investigation was carried out by focussing on two types of recreational use, organised and casual. Organised recreational use refers to any use organised by a club, association or other group. These may include training sessions or events. Casual recreational use refers to individuals, families or groups of people who use the study area for their own recreational purposes on a casual basis.

ii. Organised Recreational Use

The investigation of organised recreational use primarily involved direct contact with organisations known to, or likely to use the study area for recreational purposes.

The organisations were identified through a review of Council files detailing contact with organisations seeking to use the area, advertisements in newspapers seeking the views of user groups and direct contact with groups known to use the area.

The nature of the study area and the facilities provided there are not conducive to many group activities and this, to some extent, limits organised recreational use. The trails are however suitable for cross country running and orienteering and these are some of the organised activities that occur. Schools are regular users in this regard. City Beach High School reports that it uses the area for orienteering and fun runs, while Christchurch Grammar uses the Mt. Claremont Bushland adjoining its playing field, up to three times a week for cross country running. It is also reported that inter-school cross country events are held in the central part of Bold Park, but Perth City Council has no record of these.

The Orienteering Association of WA and the WA Triathalon Association and the Melville Little Athletics have all made use of the Reabold Hill area. Other groups who are known to have used the area include the Wembley Scout Group and the Over 50 Walking Association. A power walking club also uses the central area on a regular basis.

A regular user is the YMCA Archery Club. The Club uses the old quarry on The Boulevard, near Bold Park Swimming Pool, for archery training and events every Saturday.

It is likely that a number of other organisations use the study area for recreational purposes, and have not been identified here. It is expected that activities would include walking, running, orienteering and horse-riding as these are the types of activities that are compatible with the facilities and characteristics of the study area.

In general, however, the study area is not well used for organised recreational events, largely because it is unsuitable for such events. It is apparent that the central area of Bold Park, particularly around Reabold Hill, is the most used for organised recreational activities.

iii. Casual Recreational Use

The investigation of casual recreational use of the study area has involved carrying out a user survey, reviewing a previous survey, and seeking input from park users by way of submissions and comments. Key objectives have been to determine the level of use, activities carried out, sources of users, areas visited and attractive features of the study area.

Casual recreational use is, by its very nature, difficult to measure. With the size of the study area and its many different entry and exit points these problems are exacerbated.

Consequently, this section does not purport to be a definitive survey of casual recreational use but provides a snapshot, identifying major use patterns and trends.

a. User Surveys

In 1987 the Friends of Bold Park co-ordinated a user survey of the central area of Bold Park. The survey involved stationing interviewers at the three most popular entry points (Reabold Hill, entry adjacent to Perry Lakes, and near Camel Lake) over a Saturday to Monday period in October. Surveys were conducted for 33 hours at each location, a total of 99 hours of survey time.

The user survey carried out as part of this study is referred to as the 1992 survey and is fully detailed in Appendix G. It was aimed at measuring the recreational use over the whole study area and consequently six survey checkpoints were used. Each was surveyed for four hours on a weekend, and two were surveyed for an additional four hours on a weekday, resulting in a total of 32 hours of survey time.

The following sections review and compare the results of the surveys.

- **Level of Use**

  The 1987 survey recorded 1300 people or an average of 13 per survey hour passing the checkpoints, and of these 689 completed a questionnaire. The 1992 survey counted 232 persons or seven per survey hour, of whom 102 filled in a questionnaire.

  The gross number of people using a recreational area will be dependent on a wide range of variables including time of day, time of year, weather conditions and location of survey points. The variation between the number of users per survey hour could be dependent on any of these. However, the 1992 survey covered a wider range of survey points, including some that recorded very little activity. The number of users counted ranged from 19 per survey hour at Reabold Hill on Saturday morning, to one per hour at the Mt. Claremont Bushland.

- **Age of Users**

  The 1992 survey indicated that older age groups were significant amongst the user group surveyed. Some 62% of those surveyed were over 40 years of age. The 1987 survey had 39% in this same category.

- **Home Address**

The home address (or suburb) of respondents to the 1992 survey were coded into three categories as shown in Table 2.7 below. The results differed substantially from those recorded in 1987, however the timing of the survey periods for the 1992 survey were more likely to record regular users, who are likely to live close by. Both surveys indicated that a significant proportion of users live more than 10 kilometres from the study area.

Table 2.7 USER SURVEY - PROXIMITY OF HOME

Location of Home	1992 Survey%	1987 Survey %
Within 10 kms	77	48
10-20 kms	16	32
20+ kms	2	20
No response	5	-
TOTAL	100	100

- **Frequency of Use**

The 1992 survey found that 73% of respondents use the area weekly or more often. In comparison the corresponding figure in 1987 was 30%. This indicates that the surveys covered different user groups.

- **Areas Visited**

The two surveys had different study areas and consequently the results are not directly comparable. In addition, the response to this question will be highly influenced by the location of the surveyor.

The 1992 survey divided the study area into five sectors. The results showed that the central part of the study area was clearly the most popular with 88% of respondents saying they would visit this area. None of the other sectors scored higher than 22%.

The 1987 survey was only concerned with the central part of the study area. It found that 69% of respondents would visit the car-park at Reabold Hill, 42% the northern trails, 39% the southern trails and 21% the pine plantation.

❑ **Activities**

The two surveys used the same question on intended activities and the results are shown in Table 2.8. The differences would tend to indicate that the 1992 survey captured regular park users while the 1987 survey gained many more occasional users. However the three most popular activities were the same in each case.

Table 2.8 USER SURVEY - ACTIVITIES

	1992 Survey %	1987 Survey %
Walking	86	59
Going to look-out points	22	51
Observing plants	22	38
Running	18	16
Meditation	18	15
Observing Animals	8	28
Picnicking	8	12
Other	5	-
Photography	4	19

b. Horse-riding

The study area comprises one of the few large areas of public bushland open to horse-riders in reasonable proximity to the City.

The population of horses in the locality of the study area is reported to have grown in recent years as some additional land has been made available for agistment. It comprises two Riding for the Disabled Australia (RDA) Groups and a number of private horses on agistment. The Capricorn RDA Group is located behind the Superdrome, off Underwood Avenue. It has 16 horses, and groups of these are exercised in the study area approximately two days a week.

The Claremont RDA Group is located on Brockway Road near Graylands Hospital. It also has 16 horses and uses the study area every day, either for exercising horses or for taking handicapped people horse-riding.

About 18 private horses are kept on agistment in the Brockway Road area, two on the old Lakeway Drive-In site in Claremont, and others kept at the Showgrounds equestrian centre and at an agistment centre on Pearson Street near Herdsman Lake. These are all within a two kilometre radius of the study area.

Because many of these horses are agisted in small paddocks they require daily feedings and frequent exercise. Consequently some are ridden up to five or six times a week.

The study area provides the only substantial area of bushland open to horse-riding in the western suburbs. A number of bridle paths are provided including a seven kilometre trail which circumnavigates the central portion of Bold Park and a three kilometre circuit located near the Wollaston Theological College. These paths are the most used by horse-riders. However, the northern part of the study area provides firmer conditions and is used by people with competition horses or horses recovering from leg injuries. The Mt. Claremont Bushland is used occasionally, while the coastal strip is used to gain access to the beach.

iv. Conclusion

The study area provides for a particular type of recreation experience which relates to its natural bush setting. It is probably as close to a wilderness experience as could be achieved within 10 kilometres of a metropolitan city centre. The area has limited facilities and this adds to its natural feel. It does, however, limit its ease of access and mean that use of the study area requires some physical exertion, walking, running or perhaps horse-riding. Only Reabold Hill with its city and coast views is easily accessible for cars.

These characteristics mean that the area does not have the high visitation rates of Kings Park where a number of look-outs and picnic grounds are easily accessible by car. But they are the very characteristics most valued by users. When the survey allowed respondents to provide any additional comments, 39%, without prompting, stated that the area should be left in its natural form.

These characteristics are not generally attractive for organised group activities, except for pursuits which require a natural area, such as orienteering. The study area provides recreation opportunities which are more appropriate for individual or small groups to exercise and/or enjoy the natural bushland.

This investigation has indicated that the central portion of the study area receives the greatest recreational use. It has more facilities and provides a large uninterrupted area. Within it, the northern area around Reabold Hill and the eastern edge along Perry Lakes Drive receive the greatest use. The area north of Oceanic Drive receives some use, particularly from local residents, while the Mt. Claremont Bushland receives little recreational use. The coastal strip is generally only used for beach access.

The surveys have shown that people are willing to travel a considerable distance to use the area, and in fact 85% of users surveyed arrived by car. The 1992 survey indicated that

18% of users travelled more than 10 kilometres, while the more extensive 1987 survey put this figure at 52%. Clearly the area provides a recreation resource which is used by many residents from outside the City of Perth.

2.3.4 Educational and Scientific Use

Because of its proximity to educational and research organisations and because of the diversity of flora and fauna found in the study area, it gains considerable use for environmental education and research purposes.

The Natural Science Division of the WA Museum has been carrying out fauna studies in the central Bold Park region over a number of years. The results of this research have been published and is referred to in Sections 2.2.2 and 2.2.3. Flora studies have also been carried out and the area is generally recognised as providing a representation of the original vegetation of the Swan Coastal Plain.

For these reasons interest groups such as the WA Wildflower Society, The Local Plant Group, the Tree Society, the RAOU and the Naturalists Club all conduct activities in the study area.

A community bird banding project has been carried out in the Mt. Claremont Bushland since 1989. This project, initially run by the Perth Wildlife Watch and now by the Mt. Claremont Bird Banding Group, involves research into the resident and migratory birds of the area. Further detailed research is being carried out by university students involved in the project.

For education purposes, the central portion of Bold Park, particularly near the West Coast Highway is used extensively by the Education Services Department of the WA Museum. Programs are run for teachers, school students, the disabled and the general public. The teachers program is run three to four times a year and involves providing environmental education for school teachers. The Museum has developed a program and worksheets based on Bold Park and these are provided to teachers who can then either bring their students to Bold Park or adapt the program for some other area.

The student program is run in a two week block in October. Two schools a day are catered for with up to 60 students from each school. The students are given lectures and taken on a field trip to Bold Park. Subjects covered are flora, fauna, geology, the impacts of urbanisation on the environment and environmental research techniques. The student program is advertised to teachers each year.

Public programs include Bird Walks and Spider Walks. The Bird Walks have been held at regular intervals over the last two and a half years and are always fully booked. The Spider Walks are carried out in the evening about twice a year. These programs are advertised and are available to the general public.

The WA Museum has used Bold Park for field studies and educational programs for about four years. Because of this it has assembled a considerable data base on the area which is used in educational programs. The Museum sees that the study area provides a number of key advantages, being centrally located, easily accessible and providing a large, rich and little disturbed natural environment. By contrast, the Museum, until recently, has not used Kings Park for regular environmental educational programs. The WA Museum also participates in the Bold Bush Festival. This is an annual four week program of educational and recreational events occurring in and around Bold Park and Perry Lakes, held in October. It is organised by Perth City Council and draws on the expertise of a range of interest groups to lead walks and give talks on aspects of the environment. Most of the Bold Park activities are held in the central part of the study area.

It has also been reported that schools frequently use Bold Park for educational activities. City Beach Senior High School, which is located within the study area uses the central part of Bold Park for both science and art classes. City Beach Primary School also uses the area on a regular basis. In the past two years Scotch College has used the Mt. Claremont Bushland for biology excursions. It is likely that the area is used by other schools for environmental education purposes because of the teacher education programs carried out there by the WA Museum and because of its central location and easy accessibility.

In summary, the study area acts as a major education and scientific resource. This use occurs despite the area not having the level of facilities found at Kings Park. Its major advantages in this regard are its size, diversity of flora and fauna, lack of disturbance and central location and easy accessibility. The central portion of the study area is the most heavily used, however research and education activities have occurred in both the northern part of the study area and the Mt. Claremont Bushland.

2.3.5 Archaeology and Ethnography

A search of records held by the Department of Aboriginal Sites at the WA Museum indicate that the study area has not been the subject of any detailed ethnographic or archaeological research.

Despite this, one site within the study area was documented in a 1985 study, Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan and Murray River Regions (R. O'Connor and C. Bodney). This site was recorded as a camp site and plant source. It is the policy of the Department not to publish specific site details in public documents however Figure 2.6 indicates the general location of the site.

The Aboriginal Heritage Act 1972-1980 covers all Aboriginal sites whether they are known to the Department or not. Under Section 17 of the Act it is an offence to damage or alter an Aboriginal site in any way unless written consent has been obtained from the Minister for Aboriginal Affairs. This permission would be needed prior to any development near the site.

Because the study area comprises a large tract of land in a relatively undisturbed state, and it has not been the subject of a comprehensive study it is recommended that prior to any significant development occurring, archaeological and ethnographical studies be carried out. The aim of any such studies would be to ensure that all relevant Aboriginal interest groups are consulted and that sites of heritage value are recorded.

2.3.6 Noise

i. Method

Site visits to the study area indicate that, in general, traffic noise from the surrounding road network is the major contributor to the existing noise climate. For this reason the assessment of the existing noise climate focussed on road traffic noise.

Traffic noise is generally measured, predicted and assessed in Australia using the L_{10} (1 hour) and L_{10} (18 hour) indices. The L_{10} (1 hour) is the noise level exceeded for 10% of a one hour period. The L_{10} (18 hour) is the average of 18 L_{10} (1 hour) values for the period between 6am and 12 midnight. Consequently it provides a single measure (expressed in dB(A)) to represent traffic noise generated over an 18 hour period.

Most state road authorities regularly use a method developed in the UK to predict the noise generated by free flowing traffic (UK DoE, 1975). The method rates amongst the best in the world and has been evaluated in Australia (Samuels and Saunders, 1982) so its accuracy and applicability are known. The model relies on a number of data inputs including traffic volume, percentage of heavy vehicles, average speed, road surface and surrounding topography.

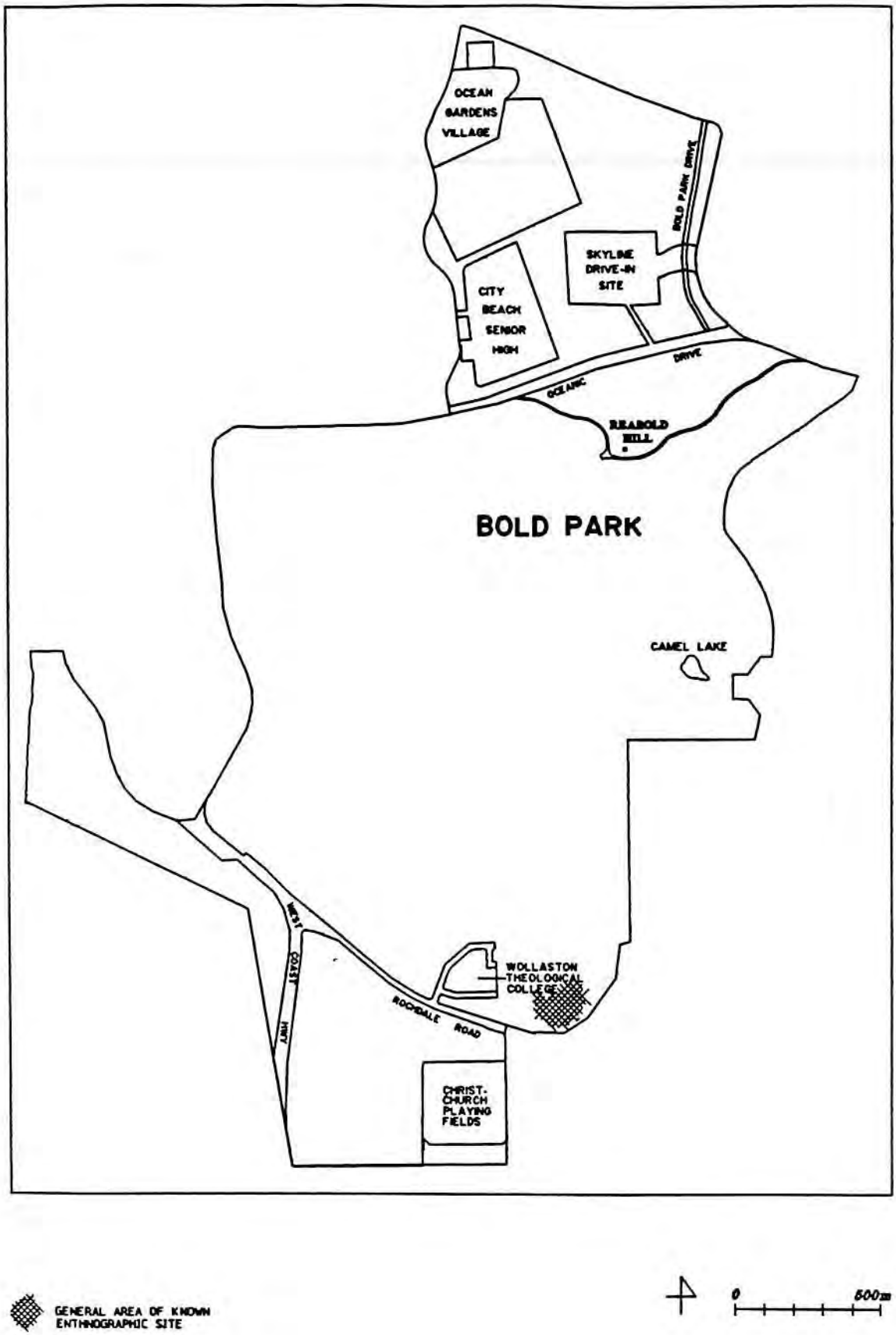


Figure 2.6 KNOWN ENTHNOGRAPHIC SITE

Using this data predictions were made for six locations on roads surrounding the study area, as shown on Figure 2.7. For each of these locations relatively recent traffic data was available.

Two types of estimates were made. At locations 1, 2, 3 and 7 an estimate was made for a point 1 metre in front of the residential facade, for residences fronting onto the road in question.

The second estimate was made for a point 100 metres from the road, and therefore can be applied to the study area.

It should be noted that no allowance was made for topographic shielding. Noise travels on a line of sight and is attenuated by solid barriers between the source and the receiver. The undulating topography of the study area provides, in many instances, for ridges which act as a noise barrier between the surrounding roads and the interior of the study area. An example of this is on the West Coast Highway, just north of Rochdale Road. In other locations the road is elevated above the surrounding land and this would assist the propagation of traffic noise. This occurs where the West Coast Highway passes the Mt. Claremont Bushland and where Rochdale Road passes the turf farm.

Where a ridge acts as noise buffer the noise level beyond the ridge could be up to 18 dB(A) less than if the intervening land was flat.

ii. Results and Assessment

Table 2.9 provides the results of the noise estimates. In the assessment of new road projects Main Roads WA currently uses 68 dB(A) L_{10} (18 hour) as a threshold level for residential development. If the project causes the traffic noise level at an existing residence to exceed this figure then some remedial action is required. It can be seen from Table 2.9 that the current noise levels do not approach or exceed this figure.

However a recent report (Mitchell McCotter, 1991) indicated that most other states in Australia adopt 63 dB(A) L_{10} (18 hour) as the level at which remedial action is required. This is on the basis of research that indicates that some 24% of Australians are highly annoyed by a noise level of 68 d B(A) L_{10} (18 hour), while the proportion highly annoyed at 63 dB(A) L_{10} (18 hour) falls to about 18% (Mitchell McCotter, 1991).

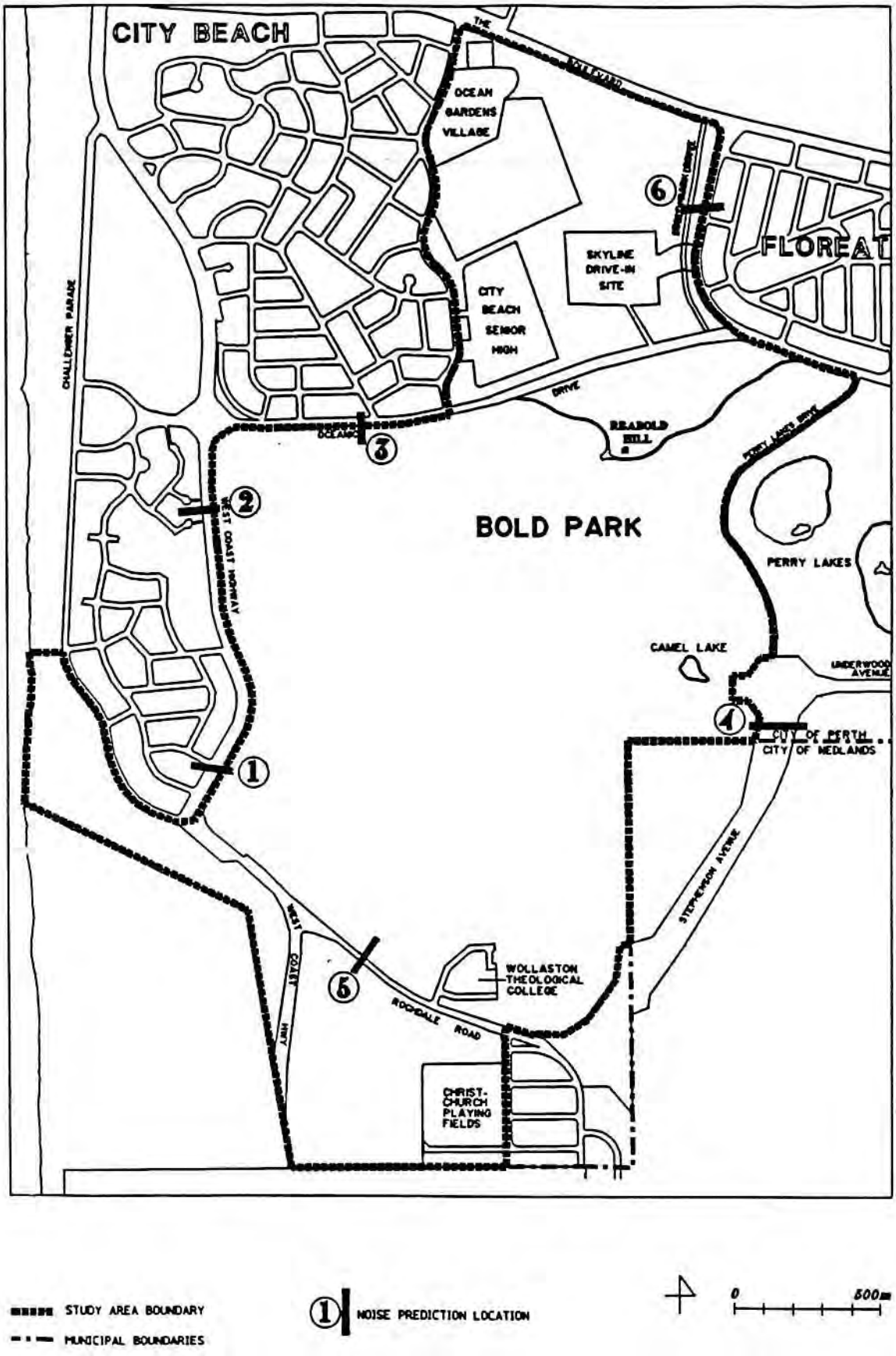


Figure 2.7 NOISE PREDICTION LOCATIONS

Table 2.9 NOISE ESTIMATES

Location[1]		Estimates of Existing Traffic Noise L_{10} (18 hour) At residential facade dB(A)	100m from road[2] dB(A)
1.	West Coast Hwy (north of Rochdale Rd)	63.0	54.5
2.	West Coast Hwy (south of Oceanic Drv)	60.0	55.0
3.	Oceanic Drv	62.7	51.2
4.	Stephenson Ave	-	51.0
5.	Rochdale Rd (east of West Coast Hwy)	-	46.0
6.	Bantry Road & Elphin Street	50	-

Notes: *1. See Figure 2.7*
2. No allowance for topographic shielding

The Mitchell McCotter report recommended that consideration be given to lowering the noise criteria in Western Australia to 63 dB(A) in line with other states. Main Roads is currently investigating this recommendation.

At none of the locations for which predictions were made did the results indicate noise levels in excess of the criteria currently used by Main Roads. However, at locations 1 and 2 levels in excess of 63dB(A) were estimated and these could be regarded as a poor noise climate.

The estimates for inside the study area indicate significantly lower noise levels, due to the increased distance between the source and receiver. The actual noise levels are likely to be even lower in instances where a ridge separates the receiver from the road.

The Environment Protection Authority in NSW considers that 40 dB(A) L_{90} provides acceptable conditions for passive recreation. The L_{90} is the noise level that is exceeded for 90% of the time and is often regarded as the background noise level. While this standard is not directly comparable with the results indicated in Table 2.9, it is likely that it would be met at many locations in the study area which are shielded from direct exposure to road noise.

On this basis those parts of the study area which are within 150 metres of the West Coast Highway, Oceanic Drive or Stephenson Avenue and have no intervening topographic features are likely to suffer from moderate traffic noise levels. The remainder of the study area is relatively free from undue traffic noise, and in some sheltered locations in the centre of the study area there is very little traffic noise and a correspondingly good noise environment.

2.3.7 Community Expectations

Community values and expectations were sought and considered throughout the process and these are detailed in Chapter 8. In general the community strongly opposes any development within the study area which is not for an educational, conservation or recreation purpose, and is seeking a means of ensuring that the area is managed for these purposes permanently.

Chapter 8 details the method and findings of the community consultation program.

Chapter 3

SUMMARY OF VALUES

3.1 INTRODUCTION

One of the main aims of this study is to determine if any parts of the study area are suitable for development, and to identify those areas. For this reason it is necessary to synthesize the results of the studies reported in Chapter 2 to provide an overall conservation rating for the study area. This rating will rank different parts of the site against itself and identify those parts of the study area which exhibit the highest value on the basis of the criteria considered.

3.2 METHOD

Any method for ranking the conservation value of land will involve value judgements. This is because the conservation value of land involves many factors including the quality of the vegetation, the degree of recreational use and the visual quality. Value judgements have to be made as to whether an area of high visual significance is as worthy of conservation as a rare plant.

For this reason a method has been applied that requires the explicit statement of assumptions or value judgements. The method is systematic and provides for an analysis that is repeatable.

The method involves two major steps:

- the rating of the value of the study area against criteria representing the key variables; and
- the combination of these ratings to provide a single rating representing the conservation value of the study area.

Each of these steps is described fully in the following sections.

3.3 RATING CRITERIA

The first value judgement in the process is to determine the key variables which will be included in the rating system. On the basis of the preceding studies the values which are assumed to form components of the overall conservation value of the study area are as follows:

- flora and vegetation values;
- fauna values;
- visual significance;
- recreational use;
- scientific and educational use; and
- archaeological or ethnographic values.

It is necessary then to provide criteria on which the parts of the study area can be rated for each variable. The following sections provide the criteria and resulting ratings map for each variable.

- **Flora and Vegetation Values**

  The criteria for the quality of flora and vegetation is based on three characteristics: the diversity of native species present, the degree of disturbance measured by the level of weed invasion, and the presence of regionally significant flora.

  Three rankings have been used:

  High — this applies to areas with a high level of diversity (above average) and low to moderate disturbance (approximately less than 25% weed species) or communities which contain regionally significant flora.

  Moderate — this includes areas with average species diversity and low to moderate disturbance levels.

  Low — this includes all other areas with high disturbance or which have a low diversity of species and are not regionally significant.

  These rankings have been mapped on Figure 3.1.

- **Fauna Values**

Because of the relatively lower levels of information relating to fauna, ranking the study area in terms of its value as fauna habitat has been more difficult. The WA Museums ground fauna survey was taken as an initial habitat assessment. This survey lists the numbers of captures of individuals for each species in four different vegetation types. Banksia Woodland areas were found to support the highest number of species (26) closely followed by Coastal Heath (24), *Dryandra Sessilis* Heath (21) and Tuart Woodland (18) (How & Dell, 1990).

Those habitats which are known to support rare species or species in need of special protection were given a high listing. The third criteria related to areas known as significant bird feeding or nesting locations. The Banksia woodlands, heathlands (including *Dryandra Sessilis, Calothanmus quadrisidus* and *Templetonia retusa* communities) and shrublands are all significant bird feeding and nesting areas. Tuart woodlands were also identified as significant nesting areas. The local diversity of vegetation types and the level of disturbance was taken into account with areas of high disturbance and limited or no native vegetation given a low classification. The three rankings are as follows:

High	areas which have been shown to act as habitat for a range of species or uncommon species.
Moderate	areas which because of their vegetation and disturbance characteristics are likely to act as habitat for a diverse range of species or uncommon species.
Low	areas with low habitat qualities and considerable disturbance.

The results are mapped on Figure 3.2.

- **Visual Significance**

The ranking of the study area according to its visual significance has been done on the basis of the visual assessment discussed in Section 2.3.1. That provided a systematic basis for identifying which are of scenic quality and combining those with areas which are most exposed to viewers. The rankings are as follows:

High	these areas are of moderate to high scenic quality and are highly exposed to viewers.

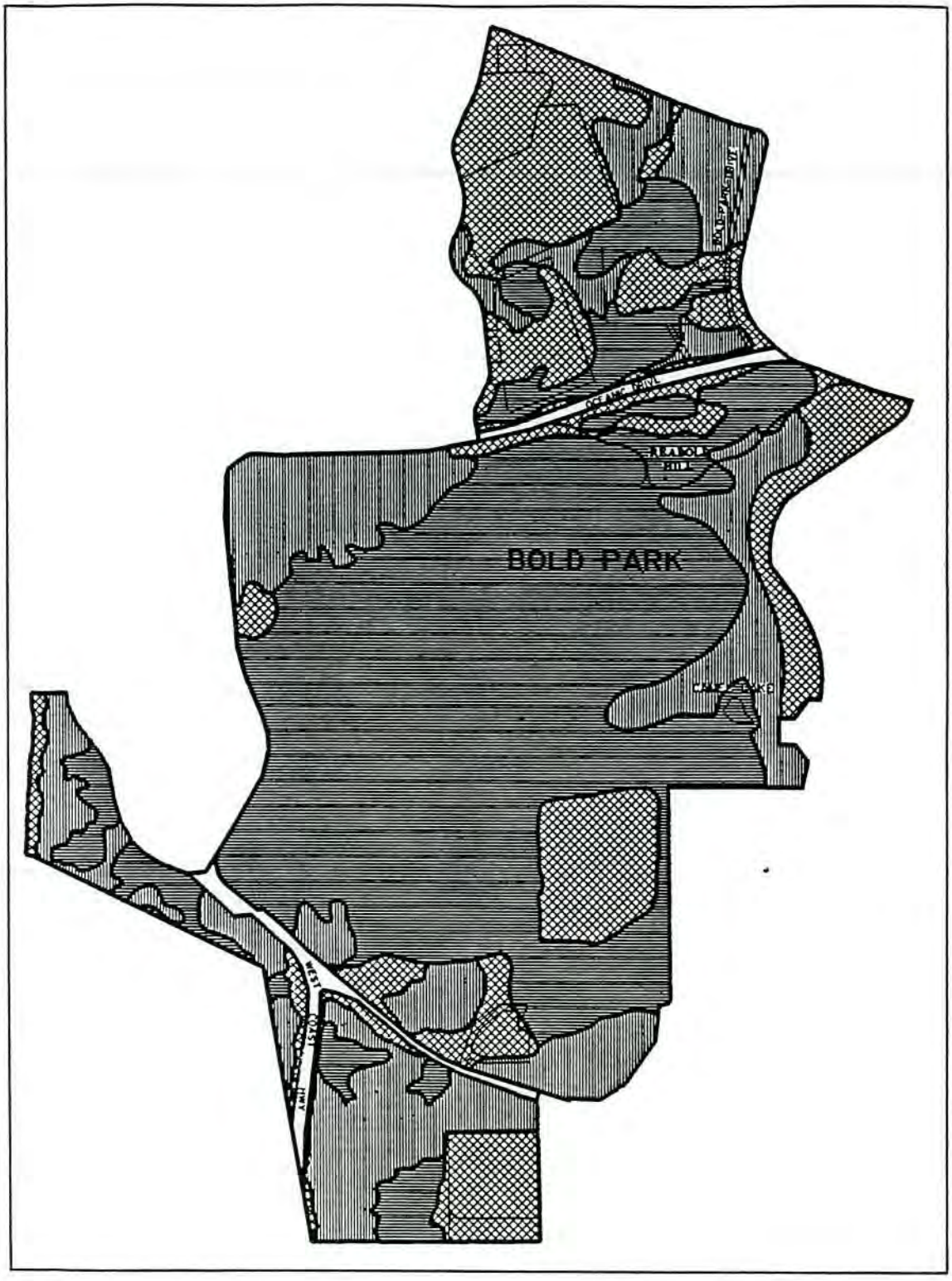


Figure 3.1 FLORA AND VEGETATION VALUES

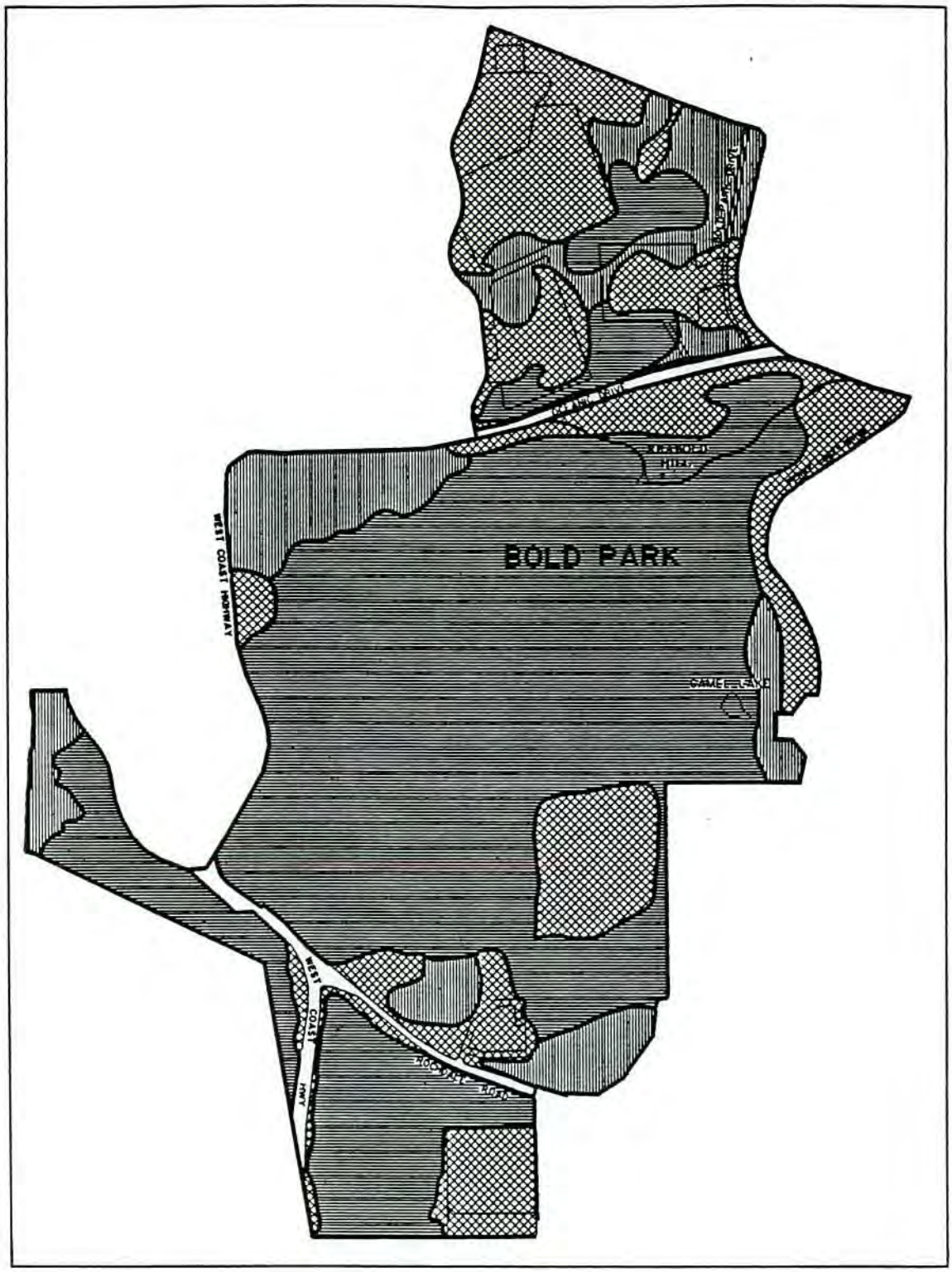


Figure 3.2 FAUNA VALUES

Moderate — these areas are of moderate to high scenic quality but receive only moderate exposure.

Low — these areas receive little exposure to viewers.

The results are mapped in Figure 2.4.

- **Recreational Use**

For the purposes of ranking the area on the basis of its recreational use the study area was divided into the same five zones used in the user survey, as shown in Figure 3.3. Initially the total results of the survey were analysed and it became apparent that zones 1 and 2 received significantly higher use than zones 3, 4 and 5. However, 75% of survey field times was spent in zones 1 and 2 and this would bias the results. Consequently, the survey was re-analysed on the basis of comparable interviewer time in zones 1, 2, 3 and 4 (no interview time was spent in zone 5). On this basis the results were similar with over 70% of users using zones 1 and 2, and less than 30% using zones 3, 4 and 5.

The result in itself was not considered a satisfactory means of ranking the study area because it ignored the presence of recreation facilities, or the use by organised groups. Consequently areas with either attributes were elevated one ranking. The results and their justification are as follows:

High — zone 1 because of its documented high use and presence of look-outs, carparks and facilities.

zone 2 because of its documented high use and presence of facilities.

other areas of high use such as playing fields and swimming pool

Moderate — zone 4 because of low levels of casual use, but regular use by organised groups and the presence of paths and swimming pool.

parts of zone 5 which include trails to beach or dual use path.

zone 3 because of its low casual use but regular use by school running groups.

Low — other areas of low casual use, no facilities, and no recorded group use.

The results are mapped in Figure 3.3.

- **Scientific and Educational Use**

The rankings for scientific and educational use were determined by identifying areas of known use. In a similar manner to the rankings for recreational use, limited data is available on specific areas of use. Consequently broad areas have been identified and ranked. The rankings are as follows:

High — areas known to be used for long term or regular scientific or educational programs.

Moderate — areas known or likely to be used for casual scientific or educational events.

Low — areas not likely to be used for scientific or educational purposes.

The results are mapped in Figure 3.4.

- **Archaeological and Ethnographic Values**

Only one part of the study area is known to have archaeological and ethnographic significance. This was taken into account in the final analysis by elevating the final conservation rating of the affected area by one step.

3.4 COMPOSITE VALUES

In order to provide a single values map for the study area it is necessary to combine the rankings provided in Section 3.3. That ranked the study area as high, moderate or low for five key variables.

These rankings could be combined using a number of different techniques. Often weightings are imposed to indicate that one variable is of greater significance than another, for instance recreational use is more important than visual significance. This is imposing a subjective judgement on the relative significance of each variable.

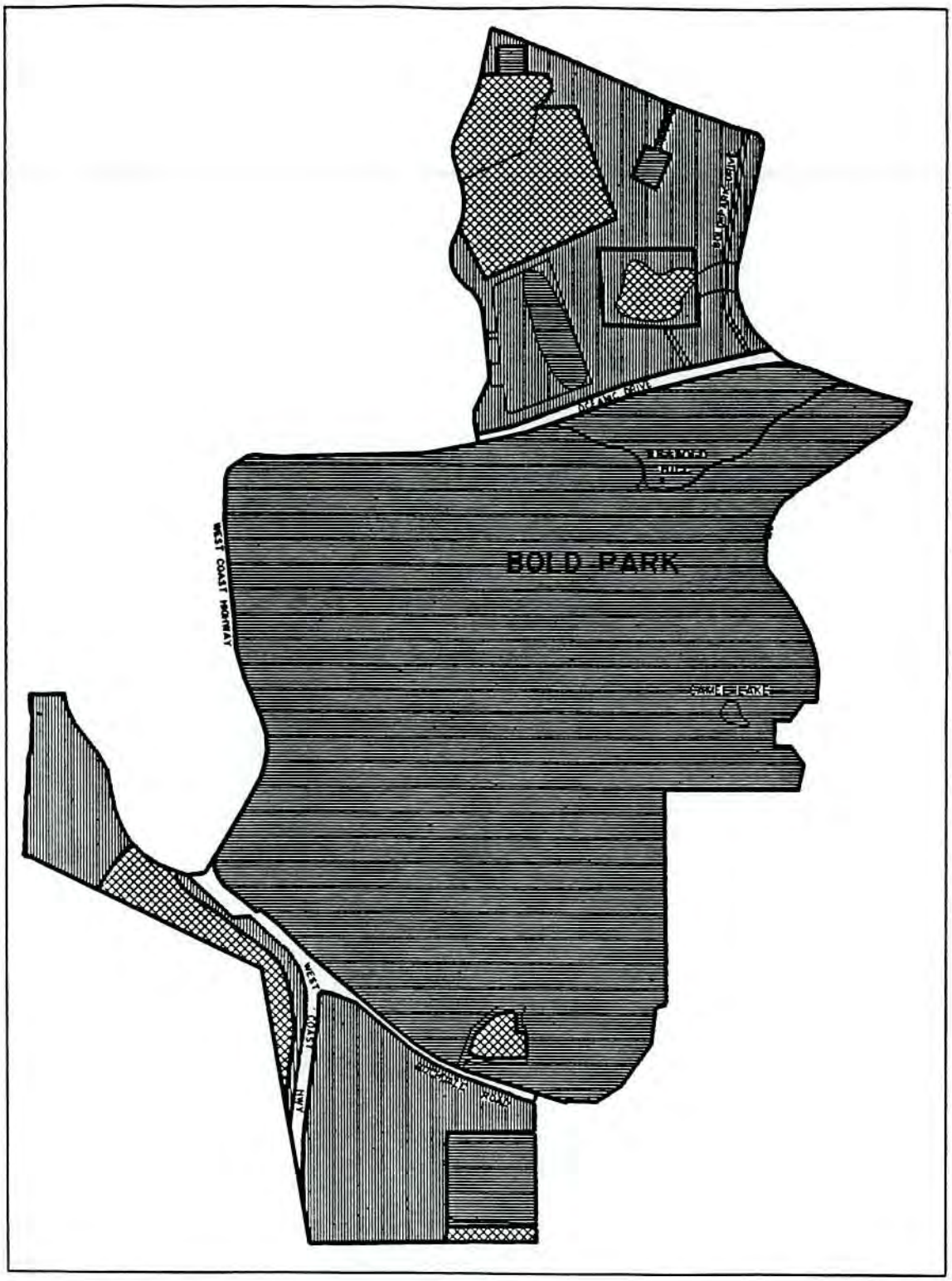


Figure 3.3 RECREATIONAL VALUES

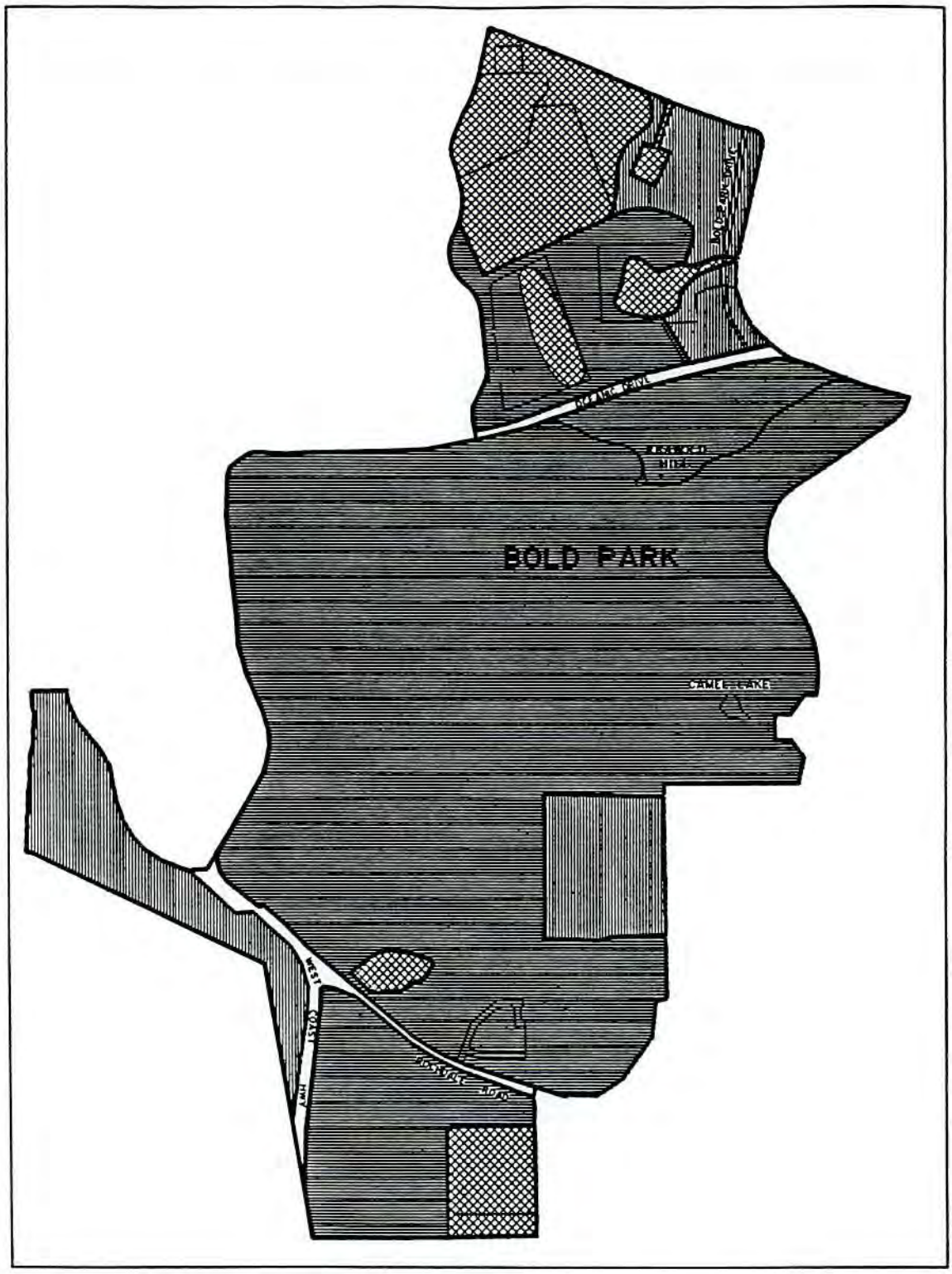


Figure 3.4 EDUCATIONAL AND SCIENTIFIC VALUES

In fact some subjective judgement on relative significance is needed in order to produce a combined ranking. In this instance it is considered appropriate to give each variable equal weight and to combine the rankings using a simple mathematical process. This is on the basis that these variables would be of equal concern to the wider community.

The combined ranking has been produced by combing the five maps referred to in Section 3.2. On this basis any point within the study area will have five rankings, a combination of highs, moderates and lows. There are 11 possible combined rankings, ranging from a point which has recorded five high values to a point which has recorded five low values.

This procedure produced a detailed map with complex boundaries. Consequently it has been simplified to provide only three rankings. This is both for ease of application and also to signify that the level assigned on the composite map cannot be regarded as the sole indication of the value of the land. The output of this exercise is shown in Figure 3.5.

3.5 CONCLUSION

Chapters 2 and 3 have drawn together the existing information relating to the study area to provide an assessment of composite values, as illustrated on Figure 3.5.

It is important to note that this information is descriptive only. It indicates where the greatest values lie, but does not suggest appropriate land uses. While it will be valuable in the broad decision-making process, individual proposals will need to be assessed on their merits.

One major outcome of this assessment is that a large proportion of the study area is rated as having high composite values. This is due to the findings reported in Chapter 2. The area has high quality flora and fauna, outstanding landscape values and is highly valued as an area for recreational, educational and scientific activities. These values generally occur across the study area, particularly in the central core area. The very fact that the study provides such a large area of high value within a suburban context gives it further significance.

In summary, the study area provides outstanding conservation, landscape and recreational values and is a major natural resource, which is of local and regional value to the metropolitan area.

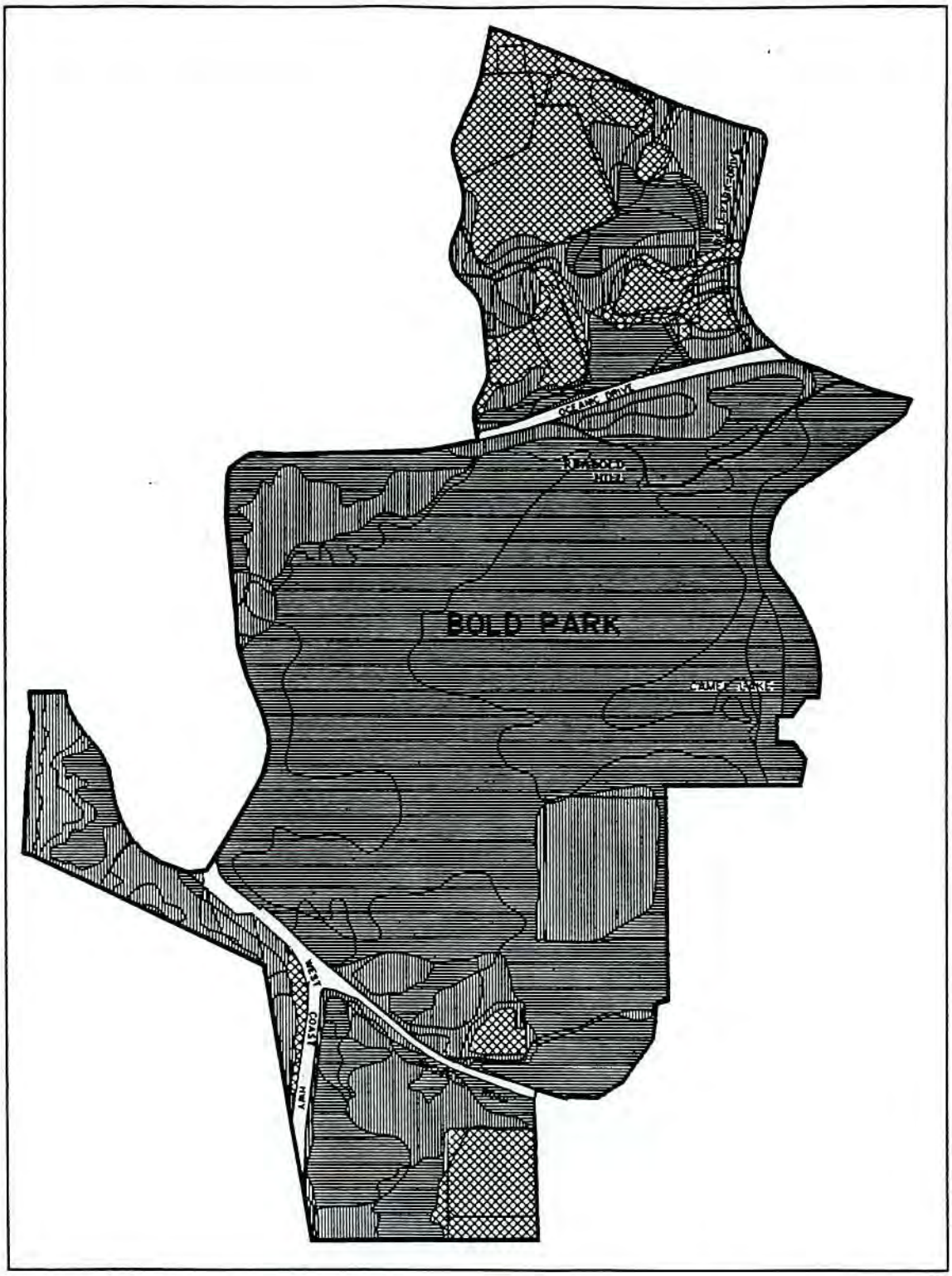


Figure 3.5 COMPOSITE VALUES

Chapter 4

OWNERSHIP, PLANNING AND MANAGEMENT

4.1 HISTORY

4.1.1 Endowment Lands and Limekilns Estate

The study area comprises parts of two parcels of land acquired by the Council early this century. The endowment lands stem from an area of "commonage" that was vested in Council in 1883. This gave the Council limited rights to lease the land. In 1920 the City of Perth Endowment Lands Act, included the land in the City boundaries and granted it to Council, giving it the full powers of a landowner. The Act does, however, provide that the proceeds of the sale of any of the endowment lands can only by applied to the development of the endowment lands, and not to any other area of the City.

The Limekilns Estate was a large private estate which separated the City from the commonage. In 1917 the Council resolved this situation by purchasing the Estate which comprised about 522 hectares (1290 acres). This land was included in the City boundaries on 18 January 1918.

4.1.2 Bold Park

In 1925 the Council laid out preliminary plans for a seaside town and a residential town (Floreat Park). An area was set aside for a public park. This area included Reabold Hill, Perry Lakes and the land which is now the City of Perth Golf Complex. It was named Bold Park after Mr. W.I.. Bold who served as Town Clerk to Perth City Council for 44 years. The park was surveyed and comprised 499 hectares (1233 acres).

During the intervening years a number of areas have been excised from the original park including:

- golf course reserve 96ha
- residential 87ha

- Water Authority reservoir 16.2ha
- City Beach High School 10.1ha
- Substation 0.3ha
- Drive-In (on lease) 7.5ha

This left a public open space area of 282 hectares. It should be noted that the lease on the drive-in site is no longer in force and this area is now available for an appropriate use.

By 1974 Council had improved 158 hectares, generally around Perry Lakes, leaving 130 hectares in natural form. Since that time the Park has been extended on a number of occasions by resolution of Council.

On 21 October 1974 the western boundary of the Park was extended to the 140ft contour, adding approximately 20 hectares.

In 1976 Perth City Council resolved to extend the Park by 99 hectares, being the land to the west of the existing Park bounded by Oceanic Drive, Challenger Parade and an Important Regional Road Reserve, which at that time extended from Underwood Avenue to the West Coast Highway. The 53 hectares of land immediately south of the road reserve was to be retained for development for residential and community purposes. This boundary was included in the City Planning Scheme which was gazetted in 1985.

In April 1991 the Council resolved that, subject to the approval of the Environmental Protection Authority, an additional 53 hectares would be added to Bold Park. Figure 4.1 shows the boundaries of Bold Park and how they have changed over time.

4.1.3 M46 and M47 Areas

The System 6 Study (Department of Conservation and Environment, 1983) identified areas with considerable value for conservation and recreation in a natural area. Some 209 localities were identified and specific recommendations were made for each. Parts of two of these localities, M46 and M47, are included in the study area and their boundaries are shown on Figure 1.1.

Further discussion of the recommendations is included in Chapter 4.5.

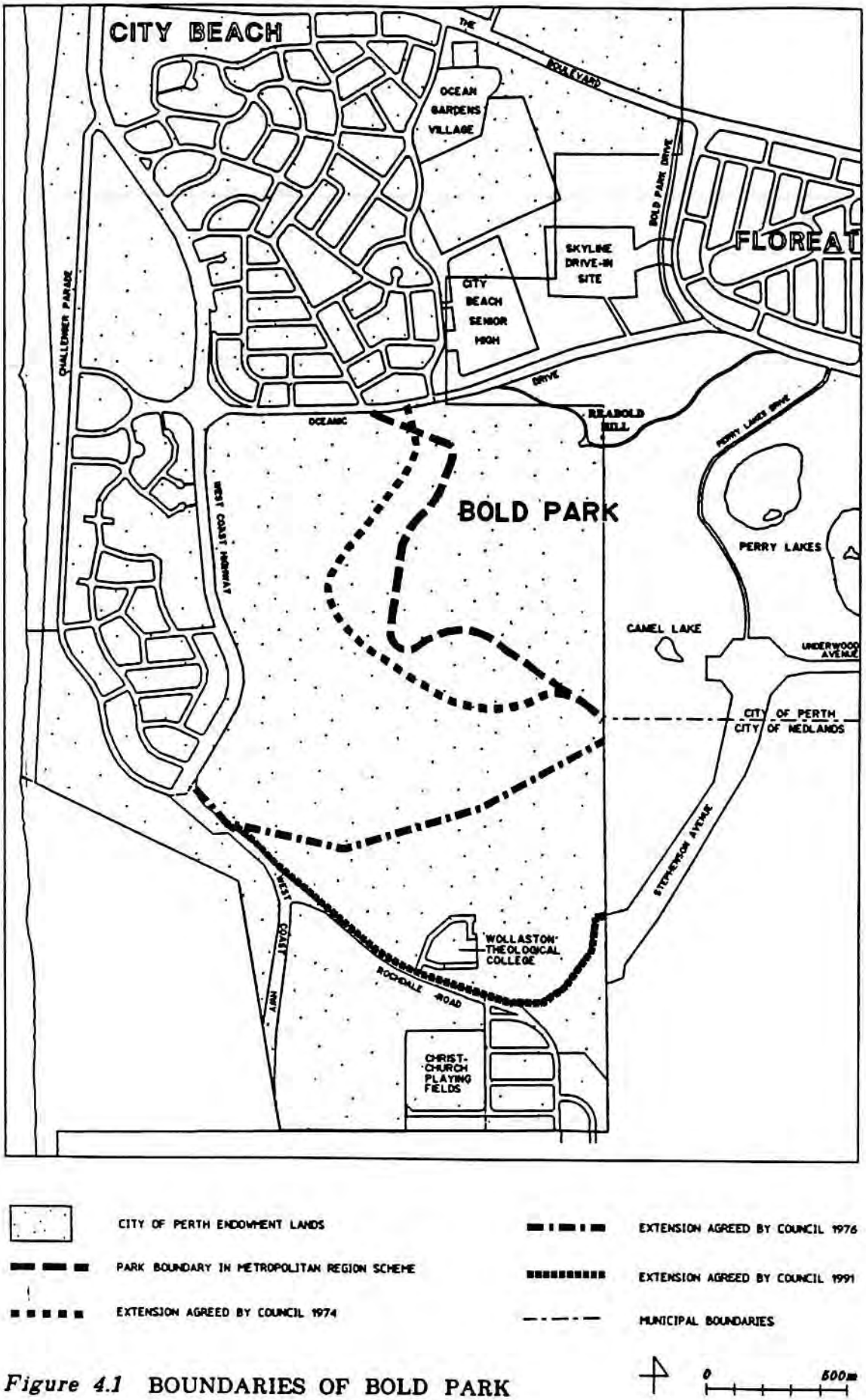


Figure 4.1 BOUNDARIES OF BOLD PARK

4.1.4 Knightsbridge Proposal

In 1987 Bond Corporation Holdings submitted a Public Environmental Review which proposed the residential development of Lot 1 Stephenson Avenue. While this site falls outside the current study area it is a contiguous parcel of bushland and forms part of the M47 area defined by the System 6 Study (Department of Conservation and Environment 1983). The proposal was highly controversial and more than 800 submissions were made to the Environmental Protection Authority when the PER was placed on public exhibition.

After a detailed assessment the EPA concluded that the development was not environmentally acceptable and recommended to the Minister that the application be rejected. One of the primary grounds for the rejection was that the proposal made no significant concession to the objectives and intent of the System 6 recommendations for the area.

A subsequent development proposal was lodged for the land and rejected by the EPA. A third proposal was prepared by Bond Corporation, however, the EPA's assessment of this proposal is now on hold pending the State government's current investigation of options for the land.

4.1.5 Realignment of West Coast Highway - Stage 1 PER

For some time Perth City Council has been concerned about dangerous curves on the West Coast Highway near Challenger Drive. As a matter of public safety it was determined that a realignment was necessary, and a study was carried out to identify and assess the most appropriate route.

That study, Public Environmental Review Proposed Realignment of the West Coast Highway, City Beach (Dames and Moore 1992) was placed on public exhibition in March and April 1992.

The close connection between that study and the present study was noted both by Perth City Council and by the EPA. However, because of the public safety issues involved it was recognised that the highway relocation study would need to proceed in advance of the present study. For this reason the highway study has been termed the Stage 1 PER and the present study the Stage 2 PER. The Stage 1 PER is discussed further in Section 5.6.

4.2 LAND OWNERSHIP

With a few exceptions the study area is owned by the City of Perth. Figure 4.2 details the land holdings.

In the northern part of the study area three parcels of land are under other ownership. The 6.3 hectares site of the Ocean Gardens Retirement Village is owned by Bold Park Senior Citizens' Centre and Homes (Inc). The registered proprietor of the WAWA reservoir is the Minister of Water Supply and Drainage, while the site of the City Beach Senior High School is a reserve vested in the Department of Education.

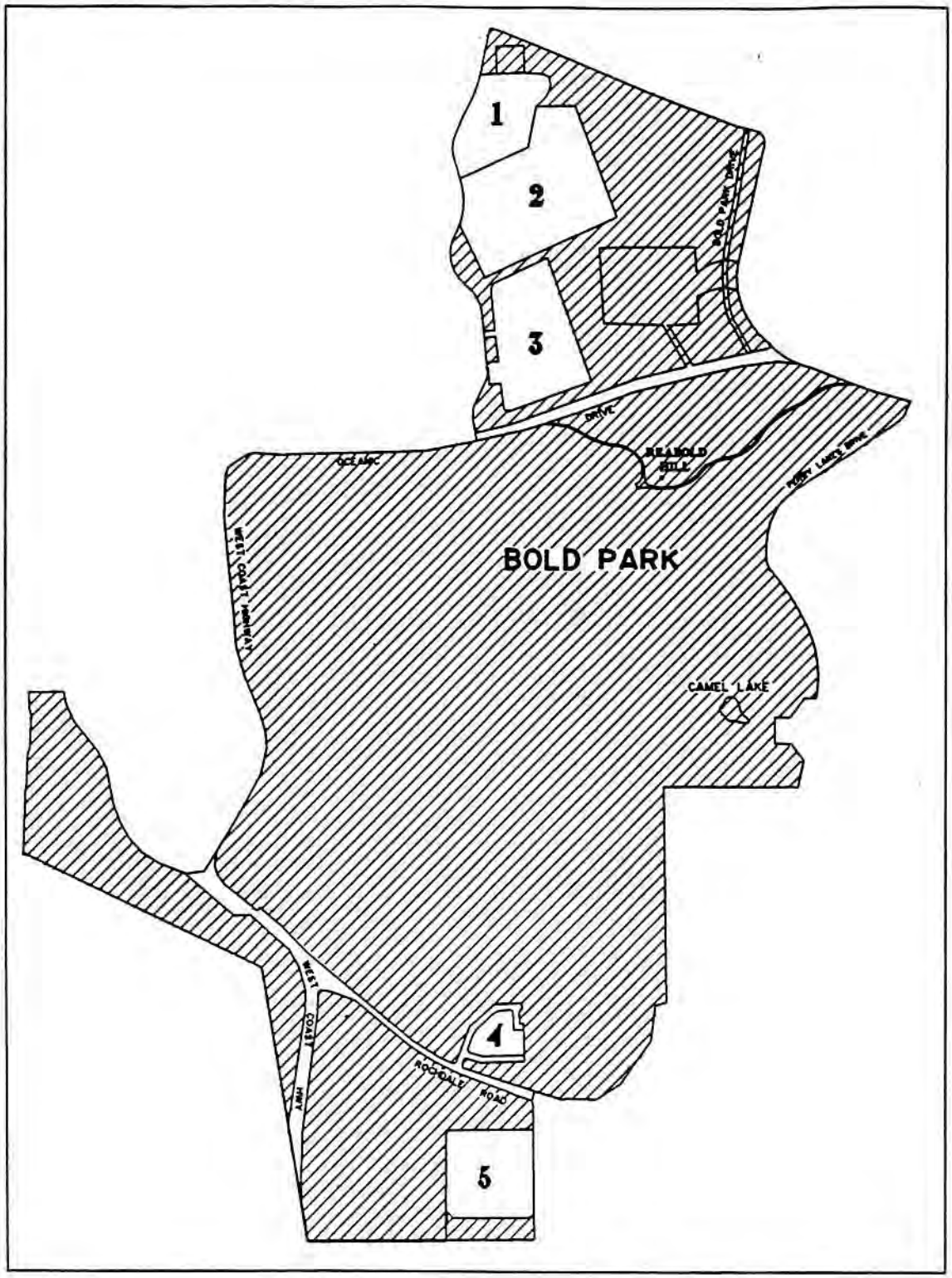
Apart from Wollaston Theological College the whole of the central part of the study area is owned by the City of Perth under three separate titles. The 1.8 hectare site of Wollaston College is owned by Perth Diocesan Trustees. The Mt. Claremont Bushland is also under the ownership of Council except for the playing fields which are owned by Christchurch Grammar School Incorporated. The coastal strip is solely under the ownership of Council.

There are two significant easements. The first effects the northern part of the study area and provides road access to the WAWA site from Bold Park Drive. The central part of the study area is crossed by a sewer easement which carries a major underground sewer main from the Subiaco Water Treatment Plant to the ocean.

A number of leases also cover parts of the area. In the central part of the study area, an area of 3.083 hectares comprising the Quarry Amphitheatre and associated facilities is leased to the Perth Theatre Trust for 21 years. Perry House near the corner of Oceanic Drive and Perry Lakes Drive is leased to the Wildflower Society of Western Australia and the Royal Australasian Ornithologists Union under letters of agreement. This situation will be reviewed in June 1993. The City Beach Bowling Club and First City Beach Scouts also lease their premises from Council.

4.3 METROPOLITAN REGION SCHEME

Land use in the metropolitan area is broadly controlled by the Metropolitan Region Scheme (MRS), which is administered by the Department of Planning and Urban Development (DPUD) on behalf of the State Planning Commission (SPC). Local authorities provide more specific land use controls in their town planning schemes, which are generally consistent with the MRS.



1 BOLD PARK SENIOR CITIZEN CENTRE AND HOMES INC
2 MINISTER OF WATER SUPPLY AND DRAINAGE
3 DEPARTMENT OF EDUCATION
4 PERTH DIOCESAN TRUST
5 CHRISTCHURCH GRAMMAR SCHOOL INC.
PERTH CITY COUNCIL

Figure 4.2 LAND OWNERSHIP

0 500m

This section will detail the application of the MRS to the study area and surrounding lands while the following section will cover the town planning schemes that apply.

The MRS is a statutory planning scheme applying to the metropolitan area. Its sets broad land use categories and, importantly, provides for regional facilities such as roads, railway lines, industrial areas and parks. The MRS zones and reserves which apply to the study area are shown on Figure 4.3.

A discussion of each follows:

- **Parks and Recreation Reserves**

  The north eastern part of the study area is generally reserved for Parks and Recreation. This includes Reabold Hill and surrounds, and most of the land between Oceanic Drive and The Boulevard. In addition the coastal strip of the study area is reserved for Parks and Recreation. The study area adjoins other Parks and Recreation reserves on four sides: the coastal reserve, City of Perth Golf Complex, Perry Lakes and Cottesloe Golf Course.

- **Public Purposes Reserve - High School**

  The site of the City Beach Senior High School is reserved for use as a high school.

- **Other Major Highway Reserve - Stephenson Highway**

  The study area is affected by a highway reserve for the Stephenson Highway (sometimes known as the Western Suburbs Highway or Route). The southern-most section, between the study area boundary and Rochdale Road, has been constructed and forms part of the existing West Coast Highway. The remainder of the reserve has not been constructed. The issue of this road is discussed in detail in Section 5.3.

- **Important Regional Road Reserves**

  Important Regional Road reserves adjoin the study area on three sides. West Coast Highway, The Boulevard and Underwood Avenue are each classified as Important Regional Roads in the MRS.

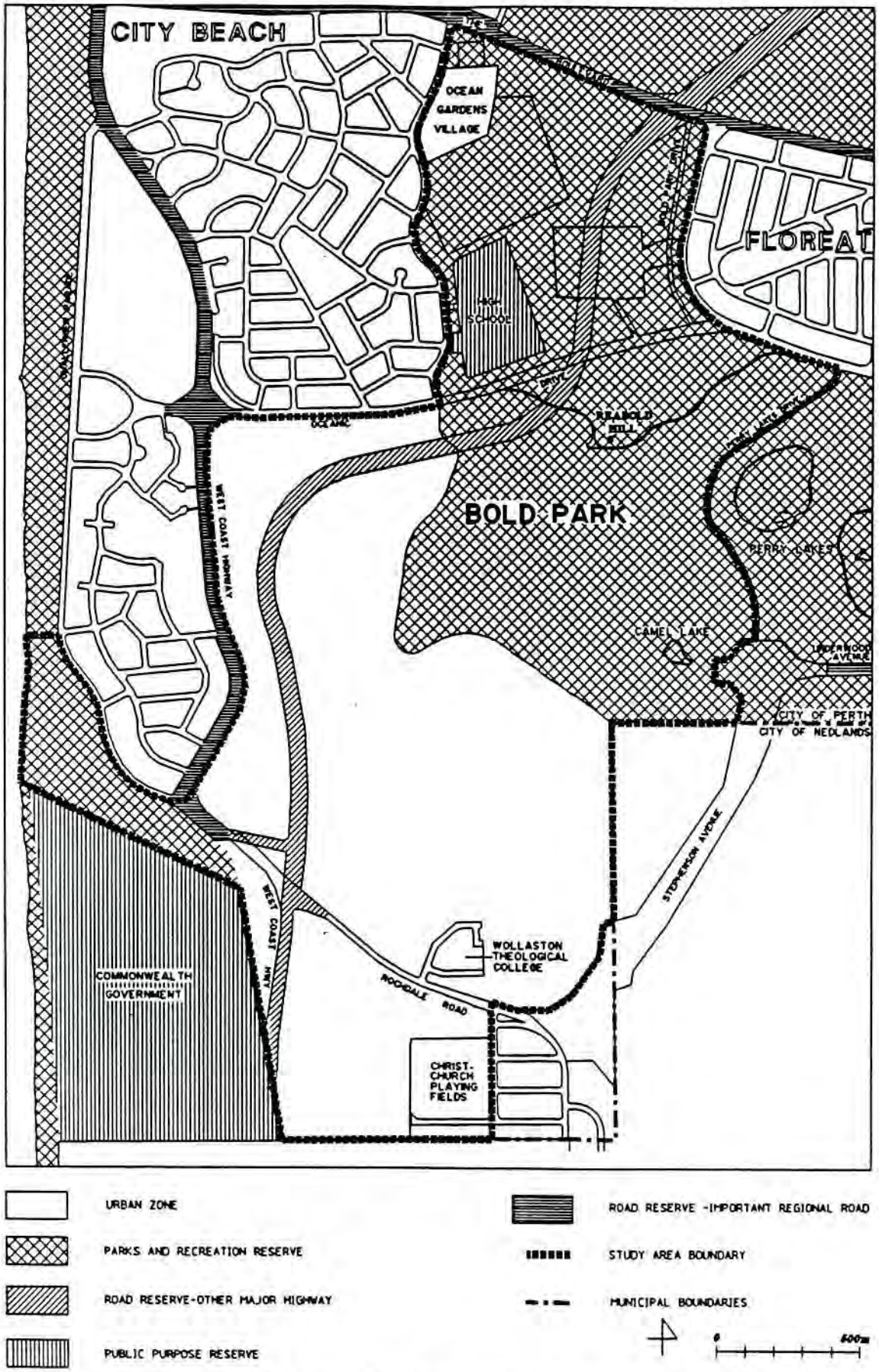


Figure 4.3 METROPOLITAN REGION SCHEME ZONES AND RESERVES

- **Urban Zone**

  The remainder of the study area is zoned Urban under the MRS. This includes all of the Mt. Claremont Bushland, a portion of land on the western side of the West Coast Highway and all of the southern and north-western parts of the central Bold Park area. The only Urban land north of Oceanic Drive relates to the Ocean Gardens Retirement Village. The study area adjoins land zoned Urban on its north-eastern, north-western, western and south-eastern sides.

The distinction between reserved lands and zones under the MRS is important. The MRS provides that reserved land owned by a public authority, such as City of Perth may be used for:

- the purpose for which it is reserved in the MRS;
- any purpose for which it was lawfully used prior to the MRS coming into force;
- any purpose for which the land may be lawfully used by the public authority; or
- any purpose approved by the State Planning Commission (SPC).

However, the **development** of any reserved land requires the approval of the SPC. Approval from the SPC is also required for development on zoned land, apart from the construction of detached dwellings or public authority works on, above or under roads.

4.4 TOWN PLANNING SCHEMES

The study area is currently covered by the City of Perth City Planning Scheme 1985. The City Planning Scheme is currently under review and the Council has released for public comment a series of documents highlighting possible changes. In addition some adjoining land falls within the City of Nedlands and is covered by the City of Nedlands Town Planning Scheme. Because of this complex situation the study area will be considered under three headings.

4.4.1 City Planning Scheme

The City Planning Scheme 1985 provides the detailed planning controls adopted by Perth City Council to guide land use and development in the City area. The City Planning Scheme includes the reserved lands as delineated in the MRS and provides more detail for the zoned land.

Figure 4.4 shows the zones and reserved lands as provided by the City Planning Scheme. As most of the northern, eastern and coastal strip of the study area are covered by MRS reserves, the City Planning Scheme makes no further provision for them.

The remainder of the study area is zoned for Residential use or reserved for Parks and Recreation. The Parks and Recreation reserve applies to the north-western part of the study area as shown on Figure 4.4. It represents a decision made by Perth City Council to extend Bold Park in 1976, as discussed in Section 4.1.

The Parks and Recreation reserve under the City Planning Scheme is a local reserve and this is consistent with an urban zoning under the regional scheme, the MRS. The Christchurch Grammer playing fields are also reserved for Parks and Recreation. The City Planning Scheme, in Clause 13, provides that land reserved for Parks and Recreation may be used or developed:

- for any purpose for which the land is reserved;
- for any purpose for which Perth City Council may lawfully use the land; or
- for any purpose approved by Council.

The Residential zoning applies to the site of the Ocean Gardens Retirement Village, the southern part of the central Bold Park area, most of the Mt. Claremont Bushland, and to a wedge of land between the West Coast Highway and the rifle range. The City Planning Scheme also provides the density coding which controls the density of residential development that is permitted in the Residential zones. The Ocean Gardens Retirement Village has a coding of R30 which means that about 30 dwellings per hectare are permitted while the remainder of the Residential zone within the study area is coded R20. This would permit single houses to be developed on residential lots averaging 500 square metres in area or grouped dwellings (town houses or villa homes) at the density of one dwelling for each 450 square metres of site area.

Three adjoining areas are covered by zones and reserves under the City Planning Scheme. The suburb of City Beach which adjoins the study area to the west is generally zoned Residential with some Parks and Recreation Reserves. The residential areas of City Beach have a density coding of R12.5 which permits single dwellings on lots averaging 800 square metres.

The suburb of Floreat adjoins the study area to the north-east. It is largely zoned Residential and also has a density of coding of R12.5. A small residential area adjoins the study area to the south-east. This area between Rochdale Road and the Christchurch Grammar playing fields, is coded R12.5 and forms part of the suburb of Mt. Claremont.

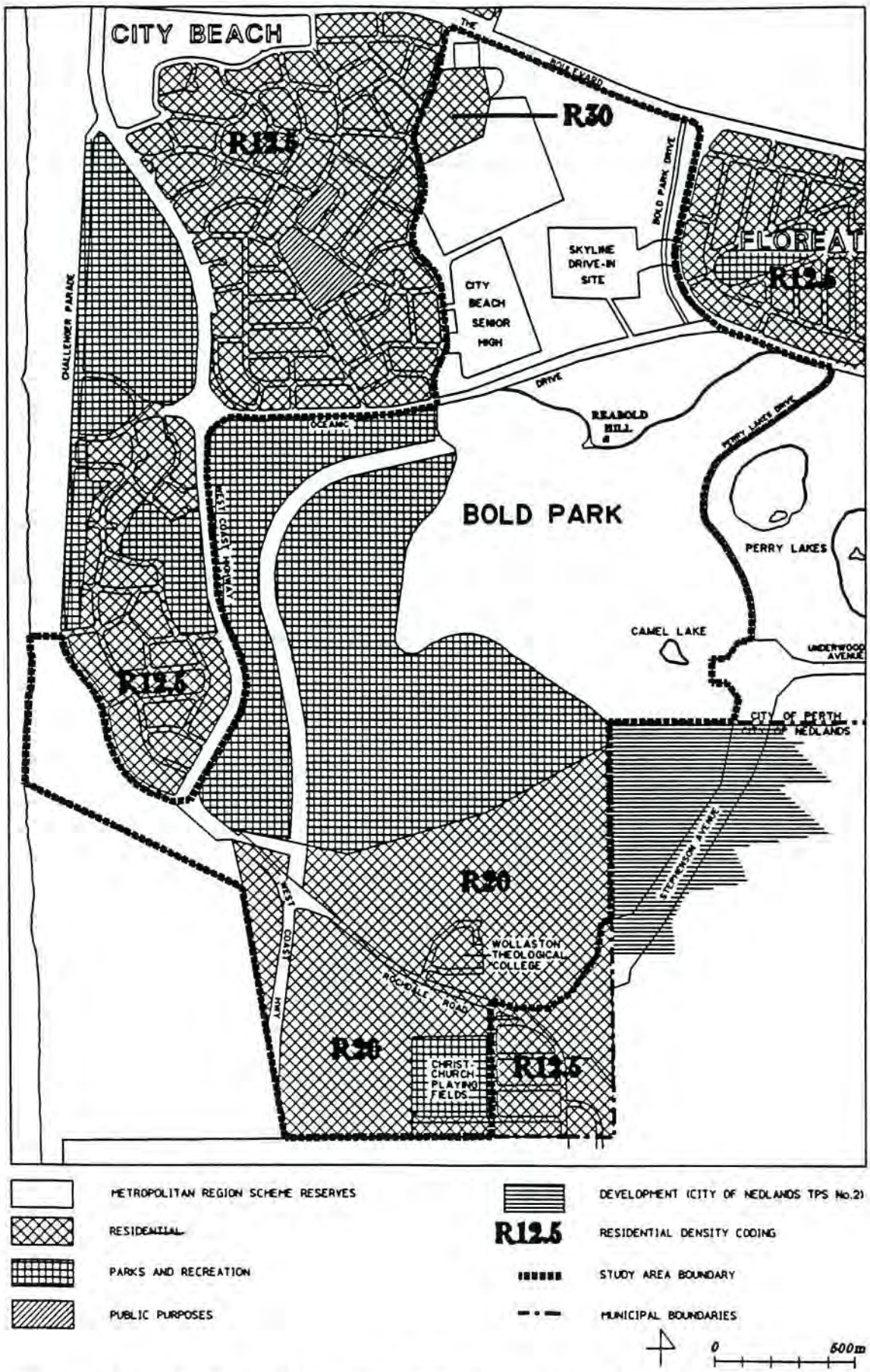


Figure 4.4 TOWN PLANNING SCHEME ZONES AND RESERVES

The remainder of the suburb falls within the City of Nedlands. The remainder of the lands surrounding the study area are covered by MRS reserves or fall within the City of Nedlands and are discussed subsequently.

4.4.2 City Planning Scheme Review

Perth City Council is currently reviewing the City Planning Scheme with the object of preparing a new scheme. The review commenced in 1991 and will continue for some time. In October 1991 the Council released a series of Precinct Documents each of which related to a portion of the City. Each Precinct Document identified the existing City Planning Scheme provisions, the predominant land uses, and the major issues relating to the area.

A statement of intent was also prepared for each precinct which indicates the principles which might underlie the application of a new City Planning Scheme.

The Precinct Documents were released for public discussion, and a series of exhibitions and workshops were held. It is important to note that the documents were released to generate public discussion and the statements of intent have not been approved by the Council itself. However these statements do form one view of future planning for the area and for this reason the views put forward in them will be reviewed and considered.

The study area is covered by two precincts, Reabold Hill and City Beach, and adjoins a third, Floreat Park. The conclusions made in relation to each are discussed as follows:

- **Reabold Hill Precinct**

  The Reabold Hill Precinct includes the central section of the study area, and most of the northern section, although the high school, and retirement village fall in the City Beach Precinct. The Precinct Document identifies a number of development issues that may affect the area included the realignment of West Coast Highway, the Stephenson Highway route and the realignment of Rochdale Road. All of these are dealt with in detail in Chapter 5.

  The Statement of Intent for this precinct refers to this PER and makes a number of recommendations:

  - the precinct contains unique bushland that should be managed for recreation and relaxation;

- limited vehicle access is desirable and regional traffic and roads should be limited to the existing road network;

- buildings and parking areas should be limited to selected locations;

- opportunities to link regional open space should be pursued;

- views from precinct should be protected;

- an area including the central and northern parts of the study and the City of Perth Golf Complex and Perry Lakes is considered suitable for a regional reserve and low intensity institutional uses;

- Council should consider undeveloped areas as flora and fauna conservation areas - and these should be protected against degrading uses within or on the edge of the precinct; and

- the need for the Western Suburbs (Stephenson) Highway is questioned and it is recommended that the section running through Bold Park should be deleted and replaced with a reserve following Oceanic Drive and Bold Park Drive.

❑ **City Beach Precinct**

The City Beach Precinct includes the Ocean Gardens Retirement Village and the City Beach Senior High School in the northern part of the study area, the coastal section and the Mt. Claremont Bushland. It also includes the suburb of City Beach adjoining the study area to the north-west and west, and the coastal area.

The Statement of Intent for this precinct provided the following relevant recommendations for this precinct:

- the precinct should continue as a regional recreation area and low density residential suburb;

- it is possible that low density residential development may be appropriate in the Mt. Claremont Bushland (based on the recommendations of EPA Bulletin 322, 1988);

- after realignment of the West Coast Highway residual land could be set aside for recreational use compatible with the surrounding M46 and Bold Park areas;

- the coastal strip of the study area should be incorporated in a regional park that would include Bold Park; and

- the density of the residential areas be increased from R12.5 to R20.

❑ **Floreat Park Precinct**

The Floreat Park Precinct adjoins the study area on its north-eastern boundary and includes the suburb of Floreat. The Statement of Intent for this area provides a number of relevant recommendations:

- the precinct should continue as a low density residential area with the density coding increased from R12.5 to R20;

- areas adjoining Bold Park should be protected in terms of landscaping and views; and

- the replacement of the West Coast (Stephenson) Highway Reserve with a route following Oceanic Drive and Bold Park Drive is supported.

In summary the Precinct Documents prepared for the City Planning Scheme Review put forward a number of issues that relate directly to the future of the study area. These include:

❑ support for a regional park including all of the study area except for the Mt. Claremont Bushland;

❑ support for removal of the MRS road reserve from the study area and replacement with an alignment using Oceanic Drive and Bold Park Drive;

❑ the possibility of low density residential development on the Mt. Claremont Bushland; and

❑ the increase in density in the surrounding residential areas from R12.5 to R20.

These have been the subject of public discussion and will be considered by the Council before they become a part of any formal planning document.

4.4.3 City of Nedlands Town Planning Scheme No. 2

The study area adjoins the City of Nedlands on its south western, southern and south eastern boundaries and consequently the planning for these adjoining areas needs to be considered.

On the south western boundary the study area adjoins two MRS reserves. These are the coastal strip of Parks and Recreation reserve and a Public Purposes Commonwealth Government reserve which applies to the Campbell Barracks - Swanbourne Rifle Range area. An MRS Parks and Recreation reserve for the Cottesloe Golf Course adjoins the southern boundary of the study area, while the area to the east of this is zoned Residential under the City of Nedlands Town Planning Scheme (TPS) and has a dual density coding of R10-R20. Lot 1 Stephenson Avenue, the site of the Knightsbridge proposal, directly adjoins the study area. It is zoned Development under the TPS which means that a wide range of commercial, institutional and residential uses are permitted with the approval of Council.

In addition, Clause 3.8 of the TPS applies to the Development zone and requires the submission of a detailed Outline Development Plan with any proposal for the zone.

The Development zone applies to land in the vicinity of the Superdrome, while the adjoining lands to the south are zoned Residential with a variety of density codings. This is the location of the recently developed St. Johns Wood Estate. The City of Nedlands is also reviewing its TPS however there have been no public documents released as yet.

4.5 SYSTEM 6 RECOMMENDATIONS

Much of the debate over the future land use of the study area results from the recommendations of the System 6 study (Department of Conservation and Environment, 1983). For this reason it is necessary to consider in detail the objectives of that study and its recommendations for the study area.

The terms of reference for that study noted that it was "to make recommendations to the EPA on areas within System 6 desirable for national parks, nature reserves and major

associated recreational areas" (Department of Conservation and Environment, 1981). System 6 refers to the Darling System which stretches from the Moore River in the north to the Blackwood River in the south and therefore includes the most densely populated region in Western Australia.

Two major reports were produced. The first became known as the Green Book (Department of Conservation and Environment, 1981) and included proposals for parks and reserves within the System 6 area. It was, in effect, a series of recommendations put to the EPA by the System 6 Committee. This was placed on wide public exhibition and submissions were taken. A second report, known as the Red Book (Department of Conservation and Environment, 1983) detailed the recommendations of the EPA to the Government and was endorsed in principle by the Government in March 1984.

In general terms the study considered two mechanisms for the provision of conservation and natural recreation areas. The first was primarily concerned with State owned land and used the provisions of the Land Act. The second was concerned with other land tenures and used State and local government planning. The study considered a range of processes including competing land uses and the planning and management of open space, before providing a series of location specific recommendations.

As noted previously, the study area includes parts of System 6 areas M46 and M47, as shown on Figure 1.1. The Red Book (Department of Conservation and Environment, 1983) noted that M46 "contributes to open space of regional significance, in conjunction with Bold Park (M47), because of its high conservation and recreation value". Its recommendations relating to the M46 areas are as follows:

- that the general recommendations on planning and management of Regional Parks be applied; and

- that the City of Perth prepare a management plan for its land.

In relation to M47 it was considered that it "constitutes open space of regional significance because of its high conservation, recreation and education value, and its proximity to Perth residential areas. Co-ordinated management of the area is likely to be required, particularly in view of the proposals for road service corridors to pass through it" (Department of Conservation and Environment, 1983).

The recommendations relating to M47 are as follows:

- that the general recommendations on planning and management of Regional Parks be applied; and

- that Perth City Council's proposal to maintain and extend Bold Park is endorsed.

These recommendations are not dissimilar to those made originally in the Green Book (Department of Conservation and Environment, 1981) and made available for public comment. The public comments are summarised in the Red Book (Department of Conservation and Environment, 1983) and those of relevance discussed as follows:

- M46:

  - the then Metropolitan Region Planning authority (MRPA) questioned the boundary of a M46 for extending beyond the existing Parks and Recreation reserve in the MRS; and

  - the Department of Administrative Services noted that it would like to be informed of the implementation of the recommendations for M46 because of the presence of Swanbourne Rifle Range and Campbell Barracks on Commonwealth owned land.

- M47:

  - a citizens group endorsed the recommendations relating to Regional Parks and proposed that the natural bush park be extended and linked to Perry Lakes and managed as a single Regional Park. It was further proposed that the Council boundary be altered to follow Underwood Avenue and Stephenson Avenue and that Lot 1 Stephenson Avenue be added to Bold Park;

  - several submissions opposed the construction of any major road through M47; and

  - the MRPA questioned the boundaries of M47 for extending beyond the MRS Parks and Recreation reserve.

The specific recommendations place considerable emphasis on Regional Parks. This is because the study area is largely privately owned land and it is not possible to seek conservation by reservation of these areas under the Land Act. Consequently it was the subject of recommendations that conservation be effected through planning mechanisms. The concept of Regional Parks is discussed further in Chapter 5 of the Red Book.

It made two basic recommendations relating to Regional Parks:

- Recommendations 15:

  Areas identified through planning procedures as open space of regional significance should, where appropriate be designated as Regional Parks.

- Recommendations 16:

  The National Parks Authority should be given the responsibility for co-ordinating the planning and management of areas identified as Regional Parks, and for the following functions:

  - the provision of technical and other advice to managing agencies and owners; and

  - an examination of the present funding and co-ordination of development programmes.

  These changes to the role of the National Parks Authority may require some legislative changes (Department of Conservation and Environment, 1983).

In its preamble on Regional Parks, the Red Book (Department of Conservation and Environment, 1983) makes specific mention of Bold Park, and Kings Park, as examples of central park of regional significance.

The concept of Regional Parks and other options for managing the study area are discussed in detail in Chapter 7.

4.6 RECOMMENDATIONS OF THE EPA

The EPA has made detailed public recommendations relating to the study area on three occasions since the Environmental Protection Act came into force in 1986. The first was the Report and Recommendations of the EPA relating to the first proposal for the Knightsbridge sub-division (EPA, Bulletin 322, 1988), the second was the Report and Recommendations relating to the second Knightsbridge proposal (EPA Bulletin 362, 1989), and the third was the report and recommendations relating to the realignment of the West Coast Highway (EPA Bulletin 655, 1992).

Bulletin 322 (EPA, 1988) is a detailed report which not only considers the merits of the proposal but also its impacts on the adjoining land and its System 6 values, and the cumulative impact of other proposals affecting the M47 area. It is largely as a result of that report that the need for this study was identified.

The bulletin emphasised the EPA's commitment to the System 6 proposals, specifically with regard to regional parks. It went on to identify the regional values of the M47 area as follows:

- the size of the M47 area, being comparable to Kings Park, is one of the largest remaining bushland remnants in the urban area of the coastal plain;
- the natural vegetation of the area is of comparatively high quality and includes areas of species at extremes of their known ecological range;
- the fauna, as with the vegetation, exhibit considerable diversity with bird species being particularly well represented;
- recreational use is based on regional rather than just local patrons; and
- because of the above, and the area's location in the metropolitan area, its educational value is also rated highly (EPA Bulletin 322, 1988).

In assessing the sub-division proposal the EPA found that development of the land would reduce the area of natural vegetation, introduce impacts on adjoining vegetation and made no allowance for the fact that land was subject to System 6 recommendations. Accordingly the proposal was recommended as not being environmentally acceptable. Recommendations were made on ways the proposal could be made more acceptable.

Bulletin 322 (EPA 1988) also considered the range of other development pressures which could threaten the integrity of M47. Four proposals were identified:

- the Stephenson Highway Reserve;
- the westward extension of Underwood Avenue;
- the development of land owned by the City of Perth; and
- the realignment of dangerous curves in the West Coast Highway near Challenger Drive.

The EPA made the following conclusions relating to these proposals:

- any proposal to construct the Western Suburbs Highway on the alignment currently reserved in the Metropolitan Region Scheme would be likely to have a significant and adverse impact on the present environmental, recreational and educational values of the M47 area;

- the extension of Underwood Avenue across the M47 area to West Coast Highway as proposed by the Perth City Council would be likely to have a significant and adverse impact on the present environmental, recreational and educational values of the M47 area;

- any connection of Stephenson Avenue through the M47 area to West Coast Highway would reduce the environmental values of the whole area as well as threatening places (within the southern section) of environmental and ethnographic value;

- any proposal to develop the Perth City Council endowment land within the M47 area for residential purposes, would (in a similar way to the impact of Lot 1) be likely to reduce the existing environmental, recreational and educational values of the M47 area;

- recognising that a realignment of West Coast Highway may be justified on the grounds of community safety, it would nevertheless result in a reduction in the overall values of the M47 area. However, should a realignment take place, the section of land alienated would have reduced values and could be used for residential purposes on an exchange basis for land within the M47 area boundary currently in private ownership; and

- examining the overall values of the M47 area and the potential for cumulative impacts, it would be unable to support all of the five proposals within the M47 area on the grounds that their cumulative impacts would be considerable and environmentally unacceptable (EPA, 1988).

In considering the regional park issue, the EPA recommended a regional park be established encompassing both M46 and M47 to protect them as open space of regional significance. It also recommended that Perry Lakes, Wembley Golf Course, the Army land and Cottesloe Golf Course be managed in sympathy with the regional park.

The full conclusions and recommendations of Bulletin 322 relating to M46 and M47 are reproduced in Appendix H. However, a number of important points were made.

These include the following:

- land excised from M47 for the Highway realignment could be used for development but only on an exchange basis for land within the M47 area currently in private ownership;

- the City of Perth land within M47 should be retained as a bushland area, however, degraded lands could be considered for activities sympathetic with the values of the surrounding bushland and the objectives of a regional park;

- suitable management arrangements including public representation should be organised;

- development of the Mt. Claremont Bushland may be acceptable if carried out in an environmentally sensitive manner with areas of higher conservation value protected in an open space system. This would reduce the amount of remnant vegetation in the locality, but this may not be significant if decisions are made which protect the environmental values of the M47 area; and

- the establishment of a regional park over these areas will be a major achievement towards securing conservation and recreational lands within the inner metropolitan area.

Bulletin 362 (EPA, 1989) was prepared in response to a second sub-division proposal for the Knightsbridge site. This report is brief and determined that while the second proposal was an improvement on the first, it did not address or resolve the substantive issues of environmental concern identified in Bulletin 322 (EPA, 1988). Consequently the EPA found that the second proposal was also environmentally unacceptable.

Bulletin 655 (EPA, 1992) re-emphasised a number of points made in Bulletin 322 (EPA, 1988). It noted that the key issues were the regionally significant values of M46 and M47, biological and physical features of the area and the landscape values.

Further details are provided in Section 5.6.

4.7 NATIONAL TRUST LISTING

In December 1992 the Council of the National Trust of Australia (WA) resolved to classify an area including the study area and place it on the Trust's register of important places.

The Statement of Significance explains why the Trust consider the area to be of heritage significance:

> "Bold park and its adjacent bushland is a highly significant area with the potential to become a Regional Park as outlined in the conservation recommendations of the Environmental Protection Authority System 6 study. The whole area is a superb complex of native bushland still remaining in a metropolis now largely devoid of natural bush. The highest point, Reabold Hill, allows a commanding view of the City of Perth and its environs from the Darling Range to the coast. There are historical links with aboriginal use and the early European activities of quarrying, farming and staging areas for cameleers and cattle drovers. Social values are apparent in the extensive use of Bold Park in particular for recreation (walking, running and riding) and tourism estimated to be 200,000 in 1987. And there is also the Quarry Amphitheatre. Perth City Council is promoting recreation and education and holds an annual Bold Park Week. Schools use the area. The recent location of the offices of the RAOU and the Wildflower Society will foster both recreation and education - RAOU has produced a bird brochure for the Park and both Societies conduct walks. Research into the flora and fauna has been undertaken. Although disturbance has resulted in "introduced" plants and animals there remains a good core of the original plant and animals species including some of biological significance. Undoubtedly there will be further and extensive study of the whole area especially as much of the research is engendered by a widespread community interest (for instance by the "Friends of Bold Park") in keeping the bushland for prosperity. The Classification of Bold Park and its adjacent bushland by the National Trust would surely promote the significance and protection of this valuable asset for the people of Perth and the wider community" (National Trust Register, 1992).

A listing by the Trust has no legal significance however it is often referred to as an authoritative database on places of heritage value. The Trust will nominate the study area for inclusion on the Register of The National Estate by the Australian Heritage Commission. The recommendations of the Trust in relation to the area are as follows:

> "1. Trust supports the area becoming a Regional Park as recommended in the System 6 study (DCE, 1983).

2. Bold Park and adjacent bushland be managed by one agency.

3. Lot 1 Stephenson Avenue be transferred from City of Nedlands to City of Perth, and be rezoned from urban to conservation.

4. The area as classified be zoned "conservation" both in the Metropolitan Region Scheme, and in local town planning schemes.

5. "Friends of Bold Park" be supported.

6. A Management Plan be prepared for whole area.

7. Weed control be instituted, with advice from King's Park Board as to efficiency of available treatments".

4.8 MANAGEMENT BY PERTH CITY COUNCIL

Over recent years Perth City Council, in its role as both owner and manager of most of the study area, has carried out a number of investigations and passed a number of resolutions. These are considered in the following sections.

4.8.1 Wycherley Report

In the mid 1970s Perth City Council set up an Occasional Committee to consider future development of Endowment Lands west of Bold Park. It is understood that this committee was called the City of Perth Endowment Lands Study Group. An Ecology Working Party was set up to advise the Group with Dr PR Wycherley as its chairman.

This Working Party produced a report to the Study Group in January 1976 which became known as the Wycherley Report (Wycherley, 1976). The Wycherley Report (1976) considered a study area which is similar to the central portion of the current study area.

It investigated the existing ecological and recreational values and management issues and, made detailed recommendations on the boundaries of the Bold Park and its future management.

The basic recommendation of the report was that the whole of the central portion of the current study area be conserved as a natural bush park save for a buffer strip running along West Coast Highway, Rochdale Road and Stephenson Avenue. This buffer was to be up to 120 metres deep along West Coast Highway and up to 240 metres along Rochdale Road and Stephenson Avenue near Wollaston College. This strip was considered suitable for housing and public building.

Development of this buffer strip was seen as providing effective control of the perimeter, generating capital to fund developments associated with the park, providing a population who could report fires, and allowing for rangers to live on site.

The report also made management recommendations on the following issues:

- regeneration of the bushland;
- the need to establish a burning regime for bushfire control;
- fencing the perimeter;
- developing the former quarry on West Coast Highway and the turf farm with car-parks, toilets, picnic areas, playgrounds and ranger's residences; and
- development of the pine plantation with similar facilities.

The report also noted that, at that time, a regional road reserve extended westward from Underwood Avenue, through the central portion of the study area to link with the West Coast Highway.

It was considered that if that road proceeded "it would provide a logical southern boundary to the extended Bold Park, because management of two portions of park bushland separated in this way would be difficult" (Wycherley, 1976 p.3).

4.8.2 Management Plans and Current Management Structure

i. Management Plans

In 1978 Perth City Council adopted a development and management policy for Bold Park (Perth City Council, 1978). The policy applied only to the northern part of the central area, north of the then proposed Underwood Avenue extension.

Its aim was to provide "a natural reserve which can be:

a. freely enjoyed by the public as a passive recreation area;

b. used to preserve a large tract of park within a bushland environment;

c. used as a reserve to encourage the preservation of the flora and fauna of the locality;

d. available to scientists, schools, organisations and the public for the study, appreciation and enjoyment of the flora and fauna; and

e. provided for public education and appreciation of items of historic interest within the area" (City of Perth, 1978 p.1).

The policy gave Council's Parks, Gardens and Landscape Department the responsibility for planning, development, management and regulation of the Park. It also provided a wide range of policy statements covering issues such as:

- park information;
- appropriate activities;
- collection of natural specimens;
- law enforcement;
- use of vehicles;
- appropriate design standards for new facilities;
- appropriate species for use in regeneration;
- wildlife management;
- fire management;
- water resources; and
- historic resources.

Of specific interest, the policy encouraged use of the area for education and scientific uses, as well as for passive recreational uses. The provision of employee housing within the area was permitted, as were visitor centres at approved locations. Regeneration using local indigenous species was an objective, as was management to maintain wildlife. It was also recommended that a fire management system be developed specifically for the needs of a natural bushland park.

In 1979 a report was prepared by the Parks and Recreation Department and put to Council, entitled Development of Bold Park. It was prepared in accordance with the Management

Policy (Perth City Council, 1978) and included a five year development program for the Park. Its recommendations included the following:

- **Fencing** - perimeter control fencing was recommended using a treated pine log fence;

- **Entry Points** - three major entry points were proposed: Reabold Hill, Camel Lake and the quarry on the West Coast Highway. The latter two would be the major entry points with complete facilities including ranger's residence, fire control services, parking area for 20-25 cars, toilets, a small picnic area and a building for interpretive information. Reabold Hill was to be for short term visitors and would have a rest area south of the present car park;

- **Interpretive Services** - an emphasis was to be placed on interpretive services with two interpretive centres, one at each major entry point and relevant training for the resident officers;

- **Housing** - as mentioned previously two houses were proposed for resident rangers, one at each major entry point;

- **Fire Control** - was recognised as a major problem. Control measures proposed included use of trails as firebreaks and reticulation of a strip of land 15-20 metres wide along tracks;

- **Water Supply** - the fire control measures proposed required a water supply and two sources were considered. One was reuse of treated effluent which passes the site in the main outlet from the Subiaco Sewerage Treatment Plant, and further investigation of effluent quality was recommended. The other source was from groundwater, requiring the installation of large bores. The two main entry points were to be supplied with mains water; and

- **Regeneration** - continued regeneration using indigenous species was proposed.

ii. Current Management Practices

Current management practices are essentially aimed at maintaining the current resource. Management activities include maintenance of trails and carparks, weed control and fire management. Detailed consideration of management issues will be considered in Sections 7 and 8.

4.8.3 Council Resolutions

Section 4.1.2 briefly discussed a number of Council resolutions to extend Bold Park. All of these, except the most recent, have been enshrined in statutory planning instruments affecting the study area. In 1976 after the Wycherley Report (1976) had been presented, a resolution was passed to increase the size of Bold Park by 99 hectares. The southern boundary adopted followed the proposed extension of Underwood Avenue. This was put into effect when the City Planning Scheme, gazetted in 1986, reserved that area for Parks and Recreation.

On 22 April, 1991 the Council resolved

> "That subject to the approval of the EPA and to facilitate management of the area the Council resolves to incorporate the 53 hectares of bushland adjacent to Bold Park into the Park and instructs the consultants so that they can prepare the Stage II Public Environmental Review accordingly" (Perth City Council Minutes 22 April, 1991).

While the motion was subject to the approval of the EPA and it is not known if this has been sought or obtained, it is taken as a clear indication of the intention of Council to extend the boundary of Bold Park to include the whole of the central and northern parts of the study area as shown on Figure 4.1.

Chapter 5

DEVELOPMENT ISSUES AND IMPACTS

5.1 INTRODUCTION

As noted in the preceding chapters, much of the concern over the future of Bold Park and its environs stems from a number of development issues that affect the study area. These were discussed in EPA Bulletin 322 (1988) which recommended that the cumulative impacts of the range of identified development proposals would be unacceptable.

The object of this chapter is to consider each of the development issues and the impacts they would have on the identified values of the study area. The issues that will be considered are, in most cases, long term development options rather than firm proposals that are currently under consideration. They are as follows:

- the realignment of the West Coast Highway near Challenger Parade;
- the proposed route of the Stephenson (Western Suburbs) Highway;
- the third proposal to develop the adjacent Knightsbridge land;
- urban development of Perth City Council endowment lands, particularly the Mt. Claremont Bushland;
- the realignment of Rochdale Road; and
- development of degraded areas.

Each of these is considered in one of the following sections. In each case the background to the development is discussed, and then the likely impacts on the study area are broadly considered. The analysis of impacts is carried out on the basis of the following factors:

- flora;
- fauna;
- recreational value;
- educational and scientific value;
- landscape value;
- noise (for roads); and
- impacts on the size of the study area and its linkages to adjoining lands.

These reflect the values of the study area described in Chapter 2.

5.2 STEPHENSON (WESTERN SUBURBS) HIGHWAY ROUTE

5.2.1 Background

i. History

As discussed previously the route for the proposed Stephenson Highway crosses the study area. It is enshrined in planning by virtue of an Other Major Highway (OMH) reserve in the Metropolitan Region Scheme as shown in Figure 4.3. The section crossing the study area was enshrined in the MRS by a 1982 amendment. It altered a previous alignment that followed Stephenson Avenue, Perry Lakes Drive and Bold Park Drive. The current route was drawn up after consultation with Perth City Council (D. Rice, MRS, pers. comm.) and it attempted to compromise between impacts on residents and impacts on Bold Park.

ii. Justification

The primary justification for the Stephenson Highway is to provide a north-south link through the western suburbs. In particular it would link Fremantle and the northern suburbs, especially Joondalup. On this basis the Stephenson (Western Suburbs) Highway route runs from North Fremantle to the Mitchell Freeway at Innaloo.

The MRS amendment which proposed the current route (Amendment No. 410/33, MRPA, 1982) noted that urban studies carried out in 1930, 1955, 1962-63, 1970, 1976, 1980 and 1981 had all concluded that at least one north-south route would be required through the Western Suburbs.

The route of the Stephenson Highway through the study area comprises two north-south links. The first runs from Rochdale Road to Oceanic Drive and the second from Oceanic Drive to The Boulevard. The Road Reserves Review (1991) forecast that traffic on existing roads in the area will increase. Traffic projections were produced for the years 2006 and 2021 and the details are shown in Table 5.1.

Table 5.1 TRAFFIC VOLUMES AND PROJECTIONS

	Vehicles Per Day		
	Current	2006	2021
Rochdale-Oceanic Link	19-22,000*	26-32,000	30-38,000
Oceanic-Boulevard Link	-	-	10-13,000

* *These figures relate to existing traffic on the West Coast Highway*

The projections assumed different road networks and the link between Oceanic Drive and The Boulevard was not included for the 2006 projection. The Review concluded:

> "Our view is that a Regional Road linking Fremantle and South West Corridor with the North West Corridor of the Region is an essential element of a regional road network especially if the regional centres of Joondalup, Stirling, Fremantle and Rockingham are to be effective centres of activity" (Road Reserves Review, Report R8, Final Report, 1991).

iii. Recommendations of Road Reserves Review

The Road Reserves Review (1991) made specific recommendations relating to the Stephenson Highway reserve between Rochdale Road and The Boulevard. It noted:

> "The MRS provides for a new road through the Parks and Recreation reserve between Rochdale Road and The Boulevard. Traffic demand for this link is relatively low, and an alternative route which utilises existing sections of West Coast Highway and Oceanic Drive, and Bold Park Drive widened to four lanes, would provide adequate capacity. Minor re-alignments to Oceanic Drive and West Coast Highway may be desirable to emphasise the continuity of this route" (Road Reserves Review, Report R8, Final Report, 1991).

This had the effect of putting forward a possible alternative route to that proposed in the MRS. The Department of Planning and Urban Development has advised that this recommendation has not been implemented and there are no MRS amendments currently planned. It has also advised that the construction of the relevant section of the Stephenson Highway is not in the current five year program of the Main Roads Department, and that any actions to construct the road or change the reserve are likely to be the subject of environmental studies as required by the EPA.

Perth City Council, in its submission on the Road Reserves Review, noted that it "is totally opposed to the Western Suburbs Highway MRS Reserve from West Coast Highway to Empire Avenue" (Perth City Council, Minutes of Council Meeting, 16 September, 1991).

iv. Summary of the Current Position

The Road Reserves Review (1991) and the Main Roads Department support the need for a north-south regional link through the Western Suburbs. The MRS contains a route that crosses through the study area and this is likely to remain in the planning documents in the foreseeable future, although no action to construct the road is currently planned. The Road

Reserves Review (1991) has suggested an alternative route however this would not be implemented without further detailed investigation.

v. Community View

The response to the community consultation program indicated strong opposition to any new highway alignment through, or adjoining, the study area.

5.2.2 Impacts on the Study Area

Because there are currently two route options, the MRS option and the RRR option each will need to be considered in terms of its impacts on the study area. The MRS alignment and a route based on the RRR recommendations are shown on Figure 5.1. It should be noted that the alignment for the RRR option is indicative only having been derived from the recommendations of the report and is not based on a published map.

i. MRS Option

The MRS reserve is 40 metres wide through the study area. It is likely that, if constructed, the road would be a dual carriageway of a similar standard to the existing West Coast Highway north of Rochdale Road. The route would require significant earthworks particularly to the south of Oceanic Drive.

The impacts of this route option are broadly considered in the following sections.

❑ **Flora**

The proposed route would have a direct impact on the following communities which are identified on Figure 2.2 Vegetation:

- *Eucalyptus gomphocephala - E. marginata* woodland. It would result in the virtual destruction of this community which only occurs in the north-east section of the study area.

- Limestone heath. A prominent ridge running east-west along Oceanic Drive contains this community which is in very good condition (ie. low levels of weed invasion and diverse flora). Road works would severely disturb this community and result in a significant reduction in the size of limestone heathlands in the study area.

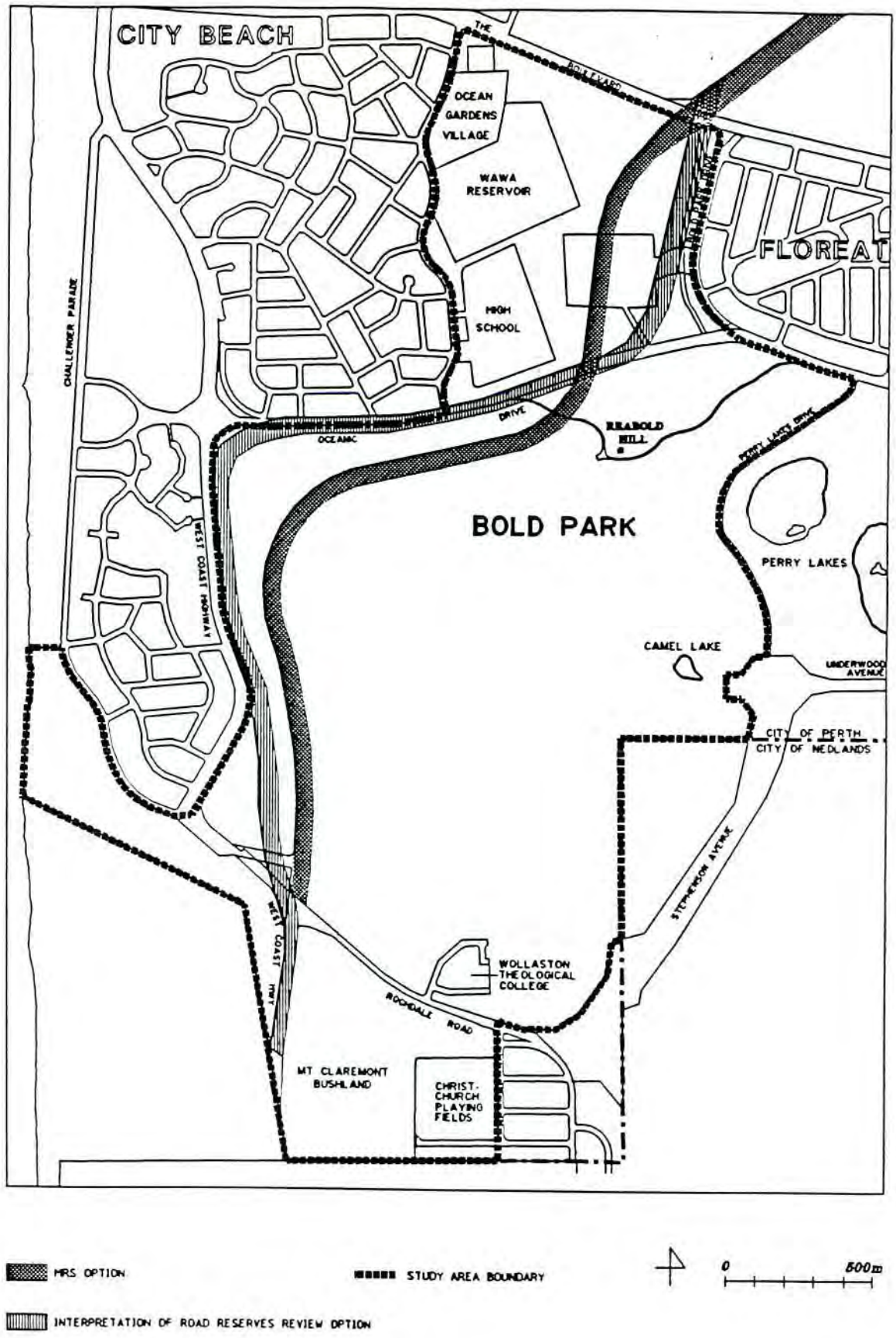


Figure 5.1 WESTERN SUBURBS HIGHWAY ROUTE OPTIONS

- *Acacia xanthina* shrubland. An important area of this community would be lost with road works, again significantly reducing the size of this community type found in the study area.

- *Eucalyptus decipiens* community. This community is unique in the study area and the proposed road would destroy much of it.

- Banksia woodlands. Although this is one of the most extensive communities found in the study area it would be reduced in area through the clearing associated with road works.

- *Acacia rostillifera* shrublands. The only stand found in Bold Park would be destroyed through clearing and disturbance associated with the road works.

Regionally significant species (Table 2.2) which would be affected include:

- *Eucalyptus* affin. *falcata*. The small population found in the study area would be destroyed by road works.

- *Acacia xanthina*. The road works would significantly reduce the population of this species.

- *Eucalyptus decipiens*. Populations would be significantly reduced by road works.

- *Eucalyptus gomphocephala*. A number of mature individuals would be lost by road works.

Other negative impacts associated with the road would include weed invasion, fire risk, erosion and pollution.

❑ **Fauna**

The direct impacts of the proposed route include the destruction of some 20 hectares of habitat and its associated fauna. The route directly affects six vegetation communities particularly the vegetation associated with the Quindalup dunes. The reptile assemblage within the Quindalup dune areas is the most diverse in Bold Park and contains five species not found elsewhere, namely *Diplodactylus alboguttatus, Cyclodomorphus branctialis, Aprasia repens, Varanus gouldii* and *Vermicella semifasciata* (How and Dell, 1990).

The proposed highway would significantly increase barriers to movement of the areas fauna including amphibians, reptiles and some small birds. Another direct impact would be road kills of fauna, particularly reptiles.

- **Recreational Value**

This route would limit the area available for the major recreational pursuits carried on in the study area and would impact on a number of the recreational developments such as walking tracks and bridle trails. It would not, however, preclude any of these recreational pursuits.

Many of the activities described in Section 2.3.3 rely on a large natural area with wilderness characteristics. The loss of area, increase in noise, and disruption to the natural topography of this route would significantly effect the wilderness values of the area and make it less attractive for many of these activities. In addition, the strip of land severed on the western side of the route between Rochdale Road and Oceanic Drive would lose most, if not all, of its value as a natural recreation area.

This route would not destroy the value of the study area for recreation in the natural environment, however it would severely effect the recreational value due to the loss of 44 hectares and increased disturbance.

- **Educational and Scientific Value**

The impact of the route on the educational and scientific values of the study area is closely linked to the impacts on flora and fauna. However, it is important to note that the route would directly affect two areas used for ongoing educational and scientific activities.

These are an area near the former quarry on West Coast Highway which is used by the WA Museum and an area directly north of Oceanic Drive which contains a diversity of vegetation communities and is used by a number of groups for educational field trips.

If this route were to proceed the area would remain a significant scientific and educational resource, however these values would be significantly diminished.

- **Landscape Value**

Impacts on the landscape value of the study area associated with the MRS option would include destruction of the limestone ridge north of Oceanic Drive from the substantial cutting required for the road to pass through the ridge.

The proposed route would be highly visible from Reabold Hill look-out, from north of the drive-in site to were it curves to the south in the north-west corner of the park. The proposed highway would be visible from sections of Oceanic Drive, the existing West Coast Highway and for a short section of the Boulevard. From within Bold Park the Highway would be visually obtrusive from all of the walk trails on the western side and several of the look out nodes.

- **Noise**

The MRS option has the effect of moving traffic away from houses and consequently noise levels are reduced. Table 5.2 provides noise predictions for the MRS option at the relevant locations shown on Figure 2.8.

Table 5.2 CALCULATED NOISE LEVELS - MRS ROUTE OPTION

Location	Calculated L_{10} (18 hour) Noise Level, dB(A) Existing	MRS Option
1	63	57
2	60	51
3	63	55
6	50[1]	49

1. Estimated noise level, since current traffic data are unavailable.

It indicates that traffic noise in the affected residential areas would fall in all cases, but that traffic noise levels in the park would however increase. For passive recreation areas the NSW Environment Protection Authority recommends a maximum L_{90} background noise level of 40 dB(A) as described in Section 2.3. This criterion would be exceeded at any point within one kilometre of the road which has line-of-sight to the roadway. In practice the area affected would be limited by topographic shielding and without details of the road design it is difficult to predict the extent of the area affected. However, for the MRS option it is likely that approximately 1/3 of the area of the park would be exposed to traffic noise with an L_{90} level greater than 40 dB(A).

An alternative assessment methodology considers the area of the park which would be exposed to noise levels high enough to disrupt normal conversation. With an L_{10} (18 hour) level of 60 dB(A), speech intelligibility for a normal voice at two metres would be unacceptable for 10% of the time during the day. For the existing roadways, this occurs at points within approximately 50 metres of the West Coast Highway, or 30 metres of Oceanic Drive. The projections indicate that this criterion would be breached within approximately

95 metres of the road. Thus, for the MRS option, there would be an area of approximately 48 hectares through the park where normal conversation would be difficult due to traffic noise.

Consequently it can be seen that while this option would improve the noise environment at surrounding residences, it would have significant impacts on the study area.

- **Size and Linkages**

The proposed route would have a significant effect on the study areas ecological linkages to surrounding conservation areas as well as further dividing the existing park and reducing its size. The EPA (1988) estimated that the highway would consume 20 hectares of land and a further 40 hectares would be isolated from the main body of Bold Park. The area north of Oceanic Drive would be severed in two while the central area would be reduced in size. The edge to area ratio which contributes to the integrity of the park would increase substantially and this would allow increased invasion of weeds.

The current corridor which extends from Bold Park north through the Wembley Golf Course would be disrupted by the increased number and size of roads and its value to wildlife subsequently diminished. Likewise the existing linkage over the West Coast Highway would be severed by an additional main road making the passage of fauna to the north and west increasingly difficult.

- **Conclusions**

This route would have a significant impact on the study area due particularly to severance, the loss of significant flora and fauna, interruption to the landscape and noise intrusion.

ii. Road Reserves Review Option

It is anticipated that the RRR route option would seek to provide for a road of the same standard as described above.

While its exact alignment has not been defined it is expected that it would follow the existing alignments of West Coast Highway and Oceanic Drive with deviations as required. The general impacts of this route will be as discussed in the following sections.

- **Flora**

Compared to the MRS option this route would have less impacts on the vegetation.

Communities directly affected include:

- *Eucalyptus gomphocephala - E. marginata* woodland. Road works would reduce the area of this community by approximately 30%.

- Tuart Woodland. Areas of Tuart woodland would be lost due to road works.

- Banksia Woodland. Areas of Banksia Woodland would be lost due to road works.

- Dune Heath. A small area of dune heath would be lost in the southern area of Bold Park.

- *Acacia rostillifera* shrubland. Much of this shrubland occurring in Bold Park would be lost through clearing and disturbance.

Regionally significant species (Table 2.2) affected by the RRR option include:

- *Eucalyptus gomphocephala* (Tuart);
- *Acacia xanthina*; and
- *Chamelaucium unicatum* (Wembley Wax).

❑ **Fauna**

The RRR option would have less impact on the study area than the MRS route. Direct impacts are confined to areas in which a new road alignment is required, such as between Oceanic Drive and the Boulevard, alongside Oceanic Drive were it is to be widened and the proposed West Coast Highway realignment. The fauna in these areas would be displaced and their habitats destroyed. This route, as with the MRS Option, passes through the only area of Tuart-Jarrah Woodland in the study area. This community has not been surveyed for fauna and may contain some species not found elsewhere in the study area. Indirect effects include increased weed invasion and fires along the road route, both of which contribute to environmental alteration and a decline in habitats available for fauna.

❑ **Recreational Value**

Because this route basically skirts the areas currently used for recreation its impacts will be significantly less than the MRS option. Earthworks may require the loss of land from the central Bold Park area along West Coast Highway and Oceanic Drive, however this would not be significant when compared to the overall size of the area. In the northern part of the study area there would be a loss of recreation area and loss of values around Bold Park

Drive. Although it does not receive heavy use, this area is currently enjoyed for walking and horse-riding. Bold Park Drive in its current form is a relatively quiet street and does not intrude significantly on the natural values of the bushland. The introduction of this route would significantly change this situation and lessen the values of that area. The route will also act as a more substantial buffer between the central and northern parts of the study area.

- **Educational and Scientific Value**

Similarly the impact of this route on the scientific and educational values of the study area would not be significant. It does not affect any areas used for major environmental or scientific activities and has only a minor impact on the overall size of the study area.

- **Landscape Value**

The RRR option will have less an impact on the landscape values of the study area compared to the MRS route. Potential impacts are associated with the widening of Oceanic Drive to the south of the existing route which would require extensive fill.

The deviation of the West Coast Highway to the east at the current intersection of the West Coast Highway and Challenger Parade would involve the construction of 0.75km of new road and have a high visual impact on the south-west corner of Bold Park.

The new alignment between The Boulevard and Oceanic Drive would be highly visible from the Reabold Hill look-out. Within the Park the landscape impacts would be relatively minor, consisting of visual intrusion of the realigned West Coast Highway and the widening of Oceanic Drive.

- **Noise**

The noise predictions for the RRR option indicate that a number of residential areas would suffer from significantly higher levels of traffic noise.

From Table 5.3 it is clear that under the RRR option, noise levels at residences along the West Coast Highway and Oceanic Drive will increase considerably. Those along Oceanic Drive will exceed both the MRD's criterion of 68 dB(A) L_{10} (18 hour) and the criterion of 63 dB(A) which is adopted in most other states. Substantial noise barriers would be required to meet 63 dB(A). The use of alternative road surfaces such as open graded asphaltic concrete would probably also be required.

The impacts on the study area would be less with this option. The area exceeding the 40 dB(A) limit used for passive recreation in NSW would be limited to 200-400 metres from the roadway. Using the alternative methodology which considers disruption to conversation an area within about 95 metres of the road alignment would be affected, or about 28 hectares around the perimeter of the park.

Table 5.3 CALCULATED NOISE LEVELS - RRR ROUTE OPTION

Location	Calculated L_{10} (18 hour) Noise Level, dB(A) Existing	RRR Option
1	63	59
2	60	64
3	63	73
7[1]	50[2]	57

1. *Location 7 represents a house on the corner of Bantry Road and Elphin Street in Floreat adjoining the northern section of Bold Park.*

2. *Estimated noise level, since current traffic data are unavailable.*

- **Size and Linkages**

The RRR road option would have less impact on size and linkages compared to the MRS option. However, the south west corner of Bold Park containing Quindalup soils and associated vegetation would be excised from the study area. Likewise an area between Oceanic Drive and the Boulevard would be lost. Earth works required to construct the proposed highway alongside the existing Oceanic Drive alignment would impact on the size of the study area due to the volume of fill material required. Linkages between the study area and Wembley Golf Course through to Herdsman Lake would be affected by this route.

- **Conclusion**

This route would have significantly less impacts on the conservation and recreation values of the study area than the MRS route. It would, however, have substantially greater impacts on adjoining residents. This is particularly in relation to traffic noise and also in terms of their views of and access to the study area.

If a decision is made to proceed with any route through or adjacent to the study area it will need to be the subject of detailed environmental and social impact studies.

5.3 KNIGHTSBRIDGE

5.3.1 Background

Lot 1 Stephenson Avenue adjoins the study area, but falls within the City of Nedlands. It is the site of a proposed residential development which was being considered through the environmental impact assessment process but is now awaiting the outcome of negotiations being pursued by the State government. The site has been the subject of two previous proposals for residential development both of which were determined to be environmentally unacceptable by the Minister for Environment.

5.3.2 Impacts on the Study Area

This proposal is outside the study area and consequently its impacts are limited to those that can spread into the study area and to the impacts of the loss of adjoining bushland if urban development went ahead. The impacts are discussed as follows.

- **Flora**

The impacts of the proposed Knightsbridge development on the flora and fauna of the study area have been considered in detail by Kinhill (1987) and the EPA (1988), hence impacts will only be considered in general terms here. Impact associated with an urban development scenario of the Knightsbridge land on the study area are mainly indirect.

These would include weed invasion, increased fire risk through arson, trampling and destruction of bushland (eg. timber cutting). Decrease in the area of bushland by development of this area would arguably decrease the biological integrity of the whole study area.

- **Fauna**

Again impacts on the fauna will mainly be indirect and include:

- predation of the study area's wildlife by domestic pets;
- loss of habitats due to increased fire risk;
- loss of habitats due to weed invasion; and
- decreases in the integrity of habitats due to disturbance such as trampling and timber cutting.

A direct impact would be the displacement of wildlife from the development area, thus increasing the pressure on the food and habitat resources within the study area.

Table 5.4 **IMPACTS ON NATURAL AREAS ASSOCIATED WITH ADJACENT ROADS AND/OR URBAN DEVELOPMENT**

Impacts	Comments
Weeds	opening up of the edges of vegetation through removing over-storey species creates condition suitable for the invasion of weeds; and dumping of garden refuse contains weeds and weed seeds.
Fires	increased accidental fires due to more people in the area; increased deliberate arson; and weed invasion leads to increased fuel loads and a greatly increased fire risk.
Pets	more people leads to an increased population of cats and dogs leading to both increased disturbance from dogs and direct predation of wildlife by cats.
Tracks	increased human use leads to more tracks and trails which in turn leads to further weed invasion along disturbed edges; and tracks in unsuitable area quickly leads to erosion.
Rubbish	people often dump rubbish including garden waste in bushland areas which leads to decreased amenity, weed invasion and further rubbish dumping.
ORV's	off road vehicles including four wheel drives and motor bikes lead to dissection of intact areas with numerous tracks, erosion and increased weed invasion alongside tracks.

❑ **Recreational Value**

The development of this area would impact on the recreational values of the study area in two ways. Firstly, the Knightsbridge site is currently used for recreation and a number of trails lead from the study area to look-out points which are situated on the Knightsbridge site. Use of these trails and look-out points would probably cease thereby removing some of the recreational opportunities that currently exist in the area.

The second impact is that urban development would directly adjoin the central part of the study area and its impacts in terms of viability and noise would detract from the wilderness values which the study area currently provides.

- **Educational and Scientific Value**

Apart from the impacts discussed under flora and fauna, development of Knightsbridge would have limited impacts on the scientific and educational value of the study area. It may, however, provide an opportunity for close investigation of the impacts of urban development on adjoining bushland.

- **Landscape Value**

The proposed Knightsbridge development would have a significant impact on the landscape values of the study area. Though the study area would be buffered by controlled access fencing and some bushland areas, the proposed residential subdivision will still be visible as the bushland vegetation will only partially screen the buildings and/or fences within the subdivision. This is particularly so along the northern boundary of Lot 1 and along the western boundary south of the pine plantation. From the Reabold Hill look-out a large proportion of Lot 1 is visible. The proposed residential subdivision of this area will impact on the landscape amenity of Bold Park as viewed from the look-out especially during the construction phase. This impact may be reduced as vegetation within the residential area develops.

- **Size and Linkages**

Although the Knightsbridge proposal will not affect the size of the study area, the corridors established by the existing vegetation in the Knightsbridge area would be lost should residential development occur. Most seriously disrupted would be the corridors running in a north-south direction.

- **Conclusions**

Urban development of Knightsbridge will have an adverse impact on the study area both through indirect impacts on flora and fauna and through the perception of having urban development adjacent to the central area of Bold Park. The addition of the Knightsbridge land to the study area would provide significant benefits to the flora, fauna, landscape and recreational values of the study area.

5.4 URBAN DEVELOPMENT IN MT. CLAREMONT BUSHLAND

5.4.1 Background

The Mt. Claremont Bushland, which forms the southern section of the study area is currently zoned for urban purposes under the City Planning Scheme and urban under the Metropolitan Region Scheme. Unlike other parts of the study area that are zoned urban, the Council has made no recent resolutions on the future of this area. The EPA in Bulletin 322 (1988) concluded that:

> "its development may be acceptable if carried out in an environmentally sensitive manner"

For these reasons the development of this land for residential or low key institutional uses such as schools will be considered. However it should be stressed that there are no pending applications for such development.

5.4.2 Impacts of Development

The impacts of development in the Mt. Claremont Bushland will be dependent, to some extent, on the area involved. The section of the study area south of Rochdale Road is approximately 45 hectares in area with 37 hectares owned by the City of Perth and the remaining area owned by Christchurch Grammar School. In order that different degrees of development are considered three options have been formulated. These are as follows:

- Full Development - this would entail development of the entire area for urban purposes, generally residential and active recreational uses. It should be noted that under this scenario about 10% of the land would remain as public open space.

- Partial Development - this would limit development to approximately 6.5 hectares. The land designated for development under this scenario was defined on the basis of the major ridgeline, and an objective of keeping development to the south east where it adjoins the urban area of Mt. Claremont.

- Minor Development - this scenario would see development on one area fronting Fortview Road comprising approximately 1.4 hectares.

Each of the three scenarios is shown on Figure 5.2. The impacts of each are considered in the following sections. Each scenario is considered against an implicit no development option.

i. Full Development

The general impacts of this scenario on the study area are discussed as follows.

❑ **Flora**

Three vegetation associations are found within the Mt. Claremont Bushland area, these are:

- Dune Heath;
- Acacia Shrublands; and
- Tuart Woodlands.

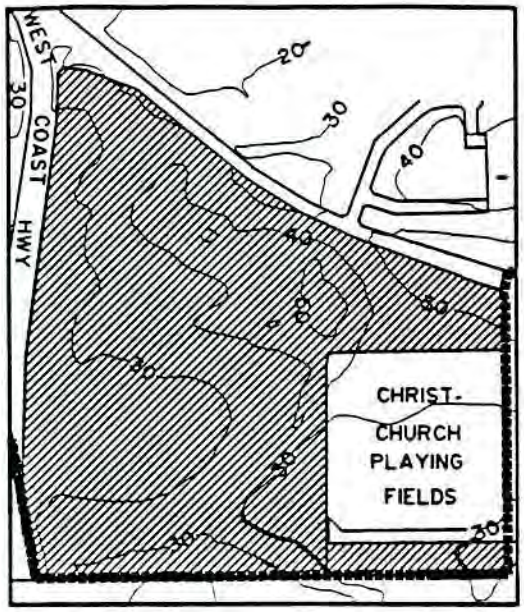
These communities are associated with the Quindalup Dunes which dominated the Mt. Claremont Bushland and represent a significant area of these particular communities within the entire study area.

Direct impacts from the development of the Mt Claremont bushland would include the destruction and complete loss of these communities from the Mt. Claremont Bushland area and therefore significantly reduce their representation within the entire study area. It should also be noted that the condition of these communities found in the Mt. Claremont bush area is generally better than those found in other parts of the study area, particularly the dune heaths. It would also result in the depletion of populations of the following regionally significant flora (Table 2.2).

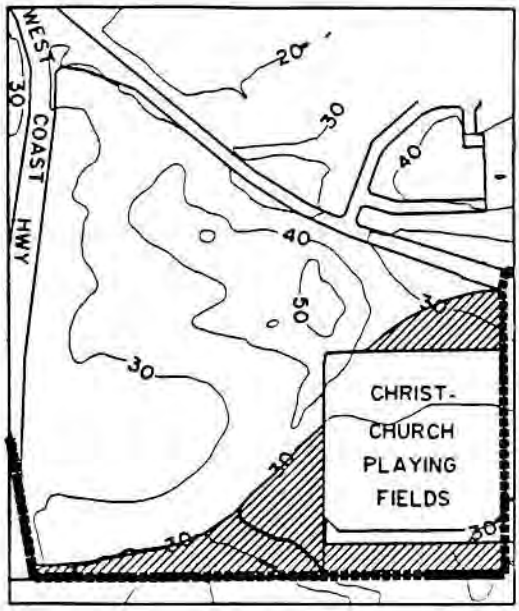
- Dune Sheoak *(Allocasuarina lehmanniana)*: the only stand of this species is found in this part of the study area and therefore full development of Mt. Claremont bushland would result in its loss from the study area.

- Peppermint *(Agonis flexuosa)*: good stands are found in this area and are found in association with the Summer-scented Wattle *(Acacia rostilifera)*.

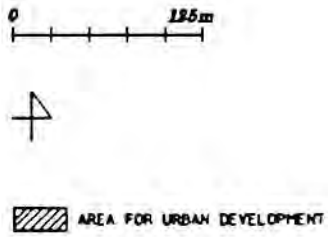
- Wembley Wax *(Chamelaucium uncinatum)*: the population occurring in the Mt. Claremont bush is relatively isolated from other populations in the rest of the study area and therefore is less likely to hybridize with commercial strains of Geraldton Wax planted (and spreading) in Bold Park. Pure populations of the local form will be less likely to be preserved if this area is developed.

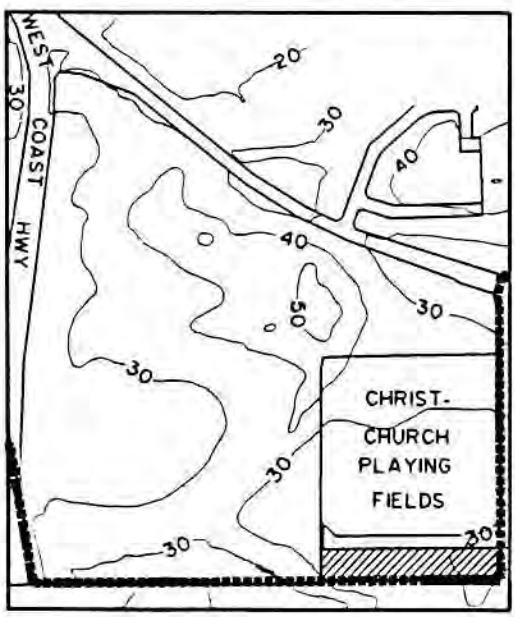


SCENARIO 1
FULL DEVELOPMENT



SCENARIO 2
PARTIAL DEVELOPMENT





SCENARIO 3
MINOR DEVELOPMENT

Figure 5.2 MT CLAREMONT BUSHLAND
-DEVELOPMENT SCENARIOS

- Tuart *(Eucalyptus gomphocephala)*: destruction of this habitat will further reduce the Tuart populations within the study area and potentially affect a significant value of the study area in terms of maintaining viable populations of Tuarts within an urban environment.

- Cockie's Tongue *(Templetonia retusa)*: a yellow flowering form is found in the Mt. Claremont area.

- Cheesewood *(Pittosporum phylliraecoides)*: limited occurrences of this species in the metropolitan region.

Another important species in the this area is the One-sided Bottlebrush *(Calothamnus quadrifidus)* which has high population levels in this area and is important food source for nectivorous birds (R. Powell, pers. comm.)

❑ **Fauna**

Impacts on the fauna of the Mt Claremont Bushland under a full development scenario would be extensive. Direct impacts include the destruction of the amphibian, reptile, mammal and bird faunas of the area. Some species many be able to move into adjoining habitats though these are probably already fully utilised. Small insectivorous territorial birds including the White-winged, Splendid and Variegated wrens are particularly vulnerable to habitat disturbance. The Mt Claremont Bushland is the only remnant within the metropolitan area where all three of the these Wren species are found together. The M46 land also serves as a stop over or staging point for many migratory species travelling through the Perth area. The location is used by a wide variety of birds with a total of 53 species being recorded to date. Of these about 20 are permanent inhabitants which have been recorded in 50 % or more of field visits over the past 12 months (Wykes 1992). Another significant group of birds that would be lost from the area if it were developed, are the honeyeaters which are attracted to the extensive areas of *Calothamnus quadrifidus* and other nectar producing plants found in abundance in the dune heaths.

The reptile fauna of the area can be expected to be diverse based on results from Quindalup dune areas within Bold Park. How & Dell (1990) recorded 24 reptile species from these areas within Bold Park. Five of these species were not found elsewhere within the study area (refer Section 5.3.2). Due to the similarity between the Quindalup coastal heaths found in the two areas a similar suite of reptiles can be expected in the Mt Claremont Bushland. This diverse reptile fauna would be lost by full residential development.

Other impacts from the full residential development scenario are indirect and relate to habitat availability, condition and the inter-relationship between Mt Claremont and Bold Park. Firstly, the Mt Claremont Bushland is less disturbed than Bold Park, having less weed invasion and lower usage by people and dogs. The area is relatively isolated which enables it to act as a refuge to which animals can retreat in case of fire or other major habitat disturbance occurring in adjoining areas. Similarly, animals can expand from Mt Claremont to recolonise adjoining habitats after disturbance. This refuge would be totally destroyed if the area were to be developed for housing. Thirdly, the Mt Claremont bush has not experienced a major fire for at least 20 years which has resulted in the maturation of plant communities providing increased variety of habitats not found to the same extent elsewhere in the study area.

- **Recreational Value**

As discussed in Chapters 3 and 4 this part of the study area receives little recreational use. Consequently even full development of the Mt. Claremont Bushland would have only a small impact on the overall recreational value of the study area.

- **Educational and Scientific Value**

In contrast the Mt. Claremont Bushland has significant educational and scientific values. These stem not only from its flora, fauna and geomorphology but also from the fact that it is regularly used both for scientific and educational programs. Full development of this area would mean the destruction of these sites and would significantly detract from the scientific and educational value of the entire study area.

- **Landscape Value**

The existing landscape provides punctuation between urban developments to the south and north and it is one of the few areas along the coastal route with bushland on both sides of West Coast Highway.

Its value includes views and vistas of the natural bushland, topographic variety associated with undulating form of the Quindalup dunes and views of the coast from within the area. Its relatively undeveloped state provides elements of an "urban wilderness" experience. Full development of the area would result in the following impacts:

- loss of the undulating topography associated with the Quindalup dunes;
- loss of views and vistas of scenic bushland;

- loss of public viewing areas from within the area ie. views to the coast and views and vistas into and across the bushland; and
- loss of "wilderness" experience within this section of the study area.

❑ **Size and Linkages**

The Mt. Claremont bushland provides an ecological linkage between Bold Park and vegetation found at Cottesloe Golf Course and potentially through to Lake Claremont. It also supports an east-west linkage between Bold Park and the area west of West Coast Highway. Full development of the area would result in the loss of this linkage and thus reduce corridors for animal and plant movement.

❑ **Conclusion**

Full development of the Mt. Claremont would result in the loss of 37 hectares of bushland. This would mean the loss of habitats and resources for both plants and animals. It would also lead to increased pressure on other parts of the study area in terms of human use and resources for animal species displaced by urban development of the Mt Claremont bushland.

ii. Partial Development

The general impacts of this scenario are described as follows.

❑ **Flora**

Under this development scenario the major impacts on the flora are related to the destruction of an area of dune heaths and some of the Tuart Woodlands and Shrublands, however the impacts are less than for the previous scenario.

The following significant species would be adversely affected:

- Wembley Wax *(Chamelaucium unicinatum)*; and
- Tuart *(Eucalyptus gomphocephala)* (see Section 5.5.2(i)).

Likewise areas containing *Calothamnus quadrifidus* would be directly affected resulting in a reduction in the population size.

Perhaps the most significant affect on the flora will arise from indirect affects associated with urban development, namely: increased fire risk, weed invasion, trampling, rubbish dumping and fire wood cutting (see Table 5.2).

Potential adverse impacts from indirect affects could result in the destruction of much of the bushland.

- **Fauna**

The direct impacts on the fauna arising from this development scenario include:

- loss of habitats particularly the dune heaths;
- loss of plants important to nectivorous birds; and
- displacement of fauna.

Indirect impacts associated with the residential development include:

- increased risk of fire and therefore habitat destruction;
- increased predation of wildlife from domestic pets; and
- destruction of habitats from increased human use eg. trampling of vegetation.

- **Recreational Value**

Because of the limited use of the area this level of development would not have a significant impact on overall recreational values. Use of the area may increase because of additional residential development in the vicinity.

- **Educational and Scientific Value**

This level of development would impact on the scientific and educational programs currently being carried out in the Mt. Claremont Bushland. The degree of impact would depend on a number of factors including the effects discussed under flora and fauna above.

The development is likely to have some impact on those programs and in the worst case could make the site valueless for them.

- **Landscape Value**

Under this scenario the impacts on the landscape are considerably less than under the full development scenario, however they include:

- partial loss of some of the dune form; and
- visual intrusion of the urban form particularly if it is developed on the more elevated parts.

❑ **Size and Linkages**

Impacts on the size and linkage are much less than with the full development scenario. These include:

- a 6.5 hectare reduction of the bush found in the study area, which means a concurrent loss of habitats; and

- the loss of linkage between the Mt. Claremont bushland and the Cottesloe Golf Course.

iii. Minor Development

The general impacts of this scenario are described as follows.

❑ **Flora**

This scenario would lead to the loss of the degraded Tuart Woodland occurring south of Fortview Road which contains a number of mature Tuarts. However the impacts from development of this area are likely to be small. Furthermore indirect effects associated with urban development as mentioned previously are likely to be small given the residential codes for this area.

That is, the number of lots created from development of this land is relatively low and therefore indirect impacts would be relatively low and could be catered for with appropriate management.

❑ **Fauna**

The minor development option involves the removal of existing vegetation and destruction of associated fauna habitats. Due to its shape the area is already considerably degraded and is of lesser habitat value than the core M46 area. The indirect impact of extra residents in this area would be less than if they were situated in the core area.

❑ **Recreational Value**

This scenario would have very little impact on the overall recreational value of the study area.

- **Educational and Scientific Value**

Because the Mt. Claremont Bushland is a highly sensitive area for education and scientific programs, even limited adjoining development has the potential to detract from its values. Increased fire risk, the spread of weeds and domestic pets with all impact on the native flora and fauna, are discussed previously. However, carefully controlled sensitive development of this magnitude may be able to co-exist with its scientific and educational values.

- **Landscape Value**

Residential development of this area would change the relatively natural and landscaped amenity of the area. The residential development would be prominent in the view shed from elevated parts of adjacent dunes. However impacts will generally be low.

- **Size and Linkages**

Developing the strip of land south of Fortview Road would reduce the size of the M46 area by an insignificant amount. The value of this area in terms of linkages is also low.

- **Conclusion**

This analysis has indicated that full development of the Mt. Claremont Bushland would destroy significant flora, fauna, educational and scientific values, many of which are not well represented elsewhere in the metropolitan region.

The partial development scenario would have correspondingly fewer impacts, but the indirect impacts which result from siting urban development directly adjacent to natural bushland of high quality could result in further degradation. The minor development scenario, on the other hand, would have no significant impacts on the values of the study area.

5.5 ROCHDALE ROAD

5.5.1. Introduction

For many years there has been discussion of the need to link Underwood Avenue in a direct fashion to West Coast Highway. In the past a proposal was put forward by Perth City

Council to extend Underwood Avenue through the M47 area to join the Western Suburbs Highway. This was discussed and illustrated in Bulletin 322 (EPA 1988).

The justification for the east-west link is to provide a more direct route for traffic travelling west from the city on Hay Street and Underwood Avenue and then south on West Coast Highway. Currently much of this traffic uses Underwood Avenue and Stephenson Avenue before turning south on Rochdale Road and then west on Alfred Road to join the West Coast Highway in Swanbourne. This means that significant volumes of traffic are passing through residential areas along Rochdale Road. The City of Nedlands and the City of Perth have both received complaints from residents in the area and acknowledge that it would be preferable to remove this traffic from the residential area.

It is believed that this traffic would turn west on Rochdale Road to link with the West Coast Highway if it provided a more direct or quicker journey. Currently the configuration of Rochdale Road, running in a north-westerly direction, involves some backtracking for a motorist on a journey in a south-westerly direction.

Consequently, the City of Nedlands has requested that the City of Perth take steps to direct traffic along Rochdale Road in a westerly direction. There are a number of options available to achieve this end:

- realigning Rochdale Road to provide a more direct route;
- upgrade the Stephenson Avenue/Rochdale Road intersection to direct traffic to the west;
- upgrading the existing alignment of Rochdale Road to provide a faster trip; or
- taking steps to dissuade traffic from using the southern leg of Rochdale Road by traffic calming or other means.

Bulletin 322 (EPA, 1988) concluded that a proposal to extend Underwood Avenue to the west through the central Bold Park area would have significant and adverse impacts on the values of the M47 area.

For this reason this study will only consider options that would have a lesser impact by passing to the south of Wollaston College. There is clearly a wide range of route options, some of which are shown in Figure 5.3. However it is not within the scope of this document to make a detailed study of them all, and consequently a single route will be considered in general terms. This route, as shown on Figure 5.3 would require the negotiation of a land purchase or swap with Christchurch Grammar School, but in crossing through their property it avoids a significant ridgeline. Implicit in the consideration of this realignment is a trade off that the existing alignment of Rochdale Road between West Coast Highway and Wollaston College would be closed, removed and revegetated.

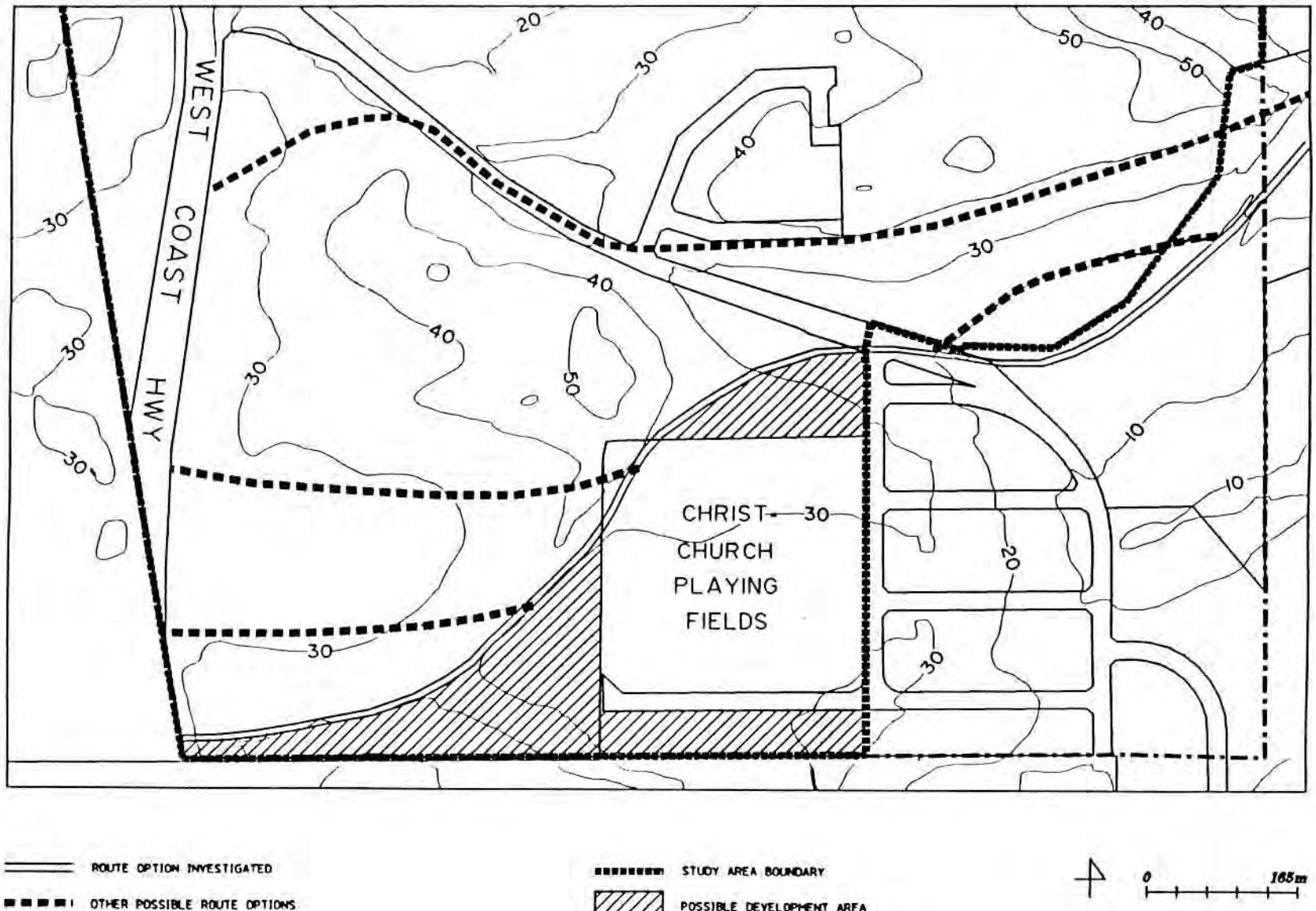


Figure 5.3 REALIGNMENT OF ROCHDALE ROAD

In return the land to the south and south east of the new alignment may be suitable for some form of development. The impacts of this scenario are considered as follows.

- **Flora**

The realignment of Rochdale Road would have significant impacts on the flora and vegetation of the Mt. Claremont Bushland area. These include the destruction of much of the dune heath community (approximately 60% of dune heaths are found in the Mt. Claremont Bushland), considerable loss of the *Acacia rostillifera* shrublands and likewise some loss of Tuart woodland.

Regionally significant species (Table 2.2) affected by the route. These include:

- Wembley Wax *(Chamelaucium uncinatum)* - an isolated population of horticultural significance; and
- Tuart *(Eucalyptus gomphocephala)*.

The dune heath affected by the route contains good populations of *Calothamnus quadrifidus*, an important species for nectivorous birds.

- **Fauna**

Significant adverse impacts on the fauna of the M46 area would result through the realignment of Rochdale Road as shown in Figure 5.3. The road route impacts on areas of dune heath vegetation which are the known habitat of 2 wren species which are locally uncommon. This community also supports large areas of *Calothamus quadrifidus* which is of regional importance as a food source for nectivorous birds. The proposed route would directly destroy approximately 20 hectares of habitat within the south-east part of M46 and in the southern section of M47 directly north of the intersection of Stephenson Ave and the existing Rochdale road.

- **Recreational Value**

As discussed previously the Mt. Claremont Bushland receives little recreational use. The main recreational drawcard in the area are the Christchurch Grammar School playing fields which also generate some use of the surrounding bushland. The major recreational impact of this scenario would be the impacts on the Christchurch playing fields and it is likely that some land swap would be necessary.

By closing the existing alignment of Rochdale Road the uninterrupted area of bushland available for recreational purposes would be increased and this would provide a benefit.

- **Educational and Scientific Value**

This scenario would impact on the educational and scientific values of the study area, in a similar manner to that described in Section 5.5.2ii. However, by separating the urban development from the bushland with a road, the impacts are reduced and may be manageable.

The closure of the existing alignment of Rochdale Road would provide added linkages between the two parts of the study area and this would have benefits.

- **Landscape Value**

Potential impacts on the landscape amenity of the area from the proposed realignment of Rochdale Road include the substantial cut and fill of dunes on the west and north side of the Christ Church Playing Fields. The road route being at or near the crest of the ridge would be visually obtrusive over a large area of M46. It would also be visibly obtrusive to users of the playing fields and from the southern part of M47 east of Wollaston College.

- **Size and Linkages**

The Rochdale Road realignment would alienate a total of 6.5 hectares from the main body of Bold Park and the M46 area. It would also sever the existing linkage to the Claremont Golf Course, however this is partially compensated for by the closure and revegetation of the current road alignment and thus integrating it into Bold Park.

The area alienated from the main body of M46 by the proposed road contains some important habitat areas that may become unmanageable due to their size and be more appropriate for some other land use.

- **Conclusions**

In general terms this analysis indicates that the impacts of a realignment of Rochdale Road in the manner described would have both benefits and costs to the study area. The closure of the existing alignment is seen as a major benefit, however a detailed impact study of the route would be necessary prior to the construction of any realignment.

5.6 REALIGNMENT OF WEST COAST HIGHWAY

5.6.1 Background

As noted in Section 1.3 Perth City Council undertook a PER relating to the realignment of the West Coast Highway near Challenger Parade in 1992. The object of the realignment was to provide a greater level of road safety in an area which had a history of accidents. The PER (Dames and Moore 1992) was released for public comment in early 1992 and the EPA released its report and recommendations (EPA Bulletin 655, 1992) in October 1992.

The EPA recommended that four options were environmentally acceptable and that three others were unacceptable. The acceptable options include three which propose varying degrees of realignment and one which proposes reconstruction on the existing alignment.

In reaching its conclusion, the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as:

- implications for System 6 Recommendations M46 and M47;
- conservation of the regionally significantly, and diverse flora and fauna associated with Bold Park;
- management of Options B, C or G to minimise disturbance of vegetation, including dieback protection procedures and impacts upon landform and visual amenity; and
- rehabilitation of the current alignment of West Coast Highway and lands alienated by the realignment.

5.6.2 Impacts on Study Area

The impacts of the realignment have been considered in detail in the PER (Dames and Moore 1992) and in EPA Bulletin 655 (1992). Consequently it is not necessary or appropriate to reconsider them here. The City of Perth will make a decision on which option it wishes to adopt. Lands surrounding the option should be managed under the recommendations for the preferred structure plan as described in Section 6.4.

5.7 DEGRADED AREAS

The brief for this study required consideration of degraded sites within the study area and of a number of specific sites. These include:

- the former Skyline Drive-in site;
- the Council turf farm;
- the pine plantation; and
- degraded land at the corner of West Coast Highway and Oceanic Drive.

On the basis of the preceding studies it is considered that two other areas should be include. These are:

- an area including and adjacent to the WAWA reservoir; and
- the former quarry on the West Coast Highway.

Each of these areas is identified in Figure 5.4. The following sections will consider the development options and constraints relating to each area.

5.7.1 Drive-In

One land use option that has been put forward for this area is a Perth City Council nursery and sub-depot. The nursery component of the development would require approximately five hectares. This would comprise:

- nursery of shrubs and trees;
- storage of fertilizer, mulch, etc;
- storage of supplies such as fence posts and play equipment; and
- storage of tractors and other equipment.

The sub-depot would require about 0.3 hectares and would consist of change rooms, a mess room, storage of bushfire fighting equipment and approximately six to eight vehicles. The two developments do not have to be on the same site.

The former drive in site and environs include the land previously leased for a drive-in site, associated access roads and land south-east of the drive-in site which was quarried before being levelled and grassed. The drive-in site is served by two access roads, one running north from Oceanic Drive and the other running west from Bold Park Drive. Most of the site is degraded with an associated weed flora. In parts of the site, particularly areas

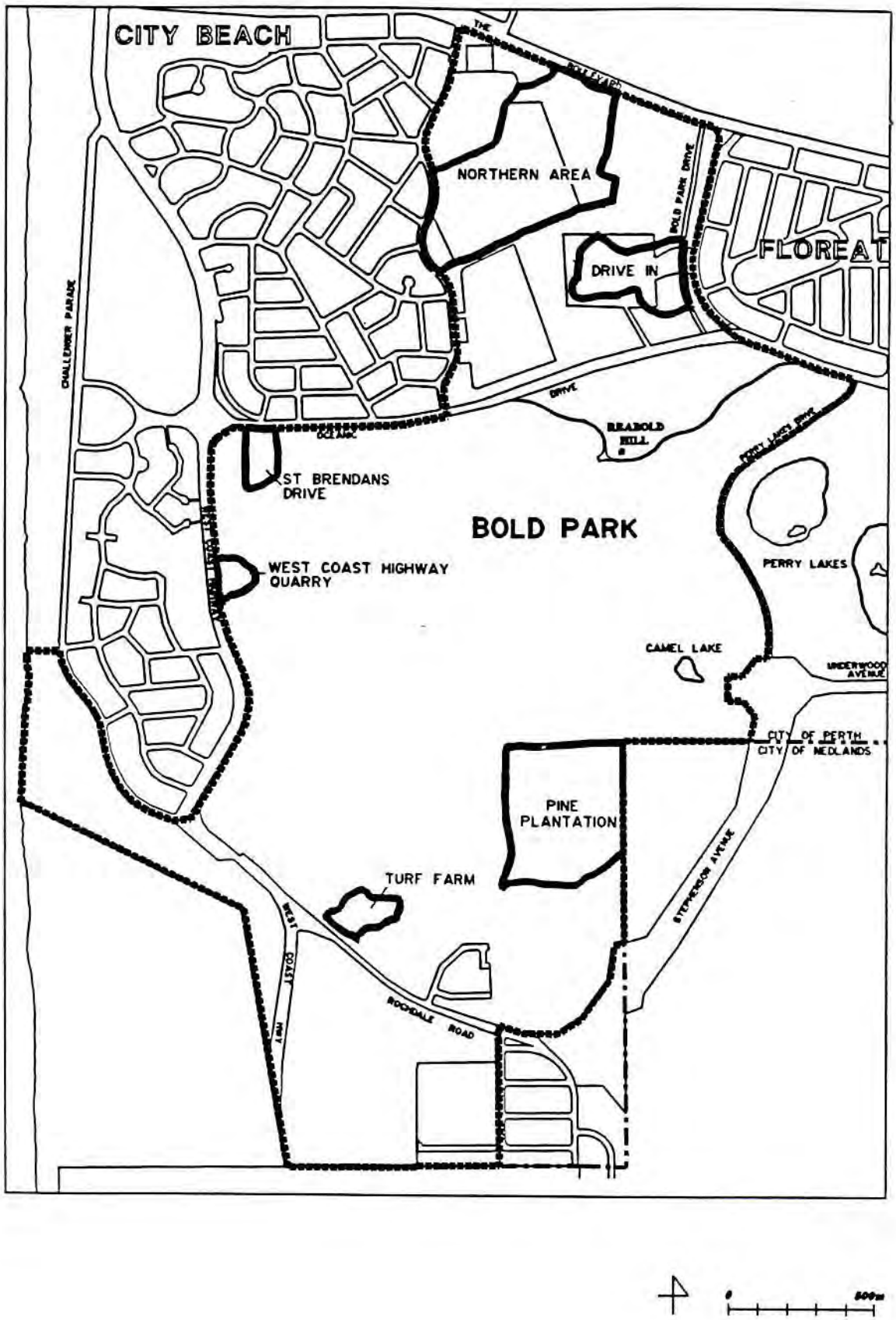


Figure 5.4 DEGRADED AREAS

adjoining native vegetation, there is some natural regeneration of indigenous species. The grassed area is adjacent to the south-east corner of the drive-in site at the corner of Oceanic Drive and Bold Park Drive. It is roughly circular in shape and consists of unreticulated grass which is maintained by the City of Perth.

The drive-in site is surrounded by a number of diverse vegetation communities. These include:

- *Eucalyptus decipiens* woodlands;
- *Acacia xanthina* shrublands;
- Tuart woodlands;
- Dune heaths; and
- Limestone heaths.

These communities contain a number of regional significant species (Table 2.2) which include:

- *Eucalyptus gomphocephala* (Tuart);
- *Eucalyptus decipiens* (Limestone Marlock);
- *Acacia xanthina* (White Stemmed Wattle);
- *Eucalyptus* affin. *falcata* (Rock Mallee); and
- *Chamelaucium uncinatum* (Wembley Wax).

This diverse assemblage of plant communities is a result of the topographic variety and corresponding soils which surround the drive-in site. Together they represent an important scientific and educational resource.

The area is currently used mainly for passive recreation including walking, jogging, nature study and dog exercise. There are no known organised groups who use the grassed area. Students from the adjoining City Beach Senior High School use part of the area for access to the school.

Three options have been proposed for the development and use of this area. These options revolve around revegetation of the site to varying degrees as well as possible local government or institutional development.

The first option is total revegetation, to regenerate the site with local indigenous species using ecological restoration techniques. Given advances in these techniques over the past five years this task is quite achievable. This would have obvious biological benefits including increasing habitats for wildlife, increased aesthetic value, enhanced linkage between Bold Park and Wembley Golf Course and increased resilience of existing

significant vegetation communities. This could be augmented with nature trails and interpretive material.

The second scenario is partial revegetation of areas next to regionally important vegetation communities combined with the depot/nursery development, walk trails, seats and interpretive signs akin to the existing facilities in Bold Park. Two locations for development of the depot/nursery are suggested, one is the eastern portion of the drive-in site and the other is towards the eastern part of the oval adjacent to Bold Park Drive. These locations allow access to the site, keep development away from residential areas and would allow revegetation of the remainder of the area. This facility could be accommodated at either of the proposed development sites. Some constraints on the development of the depot include it's size and future expansion, noise, weed source, visual integration and night lighting. A nursery facility which propagates indigenous species, has community access, provides educational resources and is visually integrated had general acceptance by the community.

The third scenario for the site involves an institutional development such as an educational facility. An institutional development could be accommodated in this area provided it was non-residential, had low human impact on surrounding vegetation communities and integrated into the landscape. Such a development would be most suitable within the oval area due to the site being level, devoid of vegetation and currently underutilised. Any institutional development should involve extensive revegetation of the immediate gardens and surrounding areas with local indigenous species. It should be noted that the concept of additional institutional development received very little support at the Search Conference.

Any development on or near the drive-in would need to take account of proposed road routes which affect the area. Significant permanent structures should only be developed after clarifying future road alignments with Main Roads.

5.7.2 Turf Farm

The turf farm comprises 1.9 hectares of flat cleared land located on Rochdale Road. The site is reticulated from a bore and is used irregularly by Perth City Council for the production of turf. Apart from the use of fertilizers the current land use has few environmental effects on adjoining lands. The turf farm is no longer the Councils' major site for turf production and its available for other uses. The site is located within the central Bold Park area which is highly valued by the community. It is in a visually significant location and is bordered by valuable Banksia woodlands to the north, which also act as significant fauna habitat.

The range of uses which may be appropriate for this site are:

- rehabilitation as natural bushland;
- development for a sports field; or
- development of a park entry location including car parking, toilets, interpretive facilities and possibly a ranger's residence.

The option of developing a sports field would take advantage of the existing characteristics and development of the site. However, it would involve the introduction of an active recreational use into an area which is valued highly for its natural characteristics. The environmental impacts which may result include the degradation of surrounding bushland due to the introduction of large numbers of people. While this option could be managed so as to avoid these impacts it would be preferable to manage the area in a manner that contributed to the natural values and image of Bold Park, through either rehabilitation or development as an entry location.

Development of an entry point would have limited impacts and could be similar to the entry points currently located on Perry Lakes Drive. The addition of a ranger's cottage would provide increased supervision of the area and lessen the risk of vandalism.

5.7.3 St. Brendan's Drive Area

The St Brendan's Drive area is located in the north-west corner of the study area adjacent to the intersection of Oceanic Drive and West Coast Highway (Figure 5.3). The area was excised from the western extension of Bold Park and roads were constructed for residential subdivision. These roads (Cordal Place, Dunloe Road and St Brendan's Drive), formed a U shaped enclave which connected to Oceanic Drive approx 100 m east of West Coast Highway.

The area enclosed by the roads was excluded from the System 6 M47 area. No residential development ever took place in the area and the roads were removed and their alignments partially rehabilitated. The level of degradation in the area is relatively low and weed invasion is at comparable levels with adjacent areas of Banksia Woodland within Bold Park.

Future impacts on the area may arise from the RRR route for the Stephenson Highway. As this area forms an integral part of Bold Park in terms of landscape and recreation amenity, contains a relatively intact biota and is not severely disturbed it is recommended that the area should be managed as part of Bold Park.

Some additional rehabilitation is required in the area to upgrade its biological integrity as a result of previous development attempts. Management of the area should include fire and weed control.

5.7.4 Northern Area

An area of approximately 26 hectares in the north western part of the study area as shown on Figure 5.4 is regarded as degraded. It supports little vegetation and what remains is generally in poor condition. The area includes the WAWA reservoir, a former quarry that is used as a recreation area, and adjoins the retirement village and swimming pool. The area within WAWA boundary has suffered from poor management.

It includes both flat areas and steep slopes fringing the reservoir. The current state of the area is such that it would be suitable either for rehabilitation or a changed land use.

Land use options for this area include the following:

- rehabilitation;
- development for active recreational purposes to take advantage of both the swimming pool, the former quarry and the existing car park;
- development for commercial, residential or institutional purposes in a similar manner to the adjacent retirement village; or
- for a combination of these or similar uses.

The status of the WAWA land may be a constraint to rehabilitation or development. Aerial photography indicates what appears to be a considerable area of excess land within the WAWA boundary. If this land is not required by WAWA it would be appropriate that it be returned for management by the same authority who is managing the surrounding lands.

Any development of this area would need to have regard to the valuable stands of vegetation to the south, and it would be preferable not to encourage greater use of that area. In addition the reservoir is situated on a high point and is visible from a considerable area. Revegetation of the slopes would add to the landscape value of the area.

The introduction of domestic animals would impact on fauna in the area and should be avoided at all costs.

Rehabilitation of this area would enhance the value and image of the study area as a natural recreation area.

However, this location has a number of other land uses such as the reservoir, retirement village and swimming pool which are likely to remain in the long term. Consequently this particular area is unlikely to fully regain its natural values. For this reason development in some form may be appropriate.

The swimming pool, car-park and former quarry which is currently used for archery, provide the area with a base of active sporting facilities.

Further development on these lines could see this area become the active recreation centre of the park.

The retirement village adjacent to this area is an example of the type of residential development that could be considered for this location. It is likely such a proposal would receive adverse public reaction as the community consultation program has indicated that many in the community are opposed to any form of residential or similar development within the study area.

5.7.5 West Coast Highway Quarry

The former quarry on the West Coast Highway has been disturbed in the past and has not regenerated. Suggestions have been made that it would make an appropriate parking area, picnic ground and entry point. Apart from this the area is suitable for few other land uses. It is distant from other facilities, lies adjacent to both Tuart and Banksia woodlands, and is close to an area which is used intensively for scientific and educational uses. A major constraint to development of the area as an entry point is that road access off the West Coast Highway may be restricted because of its status as an Important Regional Road. Consequently, it is recommended that this location be considered for an entry point, but if this is not feasible it should be revegetated.

5.7.6 Pine Plantation

The Bold Park Pine Plantation was established in the early 1920's and covers approximately 19 hectare in the south-eastern corner of the study area.

The original vegetation of the site would have been comparatively diverse and probably consisted of Dune Heath, Banksia Woodlands and *Eucalyptus decipiens* Woodlands. This diversity reflects the changing topography over the site which influences the soils and hence vegetation. The native vegetation was totally cleared prior to the planting of the pines, however a recent survey of the flora of the area found a number of native species regenerating in the area (Keighery et al, 1990). Two species of pine tree were initially established, *Pinus radiata* and *Pinus pinaster* with the majority being *Pinus pinaster*. Since their establishment, no on-going management apart from fire control has been undertaken and the pines currently have no commercial value (Wycherley 1976).

Current uses of the area include walking, nature study and jogging. The Zamia and Pine trails encircle the plantation and an unnamed trail runs north-south through the area. The pine cones are a regular food source for the White-tailed Black Cockatoo, a nomadic species which regularly visits the study area. The natural habitat and hence food source for this species has diminished in recent years. The landscape of the pine plantation is topographically varied. A major valley runs across the southern third of the plantation while the northern area consists of a high east-west ridge which is clearly visible from Reabold Hill. The pine trees promote a feeling of enclosure within the valley area which is an attraction to park users.

Options for the future of the pine plantation involve either total or partial removal of the pines or their retention and appropriate management. The total removal of the pines would involve a considerable disturbance and have significant impacts on visual amenity for park users. It would also involve a large scale ecological reconstruction of endemic vegetation communities. This effort would be complicated by the acidification of the soil by the pines needles.

Partial removal of the pines either in one defined area or to reduce their overall density by selective thinning would entail habitat disturbance as detailed above, although not on the same scale. Difficulty in establishing and maintaining rehabilitation efforts may be experienced. It will however maintain the vegetation cover over the majority of the area and retain the landscape character of the existing pine forest.

Retention of the pines would not enable revegetation as most native species will not grow under the pine canopy due to the low light, competition from the pines and high soil acidity. Retaining the existing pines will retain the landscape amenity and benefits to the White-tailed Black Cockatoos, however no further planting of pines should be carried out. The pines trees are not currently spreading into surrounding bushland areas however they have the potential to germinate from seed and spread and this needs to be monitored.

Chapter 6

STRUCTURE PLAN

6.1 PURPOSE OF THE STRUCTURE PLAN

The purpose of the structure plan is to define broad land use categories for different parts of the study area. Once these are determined management structures can be recommended and a process initiated to allow the structure plan to be implemented through a series of detailed management plans.

The land use category established for any particular area becomes the guiding objective for future management decisions. For example, if an area is designated for conservation, scientific and educational purposes, future management decisions should be made which aim to maintain and enhance the value of the area for those purposes. It would be inappropriate to provide active recreation facilities in an area so designated unless it can be shown that they do not conflict with the land use objectives.

The preparing of the structure plan is the critical stage in the study because it will determine the future land use for the study area including the balance between conservation, recreation and development.

6.2 DEVELOPMENT OF THE STRUCTURE PLAN

6.2.1 Objectives of the Structure Plan

The objectives adopted for the structure planning process are as follows:

- to protect or enhance areas of significant conservation, scientific, educational or landscape value;
- to provide for and promote appropriate recreational use;
- to take advantage of economic values where they do not conflict with the above; and
- to consider the needs of regional transport planning.

This explicitly places conservation, scientific, educational and recreational values before economic values. The reasoning behind this is that the findings and recommendations of the System 6 Report (Department of Conservation and Environment, 1983) relating to the study area and the decision of the Minister for Environment on the Knightsbridge proposal set a precedent that is reflected in the guidelines for this PER.

6.2.2 Identified Values

Chapter 3 encompassed a professional assessment of the values provided in the study area. It identified areas of high, medium and low values. On the basis of that assessment the following general recommendations apply to the areas defined on Figure 3.5 - Composite Values.

- High Composite Values

  These areas should be managed in a manner that retains and enhances their natural values. Appropriate uses are for:

  - conservation, scientific and educational purposes; and
  - passive recreation.

- Moderate Composite Values

  These areas should be managed in sympathy with adjoining lands.

  Where they are adjacent to areas of high composite value they should be managed in a manner that enhances and protects those values. Where they adjoin roads or other land uses they may be appropriate for other land uses, provided those uses do not threaten any areas of high composite value.

  Appropriate land uses are:

  - regeneration for scientific or educational purposes;
  - passive recreation;
  - active recreation; and
  - facilities such as car-parking, toilet facilities, interpretive and management centres, ranger's residence.

- Low Composite Values

These degraded areas may be appropriate for more intensive built development if this does not threaten the values of any areas identified as being of high composite value. They may also be appropriate for regeneration in order to enhance the overall composite values of the study area.

Appropriate land uses are:

- regeneration for scientific or educational purposes;
- passive recreation;
- active recreation;
- facilities such as car-parking, toilet facilities, interpretive and management centres, ranger's residence; and
- carefully controlled low scale built development.

6.2.3 Development Issues

The structure plan process must take into account developments which will affect the future of the area. The previous chapter considered these issues and discussed the impacts on the study area.

While this study can make recommendations on the appropriateness of some proposed developments, such as the development of the Mt. Claremont Bushland, decisions on others, like the Western Suburbs Highway, will be made by other authorities. This study can only comment on the likely impacts and plan to minimise them.

The structure plan and later management sections directly address the following three development issues for which Perth City Council would be the proponent and major decisions are yet to be taken. These are:

- urban development of the Perth City Council endowment lands in the Mt. Claremont Bushland;
- the realignment of Rochdale Road;
- development options for degraded lands.

However, for the other three development issues the decisions are outside the jurisdiction of the City of Perth; consequently the structure plan can only be reactive.

These are:

- the realignment of the West Coast Highway;
- the proposed route of the Stephenson (West Coast) Highway; and
- the proposal to develop the Knightsbridge land.

Of these latter three developments, decisions on the future and routing of the Stephenson (West Coast) Highway will have the most far reaching impacts on the study area, and should be considered in the structure planning process. However, the uncertainty over its future and the significance of the impacts makes this difficult.

As a result of this, the structure plans presented in the next section cannot identify or plan for a new route. However, should a route proceed that requires a significant excision of land from Bold Park it is recommended that an equal or greater contiguous area be added to the Park so that it retains all the values which are attributed to its size. This may be achieved by adding the Knightsbridge site to the park or by realigning Rochdale Road and securing the future of the Mt. Claremont Bushland as an integral part of the park, or by doing both. This does not infer that addition of these areas to the Park should only occur if excision for a highway route is required, as significant conservation benefits would flow from their inclusion regardless.

6.3 STRUCTURE PLAN OPTIONS

Structure planning requires both professional and political judgements. The professional judgements identify and describe the values of the area, and this forms the basis of the preceding chapters of this report.

Political judgements are required to determine whether the economic benefit of developing those areas of moderate or low composite values outweigh their conservation values. For this reason a range of structure plan options have been prepared. These are described in the following sections and their benefits and costs outlined.

It should be noted that the plans include a number of elements which are interchangeable and consequently the final structure plan could be an amalgamation of the following options discussed below.

6.3.1 Conservation Option

The conservation option embraces and expands the concept of retaining and promoting Bold Park as a major natural area providing for educational, scientific and passive recreation uses. It is shown on Figure 6.1.

Additional development would be limited to park facilities such as entrance points. A significant rehabilitation effort would be required for degraded areas with the long term aim being to make the area a unique representation of the natural vegetation of the Swan Coastal Plain, preserved for the enjoyment and education of future generations.

Under this option the inclusion of the Knightsbridge land would be of significant benefit and in the longer term the addition of the Rifle Range may be appropriate.

No land sales or commercial development would occur and consequently there would be no direct return to the Endowment Lands Trust Fund under this option. Expenditure would be required to manage and rehabilitate the study area.

6.3.2 Strategic Development Option

This option, shown on Figure 6.2, takes advantage of the fact that some parts of the study area are of less value than others, and that controlled development of some of these would be unlikely to have significant impacts on the conservation values of the remainder of the area. Two development sites have been identified. The first comprises 1.4 hectares of land on the south side of Fortview Road which was considered in Section 5.5.2. The second is about 12 hectares of land adjacent to the WAWA reservoir on The Boulevard which was also discussed in that section.

This option would provide some return to Council's Endowment Land Trust Fund. It would reduce the size of the natural bushland by about 27 hectares, however, the areas are not of great significance. All areas with high values would be retained and managed as natural bushland. It is likely that some members of the community would not support this, seeing it as a step that may lead to incremental development of the park. This may be alleviated if the tenure of the remainder of the study area were secured in some form of reserve or park.

This option also provides for the development of a park management and interpretive centre on the site of the former drive-in. This concept developed as an extension of the nursery discussed in Section 5.7.1 and received considerable community support during the

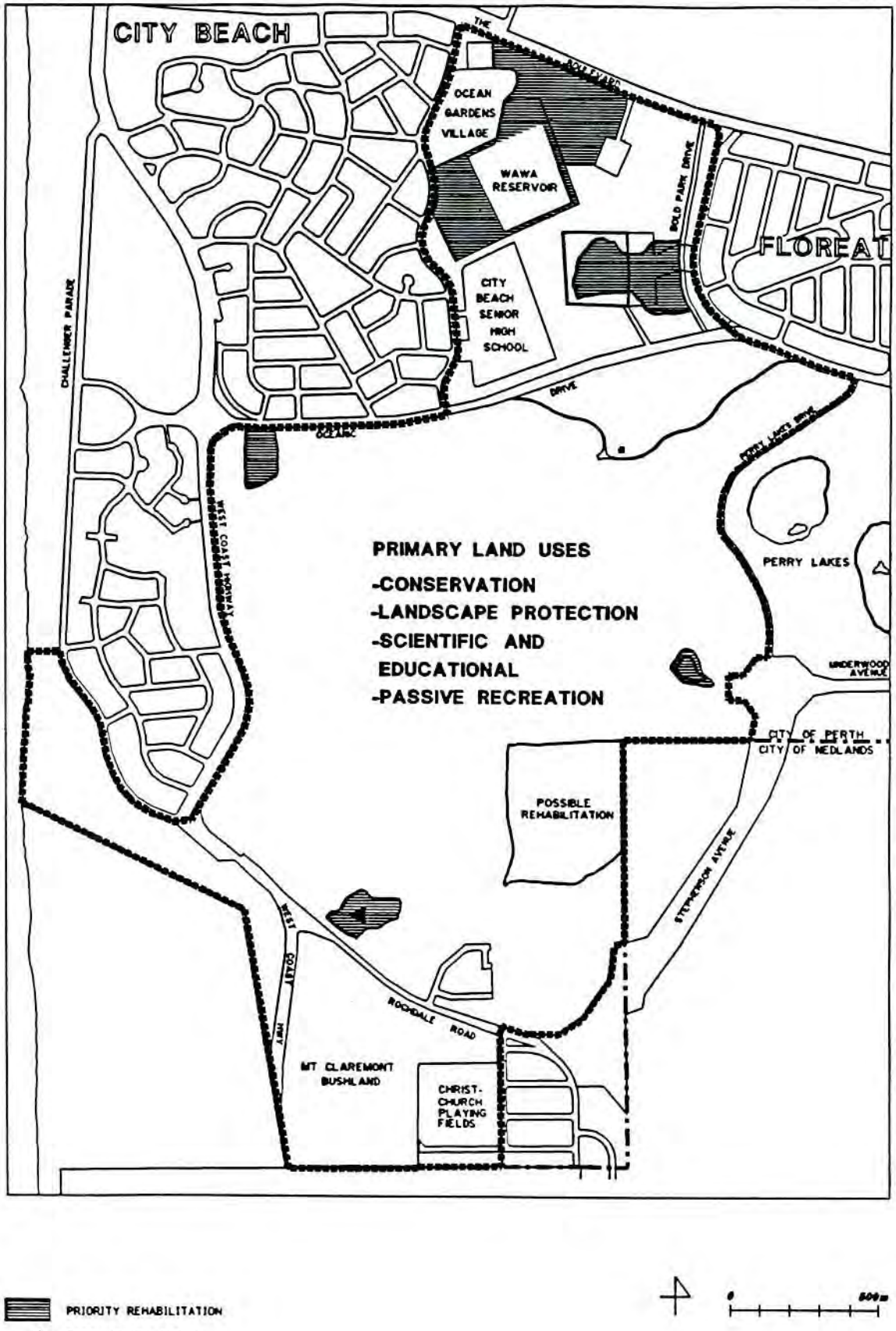


Figure 6.1 STRUCTURE PLAN OPTION 1 - CONSERVATION

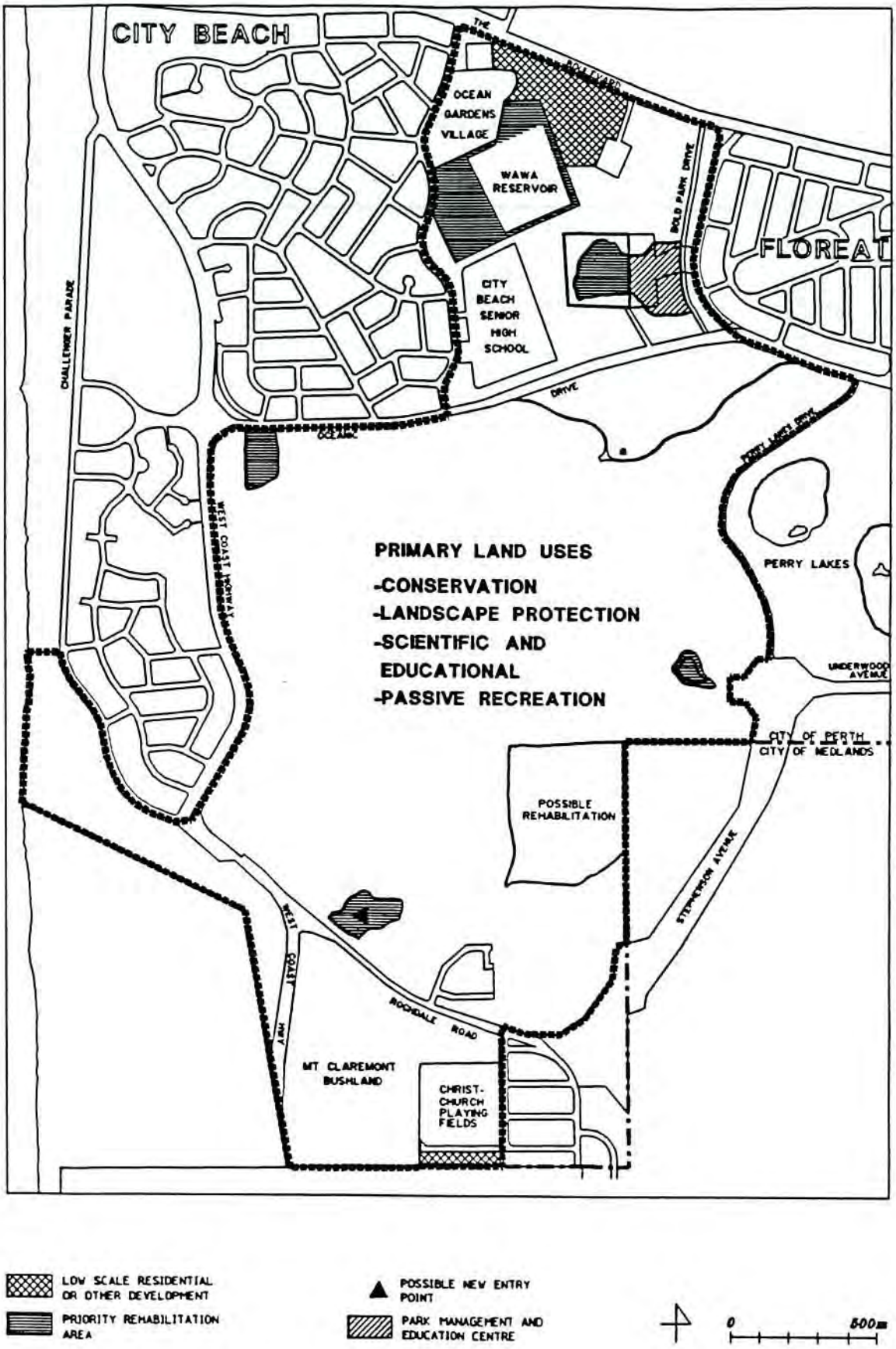


Figure 6.2 STRUCTURE PLAN OPTION 2 - STRATEGIC DEVELOPMENT

consultation program. It is envisaged that this centre would include a depot and nursery for plants used in revegetation. It would also include interpretive and educational facilities. Such a centre would not only serve local needs but also more regional ones. Community volunteers (eg. volunteer bush regenerators) and Council staff could use this centre for seed storage, propagating local plants, housing herbaria, park planning, fire management services, and as an education and recreation development and training centre. An example of this type of facility is located in North Fremantle and is known as Apace Aid (Inc.). The western half of the drive-in site would be revegetated and used as an example of techniques and results. The City Beach Senior High School has indicated an interest in specialising in environmental studies and some integration of the high school and the educational/management facility may be possible.

6.3.3 Rochdale Road Realignment Option

This option takes advantage of the concept of improving Rochdale Road to integrate the Mt. Claremont Bushland with the central part of Bold Park. It is shown on Figure 6.3.

It provides for development of approximately 6.5 hectares which would furnish a return to Council's Endowment Lands Trust Fund. At the same time it would allow most of the existing alignment of Rochdale Road to be removed and revegetated. This would allow the Mt. Claremont Bushland to be integrated with the central portion and would effectively increase the uninterrupted area of natural bushland. This option would involve the loss of natural bushland including some rated as having high composite value. It would also cut the current linkages that exist between the Mt. Claremont Bushland and the Cottesloe Golf Course. This option also provides for the management and education centre to be built at the former drive-in and for revegetation of a range of priority areas.

6.4 PREFERRED STRUCTURE PLAN

At the request of Council a preferred structure plan has been identified. It indicates the views of the study team as to the most appropriate long term land uses. It was identified after all structure plan options were discussed with Council staff and the Community Advisory Group and were put on public exhibition for a period of a week. Details of these community consultation events are contained in Chapter 8 of this report.

The preferred structure plan is based on the premise that the majority of the study area provides ecological landscape and recreation values that are worthy of conservation.

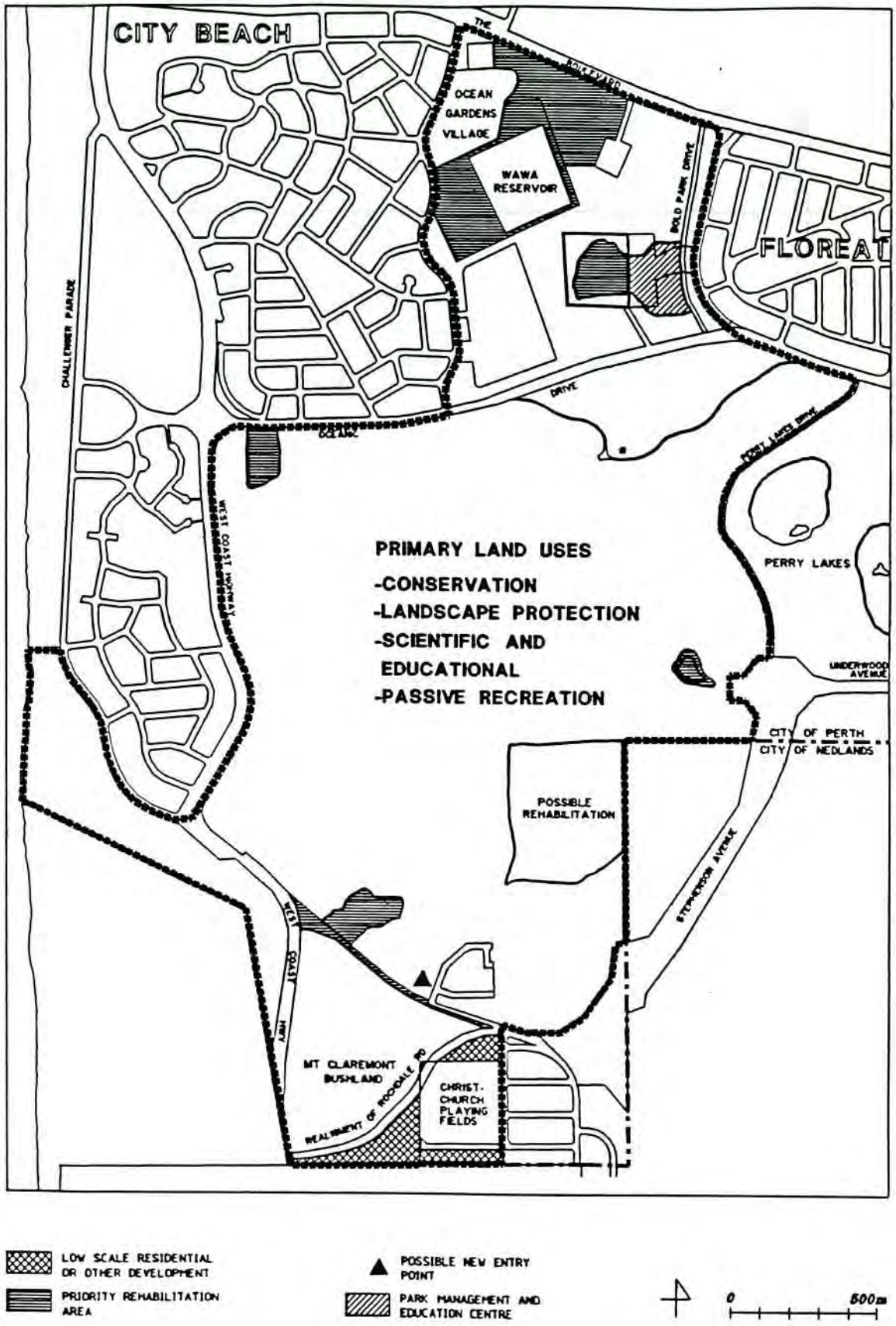


Figure 6.3 STRUCTURE PLAN OPTION 3
- ROCHDALE ROAD REALIGNMENT

Consequently development is only recommended for locations where it will not compromise those values.

The preferred structure plan is shown on Figure 6.4. It is similar to Structure Plan Option 2 - Strategic Development, and provides the following key elements:

- preservation of most of the study area for conservation and recreation purposes;
- rehabilitation of important degraded areas;
- residential development of 1.4 hectares on the south side of Fortview Road;
- development of one part of the northern area for active recreational purposes; and
- development of part of the drive-in for a park management and education centre.

Residential development is recommended for the land south of Fortview Road because it would neither cause the loss of any high quality flora, nor would it sever linkages with adjoining parklands. Development of this isolated area is not likely to have significant impacts on adjoining bushland.

The northern area is recommended for development for recreational purposes because of the suitability of the topography, the degraded nature of the environment and its location adjacent to facilities such as the swimming pool and car-park. Rehabilitation of this area would be difficult because of the proximity of urban uses such as the scout hall, bowling club and retirement village.

The preferred structure plan provides for the preservation of a unique area of natural bushland within the suburbs of Perth. It would allow the outstanding conservation and recreation values of the area to be preserved and promoted as a key attraction of the region and provide for a small economic return for the City of Perth.

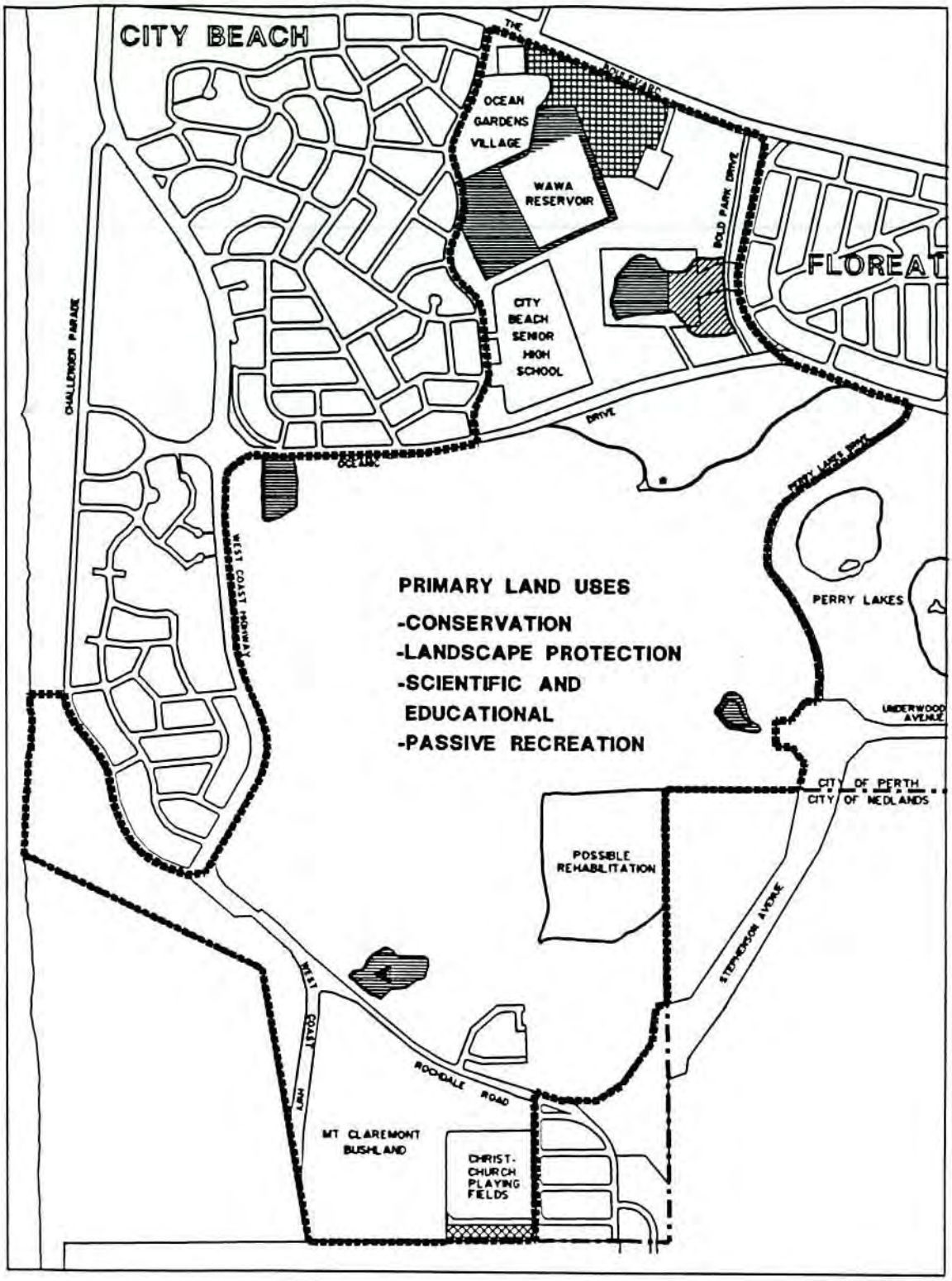


Figure 6.4 PREFERRED STRUCTURE PLAN

Chapter 7

MANAGEMENT

This chapter discusses the range of management options available for the study area.

7.1 MANAGEMENT OPTIONS

Four options have been considered for the on-going management of the study area. These are:

- continued management by Perth City Council;
- management as a Regional Park;
- management on the Kings Park model; and
- management as a Crown land reserve.

Each is described fully in the following sections.

7.1.1 Perth City Council

The City of Perth Endowment Lands Act (1920) granted part of the study area to the Perth City Council, giving it the full powers of a landowner. The remainder was purchased by the Council. As a consequence of this, the Bold Park area is managed by Perth City Council through its Department of Parks, Gardens and Landscape in accordance with the development and management policy for Bold Park (Perth City Council, 1978).

The ownership of the study area sets it apart from most other parks and reserves in the metropolitan area. They are generally Crown land reserves vested in a State or local government authority for management.

The management options generally available to the Council include the following:

- continuation of the present situation with Council funding and Parks, Gardens and Landscape administration; and

- administration through a Park Management Committee specifically set up by Council to enhance public input into management decisions and planning.

Currently, as indicated above, the Council's Parks, Gardens and Landscape Department has responsibility for the day to day development, management and regulation of the Park. Management guidelines are generally derived from the permissible uses under the planning schemes and Council policy, as outlined in Section 4.7.2.

The second option outlined above would involve establishing a Park Management Committee comprising Council and community representatives and possibly expert representatives from the Department of Conservation and Land Management (CALM), DPUD or some other body. The Committee would advise Council on planning and management policy, while the Parks, Gardens and Landscape Department would remain active in the day-to-day administration of the Park.

The chief advantage of this option for the Council is that it, as landowner, would retain ultimate control. A disadvantage is the Council may not have the resources necessary to manage a large and important area of urban bushland and that any increase in the level of on-going management would remain a financial burden to the Council.

7.1.2 Regional Park

One of the future management options suggested for the study area is as a Regional Park. This option was first identified in the System 6 recommendations for the study area "That our general recommendations on planning and management of Regional Parks be applied to this area" (Department of Conservation and Environment, 1983).

Regional Parks were initially defined in the 1981 by the System 6 Green Book (Department of Conservation and Environment) as:

> "large accessible areas of open space for fairly intensive outdoor recreation. They have three basic functions: to provide for recreation, conservation of the natural environment, and conservation of attractive man-modified landscapes. A wide range of recreation activities, of greater variety and intensity than in National Parks, is appropriate to regional parks. The natural features of regional parks help determine which activities are suitable, but these features can also be important on their own account. Regional Parks may consist entirely or partly of attractive man-modified rural landscapes or involve other land uses, providing these have recreational potential." (Department of Conservation and Environment, 1981).

In 1983 the System 6 Red Book (Department of Conservation and Environment) was more specific about land tenure in its definition of Regional Parks. This report considered Regional Parks in terms of the concept of Regional Open Space that was first introduced to Western Australia by Stephenson and Hepburn in 1955 for the protection of open space of regional significance. The Red Book considered that: "open space of regional significance should consist of a great deal more than land formally set aside for the purpose. In a functional sense it can include land in a wide range of tenure and condition. Vacant Crown land, State Forest, Land Act Reserves with various purposes, and freehold land, whether privately or publicly owned may all contribute. It may be managed for the retention of the natural vegetation, or developed as "green belts" or as parks for recreation."

According to the Red Book this concept clearly involves public as well as private land. Furthermore " there is, of course, a definitional problem of when open space is regional in character, as distinct from a local amenity. If regional, in the sense of attracting users from beyond the locality, then there is a case for external funding, whether through direct government grant or by some form of regional rating system. Whatever the means of funding adopted, there are administrative advantages in the clear recognition of the areas to which they are appropriate and applicable."

The Red Book recommended that "areas identified through planning procedures as open space of regional significance should, where appropriate, be designated as Regional Parks."

The most recent planning strategy for the Perth Metropolitan Region - Metroplan (DPUD, 1990) states "a system of Regional Parks will be developed based upon additions to the existing Parks and Recreation Reservations in the Metropolitan Region Scheme." According to Metroplan, Regional Parks" will be sufficiently large to permit both conservation of natural landscapes and a variety of recreational pursuits. Areas within parks may be developed for intensive recreation and open space uses or for conservation and passive uses. The decision will depend on the characteristics of the land. It will be necessary to ensure there is careful allocation of areas for particular recreational activities, and access is arranged in a way that ensures essential landscape and environmental qualities are retained."

Metroplan has identified fourteen Regional Parks. These are:

- Kings Park;
- Rottnest Island;
- Whiteman Park;
- Herdsman Lake;
- Canning River Regional Park;

- Darling Range Regional Park;
- Gnangara Regional Park;
- Yellagonga Regional Park;
- Rockingham Lakes Regional Park;
- Jandakot Botanic Park;
- Beeliar Regional Park;
- Serpentine Regional Park;
- Woodman Point Regional Park; and
- Port Kennedy Regional Park.

According to Metroplan further Regional Parks may be added following detailed examination of lands shown in the Regional Open Space Concept Plan (p. 83, DPUD 1990), this includes those parts of the study area reserved under the MRS as Parks and Recreation.

In 1989 the State Government set up the Regional Parks Task Force to examine the funding and resourcing of Regional Parks. The report from the Task Force has been considered by Cabinet and it is understood to include issues such as the following:

- identifying the role of a central co-ordinating authority in establishing Regional Parks. This authority is likely to be within CALM; and

- allocating funding for the management of Regional Parks.

In order to establish the study area as a Regional Park it would require:

- a proposal being forwarded to the co-ordinating authority for Regional Parks for their consideration and acceptance;

- eventual reservation of all land under the MRS as Parks and Recreation, creation of a managing agency or board; and

- an agreement being signed between the City of Perth, other land holders and the co-ordinating authority providing for on-going management of the study area as a Regional Park.

Establishing the study area as a Regional Park would recognise the regional role that it currently plays and would give some additional security of purpose. It may also provide for Government funding to assist with management. However, it would also mean that Council would have to manage the area in co-operation with the co-ordinating authority and therefore may lose some degree of control.

7.1.3 Kings Park Model

Kings Park is an A class reserve (Reserve A1720) which was originally established under the Parks and Reserves Act in 1895 by the then Premier Lord Forrest. It continues to operate under the same Act today.

The Kings Park Board is responsible for the overall control and management of Kings Park. The Board members are selected by Cabinet and appointed by the Governor for a fixed term of three years. The Board was proclaimed a body corporate on 24 July 1956 and currently falls in the portfolio of the Minister of Environment.

Kings Parks has a staff of approximately 88 people including nine professional staff, four clerical staff with the balance involved with maintenance and management of the gardens and bushland.

The Board is dependent on the Consolidated Revenue Fund for financing the majority of its operations, however, additional funding comes in the form of:

- donations to the Botanic Garden and associated activities, donations over $2.00 being tax deductible;
- the sale of various publications; and
- Research Trust Fund - funded by grants received for specific Research Projects.

During the 1990/91 financial year the Kings Park Board operated on a budget of $3.7 million.

Community involvement in Kings Park is in the form of the Kings Park Guides who conduct tours of the Park and staff the information desk. There are no community representatives on the Board.

The development of a similar structure for the Bold Park and Environs would require that the land revert to Crown land so that a similar structure to that operating at Kings Park could be established under the Parks and Reserve Act (1895). It would sever all ties between the City of Perth and the study area and would require State Government funding for management.

7.1.4 Crown Land Reserve

The option of managing Bold Park as a Crown land reserve is constrained by the requirement that any land classified as a reserve under the Land Act of 1933 must be Crown land, and this is not currently the case with Bold Park.

In order for Bold Park to become an A, B or C Class reserve, it would have to become Crown land through the transfer of land tenure from Perth City Council to the Department of Land Administration. This would be a major step for the Council, who would essentially be giving the area away, and one which would have to offer significant public interest advantages.

The main attraction of Bold Park becoming an A Class reserve would be the security of tenure conferred by this reserve category. Class A reserves are protected by an Act of Parliament which defines the reserve boundaries, vesting and purpose. Any changes to these parameters must pass through both houses of Parliament. Class B and C reserves do not offer the security of tenure conferred on Class A reserves making them a less attractive basis for long-term management approaches.

Crown land reserves are usually vested in a management body, often a Council or government department. Local parks are usually reserved for Recreation and vested in the relevant Council. If this were to occur with the study area the Council would lose ownership but retain management. Land reserved solely for the Conservation of Flora and Fauna is normally vested in CALM.

Together with changes to management, funding sources may also change. State Government funding from the Consolidated Revenue Fund enables CALM to manage its conservation estate. However, if the area were vested in Perth City Council it is likely that the Council would retain responsibility for funding management. This would not appear to provide any benefits to the Council.

7.2 PREFERRED MANAGEMENT OPTION

A preferred management option for the study area has been developed from the preceding options. In order to determine the preferred option a number of objectives were established for the management of the study area. The objectives are as follows:

- to achieve a security of purpose and tenure for the study area;

- to retain ownership of the land in the City of Perth because of the heritage links with the endowment lands;

- to provide access to additional resources to assist in management; and

- to provide an opportunity for community involvement in management of the study area.

Each of the preceding management options was considered against these objectives.

Ongoing management by the City of Perth would rely on a security of purpose provided by the town planning scheme and MRS. While this would be regarded as a reasonable level of security, it does not provide the same degree of security as an A Class reserve. This management option would however provide the benefit of retaining the links between the City of Perth and the land but access to outside expertise and funding would only be on a casual or ad hoc basis. There would be little opportunity for outside funding apart from government grant programs. The Council could choose to involve the community in management of the park as has occurred in a number of other local government areas. Consequently, management by Perth City Council could achieve the second and fourth objectives and the first and third objectives in part.

Management under the same system that applies to Kings Park would not meet all of the objectives. While it would provide security of tenure and opportunities for community involvement in management, it would cut all links between the City of Perth and the land by providing an independent management organisation. Similarly, having the study area reserved under the Land Act would also require the City of Perth to forfeit or sell the study area. It could however retain some management of the area through a vesting. Again, this would not provide any direct access to outside expertise or funding.

The preferred option is to adopt the Regional Park model and to propose Bold Park be designated as a Regional Park. This designation would give security of purpose to the area both through the planning system and through the fact that the area is identified as a Regional Park and therefore has significant conservation and recreation values. The Regional Park model would also allow City of Perth to retain ownership of the land and through a joint management agreement would provide access to outside expertise. After the preparation of management plans it may also provide access to outside government funds. Regional Parks also provide the opportunities for community involvement in management through advisory boards and other similar organisations.

Consequently, the preferred option for the study area would see the City of Perth nominating the study area as a Regional Park. It would agree to sign a joint management agreement with the co-ordinating authority for regional parks but would retain ownership.

This would provide a benefit to the City of Perth in that the area would be preserved and assistance would be available for management activities. For the government this would allow for the creation of a new and valuable Regional Park in the metropolitan area at little or no additional cost.

7.3 PARK BOUNDARIES

The boundaries of the proposed Regional Park should reflect the areas of conservation, recreation and landscape value and can include land under a variety of tenures. Consequently, it is considered that a number of parts of the study area should be excluded. These include the retirement village and the Christchurch Grammar playing fields neither of which provide values which should be preserved through the Regional Park mechanism. They should however be managed in sympathy with regional park values.

It is considered that all other parts of the study area can and should be managed as part of a Regional Park. This includes the Water Authority reservoir in the northern part of the study area. The reservoir constitutes a reasonably large parcel of land and is currently degraded. Inclusion of the area in a Regional Park and management in sympathy with Regional Park values would provide for the upgrading of this area thus ensuring an area with significant values. It is also considered that the site of the City Beach High School should be included within the Regional Park. It includes within its boundaries areas of significant vegetation. This also would support the concept of City Beach Senior High School adopting an environmental speciality. Wollaston College would be located centrally within the Regional Park and should be managed in accordance with Regional Park values.

It is also considered that the boundaries of the study area should be altered to reflect current planning for the area. For example, the reserve which was formally required for a major intersection at the junction of Underwood Avenue and Stephenson Avenue should be changed to reflect the fact that intersection is not longer required. A map showing the proposed boundaries of the Regional Park is included at Figure 7.1.

Consequently, additional land could be added to the study area in that location. Consideration could also be given to narrowing the road reserve on Stephenson Avenue.

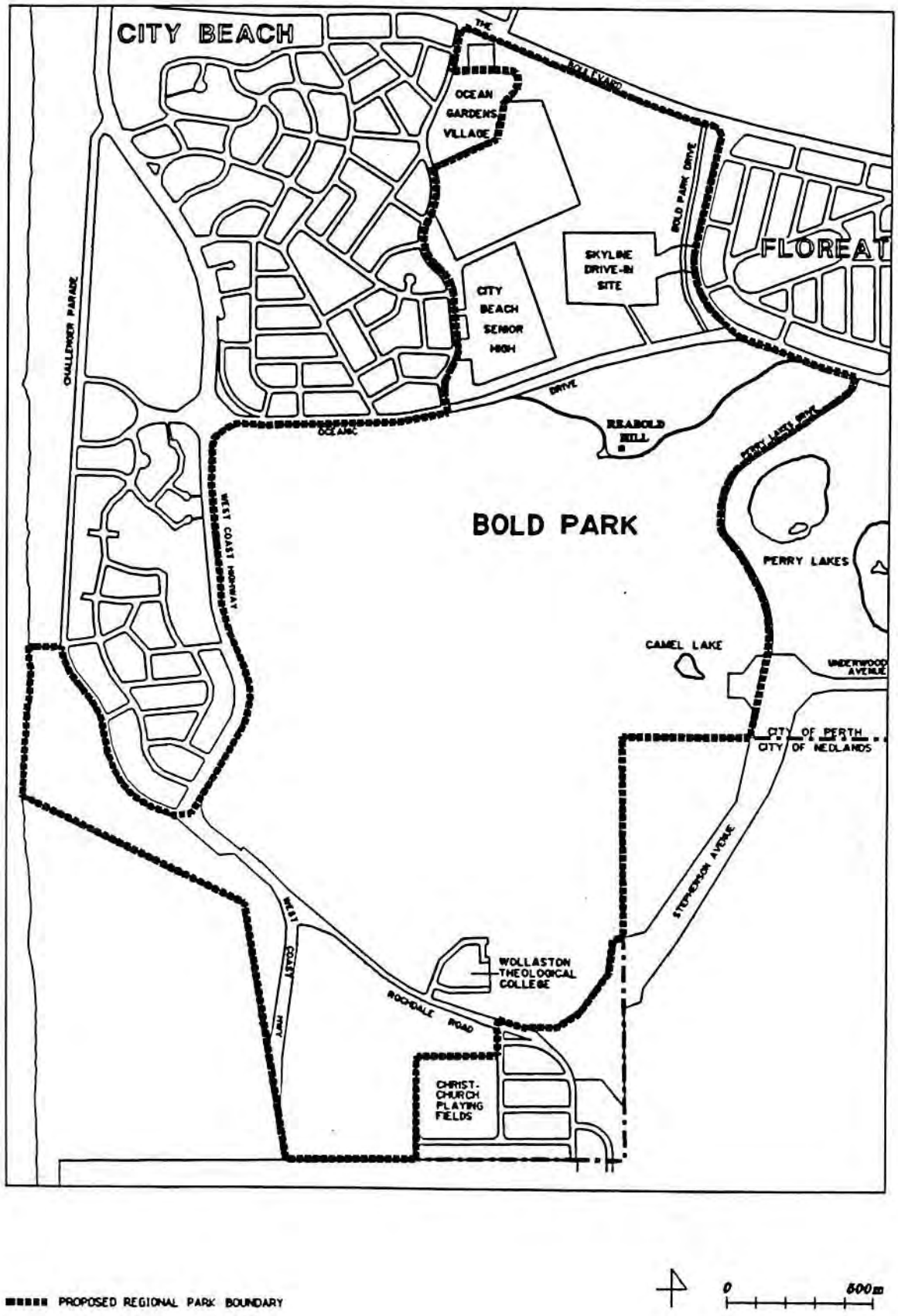


Figure 7.1 PROPOSED REGIONAL PARK BOUNDARIES

While it is outside the study area, and therefore the scope of this report, it would clearly be a benefit to the study area if the Knightsbridge land (Lot 1 Stephenson Avenue) were included within the park boundaries, and the whole area was managed by a single authority.

Otherwise the natural and semi-natural areas adjoining the study area including Knightsbridge, Perry Lakes, Wembley Golf Course and Cottesloe Golf Course should be managed in a manner that recognises their important role as ecological links. It may even be appropriate to include some of these areas into an expanded Regional Park. It has been suggested that a Regional Park at Bold Park could form a part of a larger western suburbs Regional Park stretching from Herdsman Lake through to Lake Claremont and incorporating a number of large tracts of open space and natural bushland in between.

7.4 MANAGEMENT ORGANISATION

7.4.1 Management Structure

Many of the issues related to management arrangements for Regional Parks have been documented in the recent report on the establishment of the Beeliar Regional Park (DPUD 1992). The proposed management structure for that park will be determined through a Joint Management Agreement between the local authorities and the Department of Conservation and Land Management. According to DPUD (1992) the Joint Management Agreement should cover overall policy management arrangements and funding. With respect to the Beeliar Regional Park CALM is proposed as the co-ordinating agency because of the high proportion of conservation lands. Following the formulation of the agreement CALM's initial task would be to convene a Beeliar Regional Park Advisory Committee and co-ordinate the preparation of an overall management plan. The Advisory Committee's role would be to:

- provide advice and recommendations to the Department of Conservation and Land Management on management issues and management programs for the park;
- assist in the preparation of the management plan; and
- report to the Department of Conservation and Land Management on the proposed development programs within or adjacent to the Regional Park.

The Advisory Committee would be made up of representatives from CALM, local authorities, private landowners and community representatives.

The ongoing management would be carried out by the co-ordinating agency whose role is to:

- administer a public advisory system;
- co-ordinate and approve management programs for the park;
- prepare and review joint management plans;
- approve funding allocations;
- manage the park's conservation lands according to existing and future land classification systems provided for in the Conservation and Land Management Act; and
- prescribe environmental criteria for the protection of all lands in the Beeliar Regional Park.

This example identifies two levels of management. The first is the Advisory Committee and the second, the co-ordinating agency. The Advisory Committee reports to the co-ordinating agency and the co-ordinating agency is responsible for overall management. While the term co-ordinating agency is a general one and refers to CALM it will be replaced by a more specific agency within CALM which will be created under the CALM Act (D. Haswell, pers. comm. 1992).

The management structure outlined above is one where the land is essentially crown land, with mixed vestings such as various local authorities, CALM and DPUD. The study area however, has one major owner, the City of Perth, and a number of managing agencies with smaller areas including WAWA and City Beach Senior High School. Therefore a different management structure is proposed. A Management Board should be established for the study area which could consist of:

- Council representatives;
- CALM;
- other landholders such as WAWA and the High School; and
- representatives from interested community groups, eg. conservation and recreation groups.

The Board should be chaired by the City of Perth. The role of the Board would be similar to that advocated for the Advisory Committee in the Beeliar example.

7.4.2 Management Plans

The preparation and implementation of management plans for the study area is vital to ensure that its conservation, landscape and recreational values are maintained and enhanced.

The content of management plans vary according to the land, its management problems and community concerns. However a management plan should include the elements outlined below:

i. Management Objectives

These can be broad, such as:

- ❑ maintaining the integrity of the bushland environment; and
- ❑ rationalising recreation resources for the public;

or more specific, such as:

- ❑ determining the appropriate fire control techniques; and
- ❑ rationalise paths and tracks within the reserve.

Objectives will need to be determined by the managing board in consultation with the co-ordinating agency, community interest groups and expert advice.

ii. Resource information

This section of the management plan would provide as a basis for management strategies a resource inventory of the area. It should also consider existing conflicts and stresses, and projected demands, conflicts and stresses. The resource information should cover the environmental characteristics below:

- ❑ The physical environment:
  - geology;
  - geomorphology;
  - soils;

- climate; and
- landscape values and assessment.

- The biological environment:

  - flora and vegetation - native and exotic, rare and endangered, geographically restricted and regional significant species, species richness;

  - fauna - rare and endangered, distribution and diversity, feral animals;

  - disease status (dieback disease); and

  - bushland condition (an assessment of the relative condition of the various areas of bushland).

- The cultural environment:

  - land use and tenure;
  - zoning;
  - level and type of public use;
  - Aboriginal history;
  - European history; and
  - educational values.

iii. Management Strategies or Actions

This section would consider strategies for management issues such as:

- fire control;
- weed control;
- disease control;
- disturbance factors and levels such as paths, rubbish dumping;
- ecological restoration (bush regeneration, habitat reconstruction);
- public enjoyment and interpretation, such as signage, seating, educational use;
- public involvement in the management program; and
- monitoring programs - essential for feedback on successes of management strategies.

iv. Concept Plan

A concept plan would be prepared showing conservation areas, recreation zones, paths, fire control access points, interpretive centres and areas to be rehabilitated.

This is a useful format for schematically illustrating management objectives and strategies.

v. Summary and Recommendations

The summary provides an overview of the management plan, its objectives, management strategies and community involvement.

Recommendations are essential for consolidating the intent of the management plan and provide a focus for the implementation phase of the plan. Coupled with the concept plan the summary and recommendations provide an important overview of the plan.

vi. Implementation Program

Part of the management plan would chart the various stages for implementing the plan. These may be considered under the following categories: strategy, responsibility, costing, priority and frequency.

Community involvement in the implementation phase is important in determining the success of the plan. This may be in the form of bush regeneration programs (weed control, seed collection, revegetation), education programs, advice and expertise, monitoring programs and interpretation, for example park guides.

On completion, the draft management plan it should be made available for public comment for a period of two to three months.

Comments received would be considered and incorporated into the plan where appropriate. The final plan would be adopted by the co-ordinating and the managing authority and then be made available to the public.

Management plans can become out-of-date, so it is necessary that they have a limited term of application, for example 5 to 10 years. During the final year of the plan a review process would be initiated.

7.4.3 Funding

In order to maintain the long term viability and ecological integrity of the study area adequate funding will be required. In the first instance, funds will be needed to develop the management plan. Following its adoption, funding will be required for its implementation, including provision for fire and weed control programs, bush regeneration programs, interpretive and educational signage, park equipment, landscape works and others as required.

Many local authorities in Sydney place a high priority on managing their bushland areas and Ku-ring-Gai Municipal Council is one example. The municipality has 1,100 hectares of bushland under its care and control. Planning and management of the bushland is undertaken by the Parks and Landscape Division within the Engineering and Parks Department. In 1991 a budget of $1.29 million was allocated for bushland management and interpretative services. This is undertaken by a multi-disciplinary team consisting of five technical staff and twenty three field staff (including trained and experienced bush regenerators). Contract bush regeneration firms are also employed to manage the bushland. Activities include:

- fire management;
- bush regeneration;
- environmental engineering;
- land rehabilitation;
- landscape construction;
- park and recreation planning;
- community volunteer co-ordination; and
- environmental education and interpretation.

Ku-ring-Gai Municipal Council also co-ordinates about 300 volunteers who actively participate in bushland management (Bennett 1992, Bennett, pers. comm. 1991).

There are examples of Western Australian local governments moving in this direction (City of Gosnells, City of Fremantle). Local governments have an important role in bushland management and their appropriate use of resources to meet management commitments is critical (Minister of Environment, Victoria 1991). Potential funding sources for the study area if it were to be designated a Regional Park include:

- Endowment Lands Trust Fund;

- CALM - via the co-ordinating agency for Regional Parks;

- Sponsorship - such as research grants from government and the private sector;
- Recreation Grants;
- Lotteries Commission (Gordon Reid Foundation);
- State and Federal Government grants for the environment - these currently include the Australian National Parks and Wildlife Service Save the Bush program, Landcare and Environment Action Program (LEAP), WA Conservation Corps and WA Advantage Environment Grants; and
- Greening Western Australia.

7.5 KEY MANAGEMENT ISSUES

Weed and fire management are key issues requiring urgent consideration.

7.5.1 Weed Control

A weed is generally defined as a plant which is growing where it is not wanted and this may be in a garden, lawn, crop or bushland. Weeds are often described as introduced, exotic, alien or naturalised plants. When weeds invade an area they:

- compete with native species;
- repress the juvenile plants of the canopy species;
- change the natural fire regime because of their different flammabilities and responses to fire;
- enrich the soil by adding nutrients; and
- change the food sources and habitats available to wildlife, and so alter the wildlife populations.

Much of the exotic flora found in the study area originated mainly from Mediterranean Europe and South Africa. While their introduction has been either accidental or deliberate

their spread has been greatly assisted by an increase in the frequency of fire and disturbance to the soil.

The majority of weeds invade bushland due to the dumping of garden refuse. Many weeds find their way into bush by human induced disturbance (along tracks, picnic areas, drains, lawns), or attached to machinery, people and livestock (Dixon & Keighery, 1992).

The level of weed invasion varies within the study area and generally shows the following patterns:

- areas with high weed levels including highly disturbed areas such as bordering roads (cuttings, for example), tracks, paths, bridle trails, the former Skyline Drive-in site, WAWA reservoir surrounds and the pine plantation;

- areas with moderate weed levels including the Eucalypt woodlands and some of the Banksia woodlands and Acacia shrublands; and

- areas with low weed levels including dune and limestone heathlands.

Weeds can also be categorised as being "Major", "Nuisance" or "Minor" which assists in determining management priorities. In the study area these are:

- Major - the most serious weeds in the vegetation, often difficult to control with high invasion rates, for example, veldtgrass *(Ehrarhta calycina)*, Geraldton Carnation Weed *(Euphorbia peplus)*, Rose Pelagonium *(Pelagonium capitatum)*, Bridal Creeper *(Myrsiphyllum asparagoides)*, Guildford Grass *(Romulea rosea)*.

- Nuisance - generally weeds which pose a threat to the vegetation but are not classified in the above category such as Bearded Oats *(Avena barbata)*, Wild Gladiolus *(Gladiolus caryophyllaceus)*.

- Minor - weeds which tend to have little known effect, are generally less competitive and are not yet serious, for example *Briza maxima*, *Briza minor*, climbing fumitory.

Weeds can be controlled in a number of ways. However weed control should not be considered as an isolated strategy but be used as part of the integrated process of bush regeneration which includes revegetation, erosion control and fire management. Methods of weed control are outlined below:

i. Herbicide Treatment

This is one of the most common methods of weed control and is very effective when applied skilfully. When using chemical methods of control it is important to observe all safety precautions. Users should be trained in methods of applying herbicides to avoid personal injury and injury to the general public. Herbicides can be applied in a number of ways these include:

- mist spray;
- via an applicator, either wick, brush, sponges; and
- stem injection and frilling (good for tree or shrub weeds such as castor oil).

The optimum time to apply herbicides is during the active stages of growth. For grass weeds this is before flowering time and for bulbous species just after flowering but before seed set. Two of the most effective herbicides for controlling weeds within the study area are:

- *Glyphosate* (Roundup^{R}) - a systemic non-selective herbicide. Useful for controlling most weeds especially bulbous species. This herbicide should not be sprayed in areas containing native species as it will also kill them; and

- *Flurazofop* (Fusilade^{R}) - a selective herbicide effective on most grass weeds such as wild oats. This herbicide does not affect non-grass natives species. A dye should be added to the herbicide to mark areas sprayed.

ii. Hand weeding

The Bradley method, developed by the Bradley sisters in NSW, is the best method of hand weeding. This involves observing three basic principles:

- start from the least weed infested area and work to the most infested, usually from the core outwards;

- minimise soil disturbance when removing weeds; and

- only remove weeds at a rate at which the native plants grow and can colonise an area, that is do not over weed an area, which creates large bare soil patches, as these will only be recolonised by weed species.

iii. Competition

Revegetation of a disturbed area with native species results in shading and direct competition for water and nutrients and can effectively reduce the weed biomass.

iv. Weed Control Policy

The recommended approach to weed control for the study area is based on an integrated approach involving minimising disturbance, chemical and mechanical control of weeds, training of community volunteers in bush regeneration techniques, revegetation (including direct seeding) and monitoring the effectiveness of the weed control program.

v. Weed Control Plan

A weed control plan should be developed by the managers of the study area and consider the following aspects.

a. Bushland Condition Assessment

The bushland which has already been broadly defined in Figure 2.2 could be mapped according to its level of weed invasion. For example, it could be colour coded using the following criteria:

- Green - good areas, low weed invasion, areas containing more than 70% natives;
- Blue - fair areas, medium weed invasion, areas containing 50-70% natives;
- Orange - poor areas, high weed invasion, areas containing 25-50% natives; and
- Red - very poor, very high weed invasion, areas containing 0-25% natives.

This technique would assist in determining priority areas for weed control and methods for effective weeding and regeneration.

b. Weed Species List

A species list of all weeds found in the study area should be developed and the weed categorised according to their status as either 'Major', 'Nuisance' or 'Minor' as mentioned previously. A list of techniques for the control of each weed species should be developed and trials conducted to test their effectiveness.

c. Volunteer Training

Community volunteers interested in assisting in weed control should be supported through training programs in bush regeneration. A course of this nature currently exists at Apace Aid (Inc) in North Fremantle.

d. Monitoring Programs

The control of one weed species may lead to its replacement by another. In order to evaluate the effectiveness of various control techniques monitoring programs should be established at various sites.

e. Minimising Disturbance

The plan should consider the type and level of disturbance in the study area which is assisting weed invasion, such as rubbish dumping, horses, excess tracks. A plan to minimise the level of disturbance should be developed.

f. Combined Approach

In certain highly degraded areas weed control should be carried out in conjunction with revegetation programs using endemic species. This may involve direct seeding using weed suppression agents such as mulch. Each area will need to be assessed on its merits and a program developed accordingly. The success of each program will depend on the level of follow-up weeding and replanting programs.

7.5.2 Fire Control

i. Introduction

Although fire is a natural part of the ecology of the study area, the current conditions are very different from the 'natural' situation.

This is due to a number of interrelated changes to the natural environment, the most important of which are:

- the isolated nature of the study area within a largely urban context;
- the greatly increased incidence of fire ignition due to human factors; and

- the altered natural environment particularly the degree of weed invasion which has led to high fuel loads.

These factors have contributed to an increasing number of fires within various parts of the study area over recent years. Records show that major fires occurred in 1983, 1985 and most recently in 1991.

The study area is currently divided by existing roads into three distinct regions, each with their own characteristic land uses, fire history and fire control policies and practises. These three areas are:

- Mt. Claremont Bush, southern section of study area;
- "Bold Park" central section of study area; and
- Northern section between Oceanic Drive and The Boulevard.

The current fire control program involves the construction and maintenance of cultivated fire breaks and access routes, as well as some slashing and weed control. A system of parallel pathways exist which divide the Bold Park area into at least nine smaller areas, which can be potentially separated by low fuel buffer zones. At present there is no prescribed burning program for the study area. As a preventative measure, City of Perth rangers patrol the area during the summer fire season.

Before any general fire control strategy can be formulated for the study area it is necessary to determine policies to guide fire control decisions. Fire control policy conventionally involves three levels of protection.

These are:

- protection of human life;

- protection of property including housing, public buildings and park infrastructure (such as fences, signs); and

- protection of biological values and ecological functions.

The study area supports high levels of recreational use. During periods when high recreational use coincide with very high or extreme fire danger conditions the safety of people in the study area is a serious concern. The protection of property is a priority where buildings are in close proximity to natural vegetation. Wollaston College, the Quarry Amphitheatre, City Beach Senior High School and the Bold Park Pool are buildings which

could be endangered in the event of a wildfire (uncontrolled fire). Properties adjoining the study area could be in danger in the event of a major fire. These factors need to be considered when developing a fire control program.

Protection of the conservation values of the study area is an important consideration in fire control planning. Fire frequency and intensity has a direct bearing on the health of the bushland. Too frequent fires promote weed growth and destroy fire intolerant species. Alternatively, certain species require fire in order to successfully regenerate. The optimum scenario for the protection of biological values within the study area is a mosaic of areas of different fire age, spread over all vegetation types. This situation should enable all habitats to have a variety of fire ages ranging from recently burnt through to 40 - 50 years unburnt. The presence of significant flora within the study area necessitates the detailed planning of any fire control program to protect these species and accommodate their individual biological needs.

Fire control can be achieved by both ignition reduction and fuel reduction. Ignition reduction involves removing or reducing the causes of bush fires within the study area. The greatest cause of fires in urban bushland is arson. A review of bushfire records from Kings Park for the period 1944 to 1983 found that 42% of all bushfires were deliberately lit (Wycherley 1983). Unfortunately, arson is difficult to police and offenders are rarely caught. A community education program highlighting the destructive nature of bushfires may help to reduce the incidence of arson. A coordinated 'Park Watch' program through which local people can act as voluntary rangers can be of great assistance in alerting fire control bodies to fires. The other main causes of bushfires are escapes from burning rubbish, barbecues and picnic fires, children playing with matches, powerlines and the operation of plant and machinery. Lightning strikes are the only 'natural' cause of bushfires and are very rare within the study area.

Fuel reduction involves reducing fuel levels to a point where any potential fires can be controlled by fire fighting crews on a normal summer day (Robley 1984). Depending on the vegetation of the area in question Robley relates this to a prescribed burning rotation of once every 5 to 7 years. Fuel reduction burns are designed so that a mosaic of fuel loadings is maintained and that at any one time no more than 20 % of any given fire control area supports the maximum fuel loads (Robley 1984). Prescribed burning has been the main fuel reduction practice of fire control agencies within WA for the past 40 years.

The principal method of fuel reduction currently practised within the study area is the construction of fuel free zones or fire breaks. These are a legal requirement of landowners within the City of Perth and are constructed through cultivation or mowing of a 3 - 4 metre wide strip. The numerous walking paths and tracks within the central part of the study area (Bold Park) perform a dual role as firebreaks and access routes for fire control vehicles.

The weed control approach is based on the fact that dry annual grass weeds contribute significantly to fuel loads and easily ignite. The principal weed contributing to the fuel load is annual veldt grass *Ehrharta calycina*. Trials involving the chemical control of veldt grass and other annual weeds in Kings Park have found that the control of veldt grass throughout much of the bushland by spraying with Fluazifop formulations "effected a marked reduction in fire hazards." (Kings Park Annual Report, 1989-1990). This approach to fire control has great potential within the study area due to the extensive growth of veldt grass.

The last aspect of fire control for the study area is fire suppression, which involves fire fighting applications once a fire has started. This can be an effective fire control technique if fires are detected quickly and fire fighters can respond and access the fire and contain it before it takes hold. Suppression however cannot be relied upon as the main fire control technique, it must be integrated with effective ignition and fuel reduction programs.

Fire suppression requires well trained staff with suitable equipment who are available to fight fires within short response times. Fire suppression activities can also degrade the environment through the necessity for off-road access to fire ignition points and the clearing of fire breaks leading to subsequent erosion and destruction of vegetation.

ii. Fire Control Policy

The recommended approach to fire protection for the study area is based primarily on reducing the incidence of fire ignition, secondly on fuel reduction through weed control, maintenance of fire breaks and low fuel zones, and thirdly on limited prescribed burning in strategic locations. In addition the City of Perth should continue to resource a well trained fire control crew who can quickly respond to potential fires to prevent their spread.

iii. Fire Control Plan

A fire control plan should be developed as a priority by the future managers of the study area. This plan should address all aspects of fire prevention and suppression based on the objective to preserve life, property and conservation values. A Fire Control Plan should consider the following areas:

a. Education Program

A community education program should be developed which highlights the danger of wildfires to human life and property and their destructive effect on flora and fauna within urban bushland reserves. Education should focus on the risk of accidental fire lighting and the need for the public to be vigilant against arsonists. Education programs should also

include methods of preventing wildfires, controlling their spread, and ensuring human safety in the event of a major wildlife within the study area. The effects of the natural environment of different fire regimes should also be addressed.

b. Fuel Reduction

The emphasis should be on fuel reduction through weed control. The current program of controlling veldt grass with Fusalide^{R} or similar herbicides should be continued throughout the study area. If this is not achievable, weed control measures should be concentrated between the system of parallel tracks and around picnic and car parking areas were fires are most likely to start or be lit.

Limited prescribed fuel reduction burns may be undertaken during the autumn months as further, insurance against the spread of wildfires. Prescribed burns should however only be carried out within the existing system of parallel firebreaks and tracks, and preferably after research has been carried out as to the exact locations and fire tolerance of all significant species (see Section 2.2.1). Prescribed burns should not be carried out over larger tracts of the study area.

Firebreaks can serve as effective barriers to low intensity fires and they should be maintained where they currently exist or are legally necessary. The problem of weed invasion in disturbed soil along firebreak requires further research.

c. Fire Suppression

The control of any outbreaks of fire should be given a high priority. It is recognised that the Council has, in recent years, been upgrading its equipment and training fire control staff. This process should be continued as part of a fire control plan. Access for 4WD fire control vehicles should be maintained along strategic access routes. The water supply for fire fighting should be improved by installing a large volume overhead hydrant or equipping a groundwater bore.

The suggested reticulation and irrigation system alongside walk trails within the Bold Park area is an expensive measure with some serious effects on the vegetation through disturbance and weed invasion and construction is not recommended.

d. Human Safety

Specific measures have been suggested to increase human safety in the event of a major fire within the study area. Some of the inherent problems of the study area are its large size, pedestrian accessibility and high degree of recreational use. To increase the fire safety of

the area a series of fire havens consisting of a low non-flammable walls behind which people can shelter has been suggested (City of Perth, 1989). Other suggested measures include an oval or open irrigated grass area and the provision of helicopter evacuation points.

These suggestions, would however, involve the clearing of a considerable area of bushland which would reduce the available habitat area, increase edge effects and the potential for further degradation of the environment. These measures do not overcome the problems of smoke inhalation which would contribute to fatalities more so than radiant heat.

In order to save lives and to limit the liability of Council it is important to minimise risk through access restrictions. Access to the park environment should be correlated with fire risk. On days of extreme danger there should be no access to the park, or limited access to points which would permit easy evacuation. On days of low risk access may be unlimited. Appropriate signs informing the public on the level of access should be stationed at the entrances of each walk trail. Directional signs should be placed along walk trails indicating exit points if there is a fire. An integrated program of this sort should be developed in a future management plan in consultation with CALM and the Bush Fires Board of Western Australia and the community informed of its context.

An effective fire control plan needs to consider all of the above measures and attempt to reconcile the sometimes disparate aims of protecting the environmental values of the study area as well as the need to protect the public at all times.

7.5.3 Priorities

While the preparation of a management plan should be undertaken as a priority, interim management activities will need to continue. This section identifies some of the priority issues.

i. Weed Control

- Use of Herbicides

  Weed growth within the study area needs to be managed as part of the process of ecological restoration and fire control. Weeds should be controlled by herbicide spraying between the parallel firebreaks and at least 25 metres on either side to create low fuel fire buffer zones. In particular grass weeds should be controlled.

- Community Volunteer Training

Members of the community willing to assist in weed control through bush regeneration programs should be provided with training. Members of Councils Parks and Recreation staff should also be encouraged to undertake courses in bush regeneration.

ii. Fire Control

- Signage

Educative and warning signs should be erected at all entry points into the study area. Fire danger signs which are updated daily during the fire season, and education signs instructing users of the area, on evacuation procedures and wildfire survival techniques are recommended.

- Closing Study Area to Visitors

During days of extreme fire danger it is recommended that the area be closed to the public and management activities within the area should be curtailed. Signs advising that the area is closed to visitors and the reasons for this should be installed at all entrances.

- Fire Access Plan

A plan should be drawn up of the study area to assist fire control efforts. This plan should include all firebreaks, paths, vehicle routes, bridle paths and the condition of each route. In addition, entry points and water sources for fire control vehicles should be highlighted. Surveillance points from which fires within the study area can be detected should also be noted.

- Leaflet Residents

As a means of communicating important management issues to residents surrounding the study area the City of Perth should produce a leaflet and letterbox drop all nearby residences. The leaflet could contain information on fire notification procedures along with all relevant phone numbers, and information on the dangers of wildfires to the public, property and the environment, and updates on the management of the area.

7.6 IMPLEMENTATION

The major steps required to implement the preferred structure plan and preferred management option will include the rezoning of certain land, making submissions to the government in relation to Regional Park proposals and setting up an appropriate management structure. These are considered in the following sections.

- Rezoning

In order to implement the preferred options it will be necessary to rezone those lands currently zoned Urban under the MRS and residential under the City of Perth Planning Scheme to an appropriate Parks and Recreation zoning. The land on the south side of Fortview Road which is recommended for residential development would not require a rezoning and development could proceed on the basis of the appropriate sub-division, development, and building applications. In considering these applications, Council should have regard for the values of surrounding lands and the potential for impacts from the residential development.

The initial step in the rezoning process would be to make a proposal to the Department of Planning and Urban Development to amend the MRS such that the other lands zoned Urban are reserved for Parks and Recreation. It is unlikely that this amendment would be regarded as significant under the terms of the MRS Act.

Following this reservation the City of Perth Planning Scheme would be altered to adopt the reserves. At the same time as seeking this alteration to the MRS, it may be worthwhile holding discussions with Main Roads to determine if it would be appropriate to lift the Other Major Highway reservation which also currently crosses the study area.

- Regional Park Proposal

As discussed in the preceding section to have the study area recognised as a Regional Park will require a government decision. The Regional Park co-ordinating agency, which is yet to be established, will be responsible for assessing and making recommendations in relation to Regional Park proposals. Prior to the establishment of that body DPUD will hold this responsibility.

Following reservation under the MRS, which is likely to be a criteria for recognition as a Regional Park, this study should be submitted to the relevant body in support of a Regional Park proposal for the study area.

It must be recognised that a proposal for the study area to be adopted as a Regional Park may not be successful and consequently the Council should consider future management options in that instance. While a proposal for Regional Park status is being considered by the government, and in the event that it should be unsuccessful, it is recommended that the City of Perth retain ownership of the study area and establish an advisory group to assist in setting management policy. This group would incorporate members of the community and other outside experts as required.

It would also be responsible for seeking outside funding for the management of the study area.

- Management Structure

As mentioned above an interim advisory group should be established to advise Council on management policy. The structure of the group should be determined by Council but should include, at a minimum, representatives of Council, representatives of interest groups with specific concerns relating to the study area, representatives of recreational, educational and scientific user groups, and outside experts with specific skills in the management of urban bushland.

Should the proposal to gain Regional Park status be successful, it is anticipated that the advisory group would continue as a formal advisory group under the Regional Park management structure.

Council should in conjunction with the advisory group undertake priority management works, particularly in relation to weed control and fire management. It should also proceed with the preparation of one or more management plans to cover the study area. It is important that this action occur as soon as possible to enable long term management strategies to be implemented.

- Development

Residential development of the south side of Fortview Road does not require a rezoning and is not considered to have a significant impact on the environment. However, Council should, prior to proceeding with development works, refer that proposal to the EPA for assessment. The development of active sporting facilities in the north of the study area or nursery and interpretive facilities on the Skyline drive-in site should be held in abeyance until the completion of management plans. This will ensure that any development will occur in sympathy with the long term values and management of the study area.

Chapter 8

COMMUNITY CONSULTATION

8.1 INTRODUCTION

A significant community consultation program was implemented as part of the study process.

The aim of the consultation program was to:

- inform the community of the study;
- educate the community in the issues involved;
- access information on the study area available in the community;
- identify the values placed on the study area by members of the community; and
- involve the community in the decision-making process.

The objective of the program was to ensure that the issues of concern to the community were taken into account and investigated during the study process. It also allows the views of the community to be adequately represented to the Council and other decision-making authorities.

The consultation program involved a number of different events and these are documented in the following sections. It should be noted that the program was not designed to achieve a scientific measure of the community's views in relation to the study area. The results of the program, therefore, do no purport to be statistically representative of the views of the wider community.

The program provided a number of opportunities for members of the community to become involved in the study process. It is probable that those with the greatest interest in the study area availed themselves of these opportunities and, therefore, it is these views that are strongly represented. This, however, should not be seen to denigrate the importance of the views of members of the community who donated valuable time and effort to provide information and input to the study process. It was clear that many sectors of the community hold very strong views regarding the future of the study area.

8.2 COMMUNITY ADVISORY GROUP

As part of the community consultation program a Community Advisory Group was established to liaise with the study team. The group included representatives of community groups and residents associations which operated in the locality of Bold Park or which had demonstrated a significant interest in the study area. The groups who participated in the community advisory group were as follows:

- Friends of Bold Park;
- the Wildflower Society of WA;
- the Western Australian Museum;
- the Coast Ward Ratepayer's Association;
- the Wembley Ward Ratepayer's Association;
- the Mt. Claremont Bird Banding Group;
- the City Beach Highway Safety Action Group; and
- the Western Suburbs Highway Action Group.

The terms of reference which were issued to the members of the group provided for five broad objectives:

- to identify current and potential uses of the study area;
- the identify characteristics of the study area that are valued by groups within the community;
- to identify the possible impacts of alternative land use and management options;
- to identify the acceptability to the community of different feasible land use and management options; and
- to consult with the wider community and represent those views to the committee.

The committee met on seven occasions throughout the study period. The group was organised such that the study team prepared an agenda for each meeting which was distributed in advance. Minutes were recorded to ensure that views on issues were correctly interpreted.

While a wide range of issues were discussed with the community advisory group, the group unanimously opposed any form of residential or other major development in the study area. The group expressed the view that the conservation and passive recreation values of the area

were sufficient to justify the retention of the study area in its entirety as a natural bushland park. The group consistently expressed the view that recommendations of the System 6 report (1983) should be implemented. This was demonstrated by the community advisory group's unanimous adoption of Structure Plan No. 1 Conservation (see Section 6...) as their preferred option. The views of the community advisory group on other issues are described as follows:

- **Knightsbridge**

The community advisory group believed that the Knightsbridge land should be incorporated into the study area and into any natural bushland park that is provided in the area and suggested that local government boundaries should be altered so that the site falls in the City of Perth.

- **Western Suburbs Highway Route Options**

The advisory group was strongly of the view that no new highway should go through or adjacent to the study area and questioned the need for a new highway. They considered the environmental impacts of any new route to be unacceptable.

- **Realignment of Rochdale Road**

The advisory group considered the issue of realigning Rochdale Road on a number of occasions and questioned the need for a new alignment. The group did see some benefits in re-joining the Mt. Claremont Bushland with the remainder of the study area by removing the existing alignment. There was great concern about the impacts that would result from clearing natural bushland for any new road alignment. The group considered that if the realignment proposal were to proceed then a further public environmental review would be required. The group also considered that other options may be available for re-directing traffic away from the residential areas of Mt. Claremont. The group unanimously rejected Structure Plan Option 3 which included a realignment of Rochdale Road.

- **Management Options**

The advisory group was concerned with ensuring that the values of the study area were secured for the long term. The group favoured management as an A Class reserve because of the security provided by that tenure. One constituent group on the advisory group had prepared and submitted a proposal for Regional Park status for Bold Park and adjacent bushland. That proposal included management options. The advisory group also suggested that Perth City Council may benefit from the expertise of organisations such as CALM or the WA Museum. The group also favoured the participation of community groups in

ongoing management and expressed a desire for an organisation to be set up that would allow community members to actively participate in the management and rehabilitation of the bushland. The group reiterated the need for a management plan and expressed the urgent need for management actions to control the spread of weeds and the degeneration of tracks.

- **Funding**

The group expressed the view that returns from the Endowment Lands Trust Fund should also be applied to the on-going management of the study area, as the area benefits the whole of the City of Perth and the wider region. On this basis it was also believed that funding should be provided by State government sources.

The group discussed a wide range of other issues relating to detailed management. These included:

- the need for more active weed control;
- the future of the pine plantation;
- concern over the impacts of horse riding;
- the need for sensitive bushfire management measures;
- rationalisation and rehabilitation of tracks, firebreaks and bridle paths;
- rehabilitation of the Skyline Drive-In Site;
- the need for more detailed biological studies, particularly in Mt. Claremont Bushland; and
- the benefits of City Beach Senior High School taking on an environmental speciality.

The community advisory group assisted the study team greatly by providing both a conduit to the community and a wealth of knowledge about the study area and its environment. Their contribution to the study process was greatly appreciated.

8.3 PUBLIC SUBMISSIONS

8.3.1 Introduction

The initial phase of the community consultation program involved placing advertisements and having articles run in major newspapers to inform the community that the study was underway. Advertisements ran in the West Australian, the Post newspapers and the Stirling

Times and articles covering the study were printed in the Post newspapers, the West Australian, the Australian and the City of Perth News. Copies of the advertisements and articles are included in Appendix I.

The advertisements and a number of the articles notified the community that an information newsletter had been prepared providing full details of the study and that the study team was interested to hear the views of any residents or groups having an interest in the area. This media attention and the information newsletter generated a number of submissions from the public. Other events in the community consultation program also provided for making submissions. All of the submissions received during the course of the study are discussed in the following sections.

8.3.2 Number and Origin of Submissions

Forty one submissions were received. While most were written, some were received over the telephone. From this total, 26 were from private individuals and the remainder from interest groups, schools and companies.

The majority of private submissions were from residents living in the nearby suburbs of Floreat and City Beach. Of the remaining submissions, many originated from Shenton Park, Jolimont and Wembley. This represents a comparatively restricted distribution although the interest group members are probably drawn from more distant suburbs.

8.3.3 Issues

Submissions commented on a wide range of issues regarding urban and transport development, recreational use, conservation, education and management considerations.

Interest group, school and company submissions generally raised single issues of concern. Private submissions tended to look at the study area as a whole and what it had to offer current and future users.

Overall, the major issue emphasised in submissions was opposition to any development proposals on existing bushland. In addition, specific development proposals were also frequently mentioned and strongly opposed. These included the Rochdale Road realignment, urban development of Mt. Claremont Bushland, urban development of Lot 1, Stephenson Avenue, the West Coast Highway realignment and the Stephenson Highway proposal.

Development proposals were opposed for a variety of reasons. A strong theme was the retention of the study area as a whole, with no loss of area, particularly at the margins, and no bisection, excision or resumption for transport corridors. Supporting this theme was the view that the study area retained a high degree of naturalness and was comparatively unspoilt in comparison to other urban open spaces. The unique nature of the flora and fauna of the study area was also stressed in submissions opposing development. Awareness of these aspects is high as demonstrated by the detailed submissions from a number of interest groups including the Wildflower Society of WA, Local Plants Group, the WA Museum, the Tree Society and the Mt. Claremont Bird Banding Group.

The second major issue arising from the submissions was for the management of the study for conservation and recreation purposes. Having initially registered strong opposition to any development proposals, many submissions made comments centred upon the recommendations of the System 6 Report for areas M46 and M47. These are outlined in Section 4.5. Almost a quarter of the submissions called for the establishment of a Regional Park or A Class reserve based upon the System 6 boundaries. Awareness of the System 6 Report was high and it was clear that most people want to see the study area protected in its current form and covered by a strong form of land tenure ensuring its continued use for conservation and recreation.

The significance of the size and uniqueness of the study area were also widely appreciated. Its feeling of spaciousness, of being far from intrusive traffic or buildings was often noted. Typically it was considered that "there are little enough decent areas of bushland left in Perth; Bold Park should be left alone".

Conservation comments also stressed the importance of the study area for scientific and educational purposes. The WA Museum Education Services submission, together with those from Christchurch Grammar School and City Beach Senior High School stressed the use of the study area as a rare opportunity for students to study flora and fauna in the metropolitan area. City Beach Senior High School also registered interest in being designated as a high school with an environmental speciality.

Fewer comments were made regarding recreation and management issues. Passive recreational activities were supported by a number of submissions while others favoured the re-introduction of orienteering to the study area, and the continuation of archery and horse riding. Some opposition to horse riding and the use of trail bikes was registered on the basis of erosion and introduction of weeds, and disturbance to fauna. A number of interest group submissions concentrated on recreational activities, for example the Orienteering Association, the Perth Bushwalkers Club and the YMCA.

Comments on management issues included a general need for improved management controls. The submission from the Kings Park Board drew attention to management plan options under consideration for that facility. The primary concern regarding management of the study area was the desire to see more active management, although a higher on-site presence was not advocated. Fire management and a need for increased park facilities were also mentioned.

Other management issues raised in submissions included the need for the rehabilitation of degraded areas. The drive-in and turf farm were singled out, while the pine plantation was a contentious issue with opinions divided over its retention or clearing and rehabilitation. Where rehabilitation was discussed, native species were usually nominated for use. The need for weed control was also mentioned.

8.3.4 Summary

A total of 41 submissions were received commenting on a wide range of issues regarding urban and transport developments, recreational use, conservation, education and management considerations. The majority of submissions strongly opposed any development proposals on existing bushland. The primary reason for this opposition was a widespread appreciation of the uniqueness of the size, integrity and undisturbed nature of the study area, and a strong desire to see the current area secured and managed primarily for passive recreation and conservation of flora and fauna. Almost a quarter of the submissions called for the establishment of a Regional Park or A Class reserve based upon the System 6 boundaries and recommendations. The main issues contained within these submissions are summarised in Appendix J.

The submissions also stressed the importance of the area for scientific and educational purposes, other recreational activities, for example, archery, orienteering, cross-country running and general bushwalking and observation of flora and fauna. Overall, the submissions provided an indication of the value of the study area to private individuals, interest groups, schools and companies. The message was very much one of 'leave it alone'.

8.4 PUBLIC WORKSHOP

A community search conference was held in the Library, City Beach High School on Saturday, 18 July 1992 from 12.30-4.30pm. The conference was a significant component of

the community consultation program and aimed to examine how the community valued the study area and what it believed were appropriate land uses.

The conference was over subscribed and about seventy people participated. Eight workshop groups participated in a number of sessions that allowed participants to:

- nominate the values of the study area and list all types of development appropriate to any part of the area;
- prepare a structure plan for the study area; and
- discuss and compare presentations with other groups.

The conference generated a wide range of interesting views, all of which were recorded and a number of points were broadly accepted or advocated by the participants. There was strong emphasis on nature conservation both in the values represented by the study area and in proposals for its future use. The size and integrity of the study area were considered important and the integrated management of the whole area and certain adjoining lands was advocated. It was suggested the managing agency incorporate regional, local government and community interests.

Major developments in the study area were strongly opposed and recreational, educational and scientific facilities were only acceptable to the participants on a small scale. The siting of these on the periphery of the study area to ensure preservation of the core area was recommended.

Importantly, participants gave little weight to the monetary value of the land compared to the perceived conservation values which were considered to be much more important. In summary, the conference provided an important opportunity to incorporate community views into structure plans options. These views emphasised the importance of nature conservation values and the perception of the study area as a major community asset.

8.5 PUBLIC SUBMISSIONS ON STRUCTURE PLAN OPTIONS

A public exhibition of the three structure plan options, as outlined in Section 6.3, was held at Floreat Park Library from 29 September to 3 October, 1992. All persons on a mailing list generated from previous contact and community involvement were notified of the exhibition and invited to attend and leave comments. Forms provided allowed the public to indicate their preferred structure plan option and leave additional comments.

The structure plan options displayed were Figure 6.1 the Conservation Option, Figure 6.2 the Strategic Development Option and Figure 6.3 the Rochdale Road Realignment Option.

Fifty-two submissions were received, 39 of which favoured the Conservation Option, two favoured the Strategic Development Option, six favoured the Rochdale Road Realignment Option and five considered none of the options appropriate. From this response, and the accompanying comments, it was clear that the Conservation Option was heavily favoured due to its exclusion of development from the study area. Twenty-one submissions stated opposition to any development proposal on existing bushland.

Smaller numbers opposed the Rochdale Road realignment, urban development on Mt. Claremont Bushland and the construction of the proposed Western Suburbs Highway or realignment of the West Coast Highway. Eleven submissions favoured Regional Park status for the Park.

Other submissions emphasised the need for flora and fauna conservation and the continued use of the study area for scientific and educational purposes. Submissions commenting on recreational use and management options were received in small numbers and these emphasised passive recreational activities. Overall, the submissions and comments strongly supported the Conservation Option structure plan and opposed any development or road realignment proposals. This structure plan option was supported by 75% of submissions and stressed the need to maintain the integrity of the study area.

8.6 SUMMARY OF COMMUNITY VIEWS

Community views on the study area have been sought and considered at all stages of the project. Various opportunities have been presented to enable submissions and comments to be made and collated. These have included newspaper advertisements advising the public of the PER, invitations to submit views on the study area, public workshops, and public exhibitions. A community advisory group has been active in conjunction with these other activities.

Community views have consistently emphasised the need for preservation and conservation of the study area. It is clear that the area is well known and valued for its integrity and size, the quality and uniqueness of its flora and fauna and its high degree of naturalness. These values are more important because of the lack of any comparable area in the Perth metropolitan area.

As a consequence of these values, any form of development having an impact on existing bushland is strongly opposed. This view has been consistently put forward at all phases of the community consultation program. Supporting this view, very little weight was given to the monetary value of the land compared to perceived conservation values.

After stressing their opposition to development, the community also strongly emphasised the need to ensure the long term security of the study area. The establishment of a Regional Park or A Class reserve embodying the recommendations of the System 6 Report was often noted. Together with this suggested security of tenure, it was advocated that the study area be managed by an agency including regional and local government, and community interests.

While wanting to ensure the preservation of the study area primarily for passive recreation and conservation, the continuation of passive recreation, educational and scientific activities was supported.

The theme of conservation and preservation was further emphasised in the submissions received on the draft structure plan options. Seventy-five percent of submissions favoured the conservation option which emphasised rehabilitation and no development.

In summary, community views have strongly opposed all development proposals while supporting the establishment of a secure park or reserve over the study area to promote the long term use of the area for recreation and conservation of flora and fauna.

Chapter 9

CONCLUSION

This detailed investigation of Bold Park and environs has assessed the values provided to the community under four general headings, namely:

- conservation;
- recreation;
- landscape; and
- educational and scientific.

It indicates that the study area is regionally significant in terms of each of these concerns, and forms a unique resource to the people of the metropolitan area. The value of this resource is widely appreciated by the community who strongly expressed the need for its conservation throughout the course of the study.

The development options that have been discussed for the area in the past include major regional highway routes, residential development, and alterations to local road patterns. In addition development of adjoining land, at Knightsbridge, is a possibility. Any major development in the study area would significantly detract from its values. However there is the potential for minor development, including residential development, that would not detract from the significance of the area and this has been recommended in the preferred structure plan. Development issues which may arise in the future, such as the Stephenson (Western Suburbs) Highway route or a realignment of Rochdale Road, should be considered on their merits, taking account of the significance of the study area.

The regional values of the area suggest that designation as a Regional Park is the best option for future management. This would provide benefits to the City of Perth by allowing it to retain ownership while also receiving assistance in managing the area. It would also provide security of tenure and use for the land, and this is the primary concern to many within the community.

The conservation of Bold Park and its environs demonstrate the commitment of the City of Perth to the environment.

Chapter 10

COMMITMENTS

The Council of the City of Perth has not come to any resolution concerning the matters and options discussed in this report.

As a consequence, the Commitments suggested have been excluded from this publication.

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APPENDICES

Appendix A

EPA GUIDELINES

GUIDELINES FOR PREPARING A PUBLIC ENVIRONMENTAL REVIEW OF OPTIONS FOR THE DEVELOPMENT AND MANAGEMENT OF THE LAND WITHIN SYSTEM 6 RECOMMENDATION AREAS M46 AND M47

The Environmental Protection Authority's System 6 Study resulted in a comprehensive set of proposals recommended to, and accepted in principle by Government for the protection of areas for broad conservation and recreation purposes in the most densely populated region of the State.

One of the principle general recommendations in the System 6 Report is concerned with the identification, setting aside and management of open space of regional significance.

This Stage 2 PER has resulted from a commitment by the City of Perth in their Stage 1 PER for the realignment of the West Coast Highway to identify and address all of the identified issues which could potentially affect the land covered by System 6 recommendation areas M46 and M47. The Authority considered the potential impacts on M46 and M47, arising from known development pressures could not be considered in isolation from one another. Rather, they should be considered as part of an integrated planning process for the long term management of M46 and M47. However, the Authority agreed to the City of Perth proceeding with their examination for the realignment of the West Coast Highway in isolation from other known land use pressures as a first stage assessment. The remaining issues are to be addressed in this Stage 2 PER which effectively is a planning and management document for M46 and M47.

The guidelines provide a list of topics that should be included within the Public Environmental Review. They are not intended to be exhaustive and the proponent may consider that other topics should also be included in the document. The purpose of the PER should be explained and the contents should be concise and accurate as well as being readily understood. Specialist information and technical description should be included where it assists in the understanding of the proposal. It may be appropriate to include ancillary or lengthy information in technical appendices.

The Authority notes that not all issues affecting these areas are within the direct control of the Perth City Council and that an extensive consultation programme with various other agencies and groups (particularly the Department of Planning and Urban Development) which have an interest or involvement in these areas will be necessary. The PER is therefore seen as an instrument whereby the results of all necessary studies and investigations are presented as an end product of those earlier consultations.

To achieve this objective it is envisaged that some effort and input will be required on the part of all those involved and not just by the Perth City Council.

1. Summary

The Public Environmental Review should contain a brief summary of:

- introduction to the objectives of this PER;
- salient features of the proposed future development and management of M46 and M47;
- alternatives considered within the above;
- description of receiving environment and analysis of potential impacts and their significance;
- environmental monitoring and management programmes, safeguards and commitments; and
- conclusions.

2. Introduction

The Public Environmental Review should include an explanation of the following:

- briefly describe the background history which culminated in this PER study;
- identification of proponents and responsible authorities;
- background and objectives of the development/management framework;
- brief details of, and timing of, the proposed development/management framework;
- relevant statutory requirements and approvals; and
- the scope, purpose and structure of the PER.

3. Need for the proposal

The Public Environmental Review should examine the justification and fundamental objectives for the development and management of M46 and M47 including supporting data and statistics. Broad environmental costs and benefits at local and regional levels of planning for the management of M46 and M47 using an integrated approach should be briefly discussed. Consequences of not implementing the development/management framework should be outlined.

4. Evaluation of alternatives

An evaluation of different development and management prescriptions should be provided, (ie, of keeping some options open and closing off others). This evaluation should clearly explain why a particular option or set of options, were selected. Attention should be paid to alternative management options that would not necessarily enable future development to proceed but would afford significant long term protection for M46 and M47.

5. Description of existing environment

This section should provide an overall description of the environment and of the physical, ecological and social systems likely to be affected.

This section should include:

5.1 Physical, biological, social environment

- Physical
  - landforms
  - soils
  - climate
  - wetlands
- Biological
  - emphasis on flora and floral systems (including quantity and quality) affected by the identified issues on the land covered by System 6 recommendation M46 and M47 which are important, rare or uncommon (or becoming so)
  - fauna with emphasis on rare or uncommon species

Biological issues to be set in both a local and regional context relative to their conservation status and significance.

Social environment

- landscape value of M46 and M47 in a local and regional context
- relationship of M46 and M47 with adjacent land uses
- archaeological and ethnographic sites
- existing social climate, uses and value, including current community expectations and anticipated future needs
- existing noise climate within the M46 and M47 areas

5.2 System 6 report and recommendation areas M46 and M47

The PER should present an overview in a regional and local context of the regional park concept for these areas including:

- conservation values
- recreation values
- landscape values
- social values
- scientific values
- education values

6. Development options and their environmental impacts

The PER should describe the known proposed development options for M46 and M47 and the relationships between these.

This section of the PER should show in a local and regional context the overall effect on the total ecosystem and social surroundings of the known development options or other land use pressures. The objective of this section is to synthesise all information and predict potential impacts (both adverse and beneficial) upon the environment in the short and long term, including the impacts of alternatives. This should include an assessment of the resilience of the systems to natural and man-induced pressures associated with the known development options.

Impacts should be quantified where possible. Criteria for making assessments of their significance should be outlined. Individual and cumulative impacts should be discussed.

It will be necessary to determine impacts on individual components of the environment arising from each development option before a final overall synthesis of potential impacts is made.

This section should include, but not be limited by, consideration of the following:

6.1 Potential impact on M46 and M47 values arising from proposed development options or changes in land use including:

- the connection of Underwood Avenue/West Coast Highway as a major east-west roadway
- the future of 53ha of endowment land south of Bold Park
- local roading options proposed to cater for regional traffic movements from West Coast Highway to the Mitchell Freeway
- the old Skyline Drive In
- the turf patch
- development options for M46

Discussion should include the implications of each development/management scenario on the future planning, values and integrity of M46 and M47 areas. The effect upon System 6 areas if planning for any of these developments proceed in isolation to and without considering the other potential land use proposals affecting System 6 areas.

6.2 Impact on environmental and social values identified within the project area

6.3 Impact on adjacent lands and communities

Including traffic management issues arising from consideration of road options.

7. Environmental management options for M46 and M47

Major issues requiring attention would include:

- Discuss the implementation of the Regional Park concept for M46 and M47 including management of adjacent remnant vegetation areas in sympathy with M46 and M47.

- Discuss the establishment of a management structure for the Regional Park including community involvement, and representation on the management body.

- Identify and briefly discuss the management planning issues and objectives for M46 and M47 including:

  - commitment for provision of funding for the necessary studies
  - conservation and recreation values
  - research/data acquisition
  - community consultation in the preparation of management plans
  - fire management
  - weed control
  - revegetation and re-establishment programmes
  - appropriate boundaries
  - options for vesting
  - commitment for ongoing management funding

- Administrative arrangements - review and update of zonings and reservations under Council's Town Planning Scheme to reflect a total management plan, followed by submission to DPUD for commensurate MRS amendments.

- Discuss the rationalisation of municipal boundaries if warranted as a result of proposals arising from this study.

- Suggest measures, using a co-ordinated management approach, to resolve the issues associated with the proposed development options or changes in land use identified for M46 and M47.

- Discuss the requirement for adequate environmental investigation and research to facilitate management decisions based on a thorough understanding of the regional and local conservation, recreation and educational values of the M46 and M47 areas.

8. Conclusion

Conclusions on the overall impacts of the preferred development/management framework and the associated management requirements need to be presented. On this basis, an assessment of the environmental acceptability of the preferred management option needs to be made.

9. Guidelines

A copy of the guidelines should be included in the PER document.

10. References

All references should be listed.

11. Appendices

Where detailed technical or supporting documentation is required, this should be placed in appendices.

12. Commitments

A numbered list of all environmental management commitments should be given. A commitment should include:

- who makes the commitment
- the nature of the commitment
- when the commitment will be carried out and to whose satisfaction

13. Public participation and consultation

A description should be provided of the public participation and consultation activities undertaken by the proponent in preparing the PER. Specifically, consultation with the following agencies, organisations and special interest groups is envisaged:

- Perth City Council
- Department of Planning and Urban Development
- Friends of Bold Park
- Main Roads Department
- City of Nedlands
- Museum
- Environmental Protection Authority
- Water Authority of Western Australia
- Department of Conservation and Land Management
- Conservation Council of Western Australia
- other interest groups

This section should describe the activities undertaken, the dates, the groups and individuals involved and the objectives of the activities. A summary of concerns raised should be documented. This section should be cross-referenced with the 'Environmental Management' section which could clearly indicate how these concerns have been addressed.

Appendix B

ADDITIONAL VASCULAR PLANTS FOUND IN THE STUDY AREA

Species	Common Name	Family
* *Ammophila arenaria*	Marram Grass	*Poaceae*
* *Arctotheca populifolia*		*Asteraceae*
Spinifex hirsutus		*Poaceae*
Spinifex longifolia		*Poaceae*
* *Thinopyrum distichum*	Sea wheat	*Poaceae*

Note: * = exotic species

Appendix C

MAMMALS AND AMPHIBIANS RECORDED IN THE STUDY AREA TO 1991

Mammals	
Common Brushtail Possum	*Trichosurus vulpecula*
House Mouse	*Mus musculus*
Black Rat	*Rattus rattus*
White-striped Mastiff-bat	*Tadarida australis*
Gould's Wattled Bat	*Chalinolobus gouldii*
Rabbit	*Oryctolagus cuniculus*
Cat	*Felis catus*
Fox	*Vulpes vulpes*
Horse	*Equus caballus*
Dog	*Canis familiaris*
Amphibians	
Moaning Frog	*Heleioporus eyrei*
Banjo Frog	*Limnodynastes dorsalis*
Turtle Frog	*Myobatrachus gouldii*

Appendix D

REPTILES RECORDED IN STUDY AREA TO 1991

Western Bearded Dragon	*Pogona minor*
Sandhill Dragon	*Tympancryptis adelaidensis*
	Diplodactylus alboguttatus
Spiney-tailed Gecko	*Diplodactylus spinigerus*
Marbled Gecko	*Phyllodactylus marmoratus*
Fence skink	*Cryptoblepharus plagiocephalus*
	Ctenotus fallens
	Ctenotus lesueurii
	Cyclodomorphus brachialis
	Hemiergis quadrilineata
	Lerista elegans
	Lerista lineopunctulata
	Lerista praepedita
	Lerista lineata
	Menetia greyii
	Morethia lineoocellata
	Morethia obscura
Bobtail	*Tiliqua rugosa*
	Aprasia repens
	Lialis burtonis
	Pletholax gracilis
Gould's Goanna	*Varanus gouldii*
Rosenberg's Goanna	*Varunus rosenbergi*
	Ramphotyphlops australis
Dugite	*Pseudonaja affinis*
Jan's Banded Snake	*Vermicella bertholdi*
Black-naped Snake	*Vermicella bimaculata*
Black-striped Snake	*Vermicella calonotos*
Narrow-banded Snake	*Vermicella fasciolata*
Southern Shovel-nosed Snake	*Vermicella semifasciata*

Appendix E

LIST OF BIRD SPECIES RECORDED IN THE STUDY AREA 1985 TO PRESENT

		Ref*	Status*
White-faced Heron	*Ardea novaehollandiae*	2	UC\V
Australian Shelduck	*Tadorna tadornoides*(B)	3	UC\V
Black-shouldered Kite	*Elanus notatus*	1	C\R
Whistling Kite	*Haliastur sphenurus*	4	UC\R
Brown Goshawk	*Accipiter fasciatus*	1	UC\R
Collared Sparrowhawk	*Accipiter cirrhocephalus*	1	UC\R
Little Eagle	*Hieraaetus morphnoides*	1	UC\R
Peregrine Falcon	*Falco peregrinus*	1	R\V
Australian Hobby	*Falco longipennis*	3	UC\R
Brown Falcon	*Falco berigora*	3	UC\R
Australian Kestral	*Falco cenchroides*	1	UC\R
Stubble Quail	*Coturnix pectoralis*	3	R\R
Painted Button-quail	*Turnix varia*(B)	1	R\R
Silver Gull	*Larus novaehollandiae*	5	C\V
Pacific Gull	*Larus pacificus*	5	C\V
Feral Pigeon	*Columba livia*	3	C\V
Spotted Turtle-Dove	*Streptopelia chinenis*	1	VC\R
Laughing Turtle-Dove	*Streptopelia senegalensis*(B)	1	VC\R
White-tailed Black-Cockatoo	*Calyptorhynchus baudinii*	1	VC\R
Galah	*Cacatua roseicapilla*(B)	1	VC\R
Little Corella	*Cacatua sanguinea*(B)	1	C\R
Sulphur-crested Cockatoo	*Cacatua galerita*	1	UC\I
Rainbow Lorikeet	*Trichoglossus haematodus*(B)	1	UC\I
Red-capped Parrot	*Purpureicephalus spurius*	1	C\R
Western rosella	*Platycercus icterotis*	1	C\R
Port Lincoln Ringneck	*Barnardius zonarius*(B)	1	VC\R

(* See end of this Appendix)

		Ref*	Status*
Elegant Parrot	*Neophema elegans*	1	VC\R
Pallid Cuckoo	*Cuculus pallidus*	1	C\M
Fan-tailed Cuckoo	*Cuculus pyrrhophanus*	4	UC\M
Horsfield's Bronze-Cuckoo	*Chyrsococcyx basalis*	1	C\M
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	1	C\M
Southern Boobook	*Ninox novaeseelandiae*	1	C\R
Barn Owl	*Tyto alba*	1	UC\R
Tawny Frogmouth	*Podarqus strigoides*	1	UC\R
Fork-tailed Swift	*Apus pacificus*	4	R\M
Laughing Kookaburra	*Dacelo novaeguineae*(B)	1	VC\R
Scared Kingfisher	*Halcyon sancta*(B)	1	C\R
Rainbow Bee-eater	*Merops ornatus*	1	C\M
White-backed Swallow	*Cheramoeca leucosternum*	1	UC\M
Welcome Swallow	*Hirundo neoxena*	1	VC\R
Tree Martin	*Hirundo nigricans*	1	VC\R
Richards Pipit	*Anthus novaeseelandiae*	1	C\R
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*(B)	1	VC\R
Jacky Winter	*Microeca leucophaea*	3	VC\R
Golden Whistler	*Pachycephala pectoralis*	3	C\R
Rufous Whistler	*Pachycephala rufinentris*	1	VC\R
Grey Shrike-thrush	*Colluricincla harmonica*	1	C\R
Grey Fantail	*Ripidura fuliginosa*	1	C\R
Willy Wagtail	*Ripidura leucophrys*(B)	1	VC\R
Splendid Fairy-wren	*Malurus splendens*	1	C\R
Variegated Fairy-wren	*Malurus lamberti*	3	C\R
White-winged Fairy-wren	*Malurus leucoptera*	1	C\R
White-browed Scrubwren	*Sericornis frontalis*	1	C\R
Weebill	*Smicrornis brevirostris*	1	VC\R
Western Gerygone	*Gergone fusca*	1	VC\R
Western Thornbill	*Acanthiza apicalis*	1	VC\R
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*(B)	1	C\R
Red Wattlebird	*Anthochaera carunculata*(B)	1	VC\R
Little Wattlebird	*Anthochaera chrysoptera*	1	C\R
Singing Honeyeater	*Lichenostomus virescens*(B)	1	VC\R
White-naped Honeyeater	*Melithreptus lunatus*	1	UC\M
Brown Honeyeater	*Lichmera indistincta*(B)	1	VC\R

(* See end of this Appendix)

		Ref*	Status*
New Holland Honeyeater	*Phylidonyris novaehollandiae*	1	C\R
White-cheeked Honeyeater	*Phylidonyris nigra*	1	VC\R
Tawny-crowned Honeyeater	*Phylidonyris melanops*	1	C\M
Western Spinebill	*Acanthorhynchus superciliosus*	1	VC\R
Mistletoebird	*Dicaeum hirundinaceum*	1	VC\R
Spotted Pardalote	*Pardalotus punctatus*	1	VC\R
Striated Pardalote	*Pardalotus striatus*	1	C\R
Silvereye	*Zosterops lateralis*(B)	1	VC\R
Australian Magpie-lark	*Grallina cyanoleuca*(B)	1	VC\R
Grey Butcherbird	*Cracticus torquatus*	1	VC\R
Pied Butcherbird	*Cracticus nigrogularis*	3	R\R
Australian Magpie	*Gymnorhina tibicen*(B)	1	VC\R
Australian Raven	*Corvus coronoides*(B)	1	VC\R

Notes:

(B) *Denotes recorded breeding in Bold Park (How & Dell, 1990)*
Total number of breeding birds = 19 species.

Status: *Denotes relative abundance and usage pattern of each species.**

VC *Very Common*
C *Common*
UC *Uncommon*
R *Rare*

VR *Very Rare*
R *Resident*
M *Migrant*
V *Visitor*
I *Introduced*

* *This information was compiled from information in, Van Delft 1988, Dames & Moore 1986 and Blakers et al 1984.*

Ref: *Denotes reference which lists species in the study area:*

1 *How & Dell, 1990*
2 *WA Museum in EPA 1988 Bulletin No. 322*
3 *RAOU Metro Bird Project, Compiled data sheets.*
4 *Wykes, 1990*
5 *Dames & Moore, 1986*

Appendix F

LANDSCAPE ASSESSMENT

The method of assessing landscape management zones is based on the following steps:

- definition of landscape character types;
- assignment of variety classes;
- assessment of sensitivity levels; and
- the combination of these to produce landscape management plans.

a. Landscape Character Types

A landscape character type is defined as "an area of land that has common distinguishing visual characteristics of landform, rock formation, water form and vegetative patterns" (USDA 1974). In the study area landform and vegetation pattern are by far the dominant landscape identifying factors.

A total of seven distinct landscape character types were identified.

i. Beach

This is a distinctive landscape unit which runs from the high water mark to the crest of the foredune. It includes the berm line, the zone of primary colonising vegetation and the seaward side of the sparsely vegetated foredune. This area has not been extensively modified apart from the presence of exotic dune plants, and fenced beach access pathways.

ii. Vegetated Dunes and Swales

This landscape type covers an area from the top of the foredune to Challenger Parade between the Army fence to the south and Falmouth Avenue to the north. It contains steep vegetated dunes, protected interdunal swales and dense shrub thickets. It has a diverse vegetative texture and variable local topography.

iii. Undulating Shrublands and Woodlands

This unit occupies the western half of Bold Park, the majority of M46 and parts of the northern section of the study area. The topography is gently undulating and vegetation texture is diverse.

iv. Steep Woodlands

This area comprises the central valley of the northern section and several steep valleys on the eastern side of Bold Park. The vegetation consists of open woodland with scattered tall trees and an open understorey.

v. Heath Ridges

This unit comprises texturally diverse low closed vegetation and is found on high ridges in M46 and Bold Park. At Reabold Hill and adjacent ridges to the north of Oceanic Drive it occurs in association with outcropping surface limestone.

vi. Ovals and Mown Grassed Areas

These are scattered throughout the study area and vary from the formal Christchurch Grammar School playing fields to informal mown grass such as at the turf farm and the western verge of Perry Lakes Drive.

vii. Modified, Cleared and Disturbed Areas

This unit contains sites that once had a defined human use, such as the former Skyline drive-in site, in addition to areas that have been disturbed, cut and filled for road works, such as the west side of M46 adjacent to West Coast Highway. It also contains regenerating areas like the former St Brendan's Drive area.

b. Variety Classes

The seven defined landscape units are divided into three variety classes. This process is based on the presumption that though all landscapes have value, those with the greatest diversity of forms have the greatest potential for scenic quality.

Three variety classes are used:

Class A - Distinctive, Class B - Common and Class C - Minimal

Class B areas are assigned initially to those areas with features that are common throughout the landscape type. The key classification features that are used include vegetation form, line, colour and texture and topographic variation and diversity.

Class A - Distinctive:	Beach and foredune Vegetated dunes and swales Steep woodlands
Class B - Common:	Undulating shrublands and woodlands Heath Ridges
Class C - Minimal:	Ovals and mown grass areas Modified cleared and disturbed areas.

c. Sensitivity Levels

The third stage in the landscape assessment process involves assigning landscape sensitivity levels, which are a measure of viewer access and numbers and the length of viewing time, combined with an assessment of viewer types and their concern for the scenic quality of an area. This stage involves making some assumptions about viewer concerns however it assists in determining which areas are most susceptible to landscape alteration. A hierarchy of viewing points is established which ranks travel routes and viewing locations within the study area according to the numbers and concerns of viewers. The following identifies the hierarchy determined for the study area.

Level 1 High **Highest Sensitivity**	West Coast Highway, Oceanic Drive, Rochdale Road, Stevenson Avenue, The Boulevard, Reabold Hill Look-out and Scenic Drive
Level 2 Moderate **Moderate Sensitivity**	Perry Lakes Drive, Challenger Parade, Fortview Road, McClemants Road, Bold Park Drive, Kalinda Drive.
Level 3 Low **Lowest Sensitivity**	Walk trails, Cycleways, Bridal trail, foot tracks, Firebreaks, Informal roads and carparks.

The next step in determining sensitivity levels is to define the distance from the viewer to the landscape being viewed. Four distance zones are used which have been modified from the original USDA criteria due to the visual complexity and accessibility of the study area.

The zones are as follows:

Foreground (fg)	0 to 200 metres
Midground (mg)	200 to 1000 metres
Background (bg)	1000 metres to horizon
Unseen (us)	All areas unseen by ground based viewers.

The sensitivity level of a particular landscape is determined by combining the distance zone with the type of viewing point. Hence the landscape is divided into zones according to the location and distance from which it is viewed. For each sensitivity level there are three distance zones, thus the landscape is divided into nine possible units. Many parts of the study area can be viewed from different locations and viewing distances concurrently.

To resolve this a hierarchy of sensitivity levels, as shown in the chart below (USDA 1974), has been developed.

	fg1	**mg1**	**bg1**	**fg2**	**mg2**	**bg2**
bg2	fg1	mg1	bg1	fg2	mg2	bg2
mg2	fg1	mg1	mg2	fg2	mg2	
fg2	fg1	mg1	fg2	fg2		
bg1	fg1	mg1	bg1			
mg1	fg1	mg1				
fg1	fg1					

If an area has been identified as having two applicable sensitivity levels, the most restrictive sensitivity level can be read from the chart.

d. Landscape Management Zones

The final part of this process is to combine the sensitivity levels with the three variety classes discussed previously. The resulting landscape management zones are an indication of the inherent value of the landscape, combined with a regard for its ability to absorb landscape alteration.

Table F.1 LANDSCAPE MANAGEMENT ZONE DETERMINATION MATRIX

Scenic Quality Class	Distance Zone & Sensitivity Level								
	fg1	mg1	bg1	fg2	mg2	bg2	fg3	mg3	bg3
Distinct (A)	A	A	A	A	B	B	B	B	C
Common (B)	A	A	B	B	B	B	B	C	C
Minimal (C)	A	B	B	B	B	B	C	C	C

From Table F.1 it can be seen that the majority of areas come under Zone A or B. The table however can be modified to more accurately represent the situation in the study area. The majority of the study area can be viewed as foreground or midground areas due to the extensive network of access paths. Hence it is appropriate to modify the matrix table to delete all background areas. A modified matrix is included in Table F.2.

Table F.2 MODIFIED MANAGEMENT ZONE DETERMINATION MATRIX

Scenic Quality Class	Distance Zone & Sensitivity Level					
	fg1	mg1	fg2	mg2	fg3	mg3
Distinct (A)	A	A	A	B	B	B
Common (B)	A	A	B	B	B	C
Minimal (C)	A	B	B	B	C	C

Appendix G

USER SURVEY

G.1 Method

The user survey was carried out by interviewing park users. Surveying took place on both Saturday, 15 May 1992 and Tuesday, 19 May 1992. Surveys were carried out at six different locations in the study area.

The questionnaire was designed to be self administered and a copy is provided following the survey results. It was partly based on, and repeated some of the questions used in, a survey carried out in 1987 (Friends of Bold Park Bushland 1987).

Interviewers were located at a given checkpoint. They were instructed to ask all park users to fill in a questionnaire and to count all persons passing the checkpoint regardless of whether they completed a questionnaire or not.

The location of each checkpoint and the timing of the survey are indicated in the following table and on Figure G.1.

Table G.1 CHECKPOINT LOCATION AND TIMES

Checkpoint Location	Saturday 15-5-92	Tuesday 19-5-92
Reabold Hill Car-park (A)	8am - 12 noon	7am - 11am
Entrance near Perry Lakes (B)	8am - 12 noon	7am - 11am
Entrance near Camel Lake (C)	8am - 12 noon	-
Entrance near Turf Farm (D)	1pm - 5pm	-
Fortview Road (E)	1pm - 5pm	-
Bold Park Drive (F)	1pm - 5pm	-

These locations were selected as providing the greatest potential of "catching" park users in each section of the study area. No rain occurred during the survey period, with all periods exhibiting conditions typical of autumn, being fine with cloudy periods.

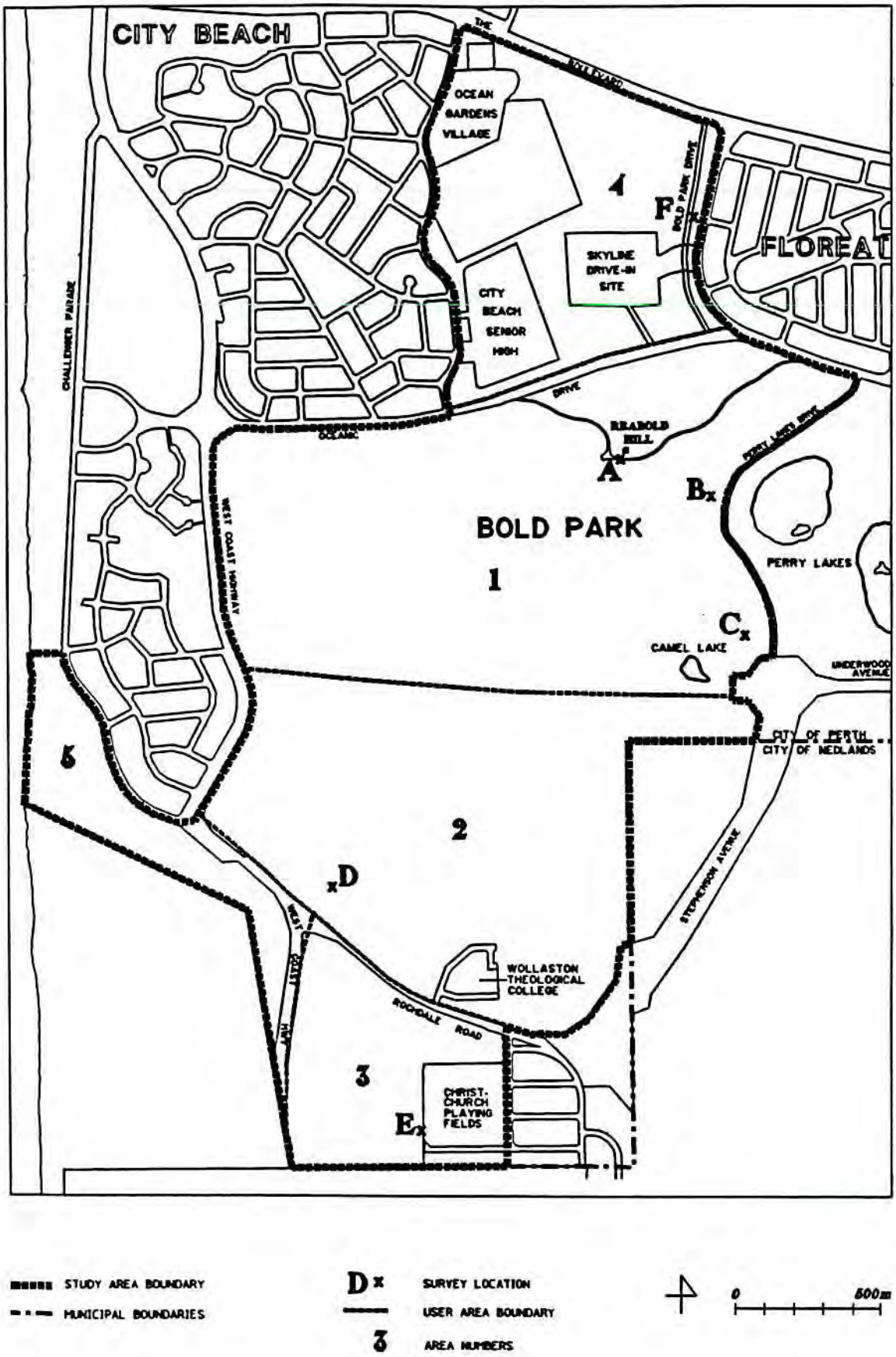

Figure G.1 USER SURVEY AREAS AND SURVEY LOCATIONS

G.2 Results

The following tables provide the results of the survey. Where appropriate they are related back to the question in the questionnaire.

Number of Users

The following table indicates the number of park users counted and surveyed at each location. Each survey session was four hours long.

Table G.2 NUMBER OF USERS

Location	Time	Users Counted	Users Surveyed
Reabold Hill	Sat am	77	20
Reabold Hill	Tues am	28	16
Perry Lakes	Sat am	28	16
Perry Lakes	Tues am	40*	15
Camel Lake	Sat am	22	13
Turf Farm	Sat pm	21	14
Fortview Road	Sat pm	5	3
Bold Park Drive	Sat pm	11	5
TOTAL		232	102

* *Includes a group of 20 school children*

Q1 Sex

	No.	%
Males	51	50
Females	51	50
Total	102	100

Q2 Age

	No.	%
10-19	2	2
20-29	16	16
30-39	20	20
40-49	26	25
50-59	22	21
60+	16	16
Total	102	100

Q3 Home Address

Home addresses or suburbs were coded into three categories as shown below:

	No.	%
Within 10kms	79	77
10-20kms	16	16
20+kms	2	2
No response	5	5
Total	102	100

Q4 Frequency of Visits

	No.	%
Daily	26	25
Few times a week	33	32
Once a week	16	16
Every few weeks	6	6
Once a month	3	3
Every few months	2	2
Few times a year	10	10
Once a year	4	4
Other	2	2
Total	102	100

Q5 Last time visited study area

	No.	%
Yesterday	32	31
Within last week	48	47
Within last month	8	8
Within last year	12	12
Never	1	1
No response	1	1
Total	102	100

Q6 Length of Stay

	No.	%
Less than 10 minutes	1	1
10-30 minutes	15	15
30-90 minutes	68	67
90+ minutes	18	17
No response	0	0
Total	102	100

Q7 Mode of Transport to Study Area

	No.	%
Car	87	85
Bicycle	0	0
Walk	9	9
Run	3	3
Horse	3	3
Total	102	100

Q8 Activities in Park (multiple responses allowed)

	No. of Responses	% of 102
Walking	88	86
Running	18	18
Picnicking	8	8
Meditation	18	18
Training with Club	0	0
Going to look-out points	22	22
Photography	4	4
Observing Plants	22	22
Observing Animals	8	8
Other Activities	5	5

Q9 Parts of Study Area Visited* (multiple responses allowed)

	No. of responses	% of 102
Zone 1: Reabold Hill	90	88
Zone 2: South Bold Park	60	59
Zone 3: Mt. Claremont Bushland	20	20
Zone 4: North of Oceanic Drive	22	22
Zone 5: Coastal Section	14	14

* *See Figure G.2*

Q10 Additional Facilities

Facility	Agree %	No Opinion %	Disagree %	No Response %
More car-parking	7	18	62	13
More park access rds	6	20	60	14
More trails	19	19	49	13
More signposts	26	19	40	15
Better weed control	32	29	27	12
More environmental information	58	17	16	17

Q10A Other Facilities Needed (open-ended question, multiple responses allowed)

	No. of responses	% of 102
None	29	28
Toilets	4	4
Taps/Water fountain	3	3
Shop/Kiosk	3	3
Other	5	5
No response	61	60

Q11 Are there other areas in Perth offering the same things?

	No.	%
Yes	33	32
No	68	67
No response	1	1
Total	102	100

Q11A If yes, where?

	No.	%
Kings Park	21	20
Whiteman Park	3	3
Other	10	10
No response	68	67
Total	102	100

Q12 Reasons for Coming to this Area (multiple responses allowed)

	No. of responses	% of 102
Close to home	68	67
Peace and quiet	81	79
Quality of views	50	49
Plants and animals	26	25
No cars	41	40
Good trails & recreation facilities	52	51
Bridle trails	14	14
It is a large natural area	31	30
Other reasons	10	10
No response	3	3

Q13 View of Development Options

Option	Agree %	No Opinion %	Disagree %	No Response %
Extension of West Coast Highway through bush	2	5	90	3
Residential Development	3	4	91	2
Playing Fields	4	8	86	2
Realignment of Rochdale Road	6	20	70	4

Q14 Other Comments (open-ended, multiple responses allowed)

	No. of responses	% of respondents
Should remain in current state	40	39
Other comments	27	26
No comment	45	44

Q14A Sample of Comments:

- Best bushland area in any capital city/metropolitan area;
- Leave it alone for pete's sake. I used to go to Buckland Hill but now that's totally gone and that was nothing compared to this;
- This is the only park in the Perth metropolitan area where you can ride horses - banning of horses would leave the 20 or so private horses with nowhere to be ridden;
- As long as the area is so full of exotic weeds I see no objection to off-track use by orienteers;
- I feel the rangers should not use a 4WD to get around the park as they (inadvertently, I hope) destroy both wildlife and the trails;
- Putting the highway through this area would destroy it. There are a few species of plants and animals that are here and nowhere else in the metropolitan area. The area is small as it is, making it smaller would destroy these habitats;
- Please leave it as it is - its unique;
- Few in this world have virgin bush like this so close to the city. Resist the pressure to build highways and houses and give people in the next century the opportunity to have a world class recreational area. Please don't destroy this unique area;
- It is a privilege for all to use the park as it is;
- Regarding the realignment West Coast Highway: Stephenson Avenue plan must be scrapped or removed from Road Reserve and the option of using Hale Road as a northern link taken up;
- Do not encroach on this natural bushland or disturb its peace, quiet and privacy or seclusion as has occurred with high rise buildings around the perimeter of Kings Park; and

- Coastal scrubland is being eliminated at an alarming rate north and south of Perth. This unique area within reach of all Perth suburbs must be maintained in its present form at all cost.

Appendix H

CONCLUSIONS AND RECOMMENDATIONS OF THE EPA RELATING TO M46 AND M47

(BULLETIN 322, 1988)

SUMMARY AND RECOMMENDATIONS

Bond Corporation Holdings proposes to subdivide and develop Lot 1 Stephenson Avenue, City Beach, for residential purposes. It is zoned 'urban' under the Metropolitan Region Scheme and 'Development Zone' under the Nedlands City Planning Scheme. The land is approximately 19 ha in area and the residential estate would be known as "Knightsbridge".

Lot 1 Stephenson Avenue is contained within the boundary of the Government endorsed System 6 Recommendation M47. The EPA's System 6 Recommendation identified the land within the M47 boundary as "constituting open space of regional significance". The M47 area includes the land known as "Bold Park".

The proposal to develop Lot 1 was assessed under the provisions of Part IV of the Environmental Protection Act 1986. The level of environmental assessment was set at Public Environmental Report (PER) by the Minister for Environment after he had upheld appeals on this point. The PER was released for a public review period closing on 1st February 1988. During this period 863 public and government agency submissions were received.

In addition to receiving written submissions, the EPA met with representatives of the proponent and a local action group, the Friends of Bold Park, to hear the respective points of view in person.

In carrying out its assessment of this proposal, the Environmental Protection Authority has undertaken the following:

- reviewed the potential environmental impacts of developing a residential estate on Lot 1 itself;

- reviewed the potential environmental impacts of a residential estate on the land covered by System 6 Recommendation M47; and

- reviewed the proposal in the context of other known pressures on the land covered by System 6 Recommendation M47.

In order to reach conclusions and make recommendations on the proposal, the Authority also re-examined the values identified for the System 6 M47 area and commented upon the importance of the System 6 study.

SYSTEM 6 AND THE M47 AREA

The EPA's System 6 Study resulted in a comprehensive set of proposals recommended to, and accepted in principle by, Government for the protection of areas for broad conservation and recreation purposes in the most densely populated region of the State. It is assumed that with population growth, pressures on these areas will increase. Accordingly, the Authority sees the implementation of the System 6 Recommendations to be of the greatest importance.

One of the principal general recommendations in the System 6 Report is concerned with the identification, setting aside and management of open space of regional significance. The values of such open space are contributed to in various ways by different parcels of land involved.

As well, the System 6 Report notes that "open space of regional significance consists of a great deal more than land formally set aside for the purpose. In a functional sense, it can include land in a wide range of tenure and condition." The Report adds "It may be managed for the retention of the natural vegetation, or developed as "green belts" or parks for recreation. It may consist of uncleared bush awaiting development or farmland forming man-made rural landscapes of considerable amenity value."

Rather than acquire and manage all appropriate land, the System 6 Study proposed an alternative. This is "to leave much of the land in question in private ownership while subject to planning or development constraints." The alternative is based on the premise that protection of natural values should be reflected in amenity and real estate values leading therefore to both private and public benefits.

The System 6 Report further recommends that open areas of regional significance should be identified as regional parks through the planning process and to include both public and private lands.

The System 6 Recommendations include over 60 which cover areas within which land is privately owned. Thus, the circumstance of Lot 1 being within the boundary of M47 is not unique. The Environmental Protection Authority's position regarding development proposals for such private property is that proposals must meet the intent and objectives of the appropriate System 6 Recommendations for the Authority to consider them to be environmentally acceptable.

Therefore, in order to assess this proposal, the Authority reviewed the significance and values of the System 6 M47 area especially with respect to the criteria of conservation, recreation and education. As a result of this review, the Environmental Protection Authority has reaffirmed the important regional values of the M47 area. In summary these are:

- the size of the M47 area, being comparable to Kings Park, is one of the largest remaining bushland remnants in the urban area of the coastal plain;

- the natural vegetation of the area is of comparatively high quality and includes areas of species at extremes of their known ecological range;

- the fauna, as with the vegetation, exhibit considerable diversity with bird species being particularly well represented;

- recreational use is based on regional rather than just local patrons; and

- because of the above, and the areas' location in the metropolitan area, its educational value is also rated highly.

ASSESSMENT OF THE PROPOSAL

The EPA considered in its assessment, that while the values of Lot 1 itself are not unrepresented elsewhere in the M47 area, development of the land would reduce the overall area of natural vegetation and introduce a range of of impacts associated with positioning housing adjacent to conserved natural

vegetation. In addition, the Authority considered that the proposal made no allowance for the fact that it was proposed for land encompassed by a System 6 Recommendation. This contrasted with other proposals affecting System 6 recommendations such as Buckland Hill M55 (approximately 30% open space proposed), Waterways Mandurah C50 (System 6 land transferred to the Crown free of cost) and Halls Head Canal project C50 (land identified in the System 6 Report set aside for open space). These points led the Authority to reach the following conclusions:

- the proposal as described in the PER makes no significant concession to the intent and objectives of the System 6 M47 Recommendation; and

- additionally, there are a number of individual impacts which, cumulatively, would unacceptably reduce the values of the M47 area.

THE ENVIRONMENTAL PROTECTION AUTHORITY CONCLUDES ACCORDINGLY THAT THE DEVELOPMENT AS PROPOSED IS NOT ENVIRONMENTALLY ACCEPTABLE.

As part of the assessment, the Authority considered the key elements of the proposal which, if changed, could have the potential to ameliorate the main environmental impacts.

In summary these were:

- limiting the housing development to an area south of the ridgeline which generally runs east-west across Lot 1;

- relocation of public open space to separate the housing development from the balance of the M47 land;

- ensuring buffers are included within Lot 1, and

- rearranging roads to the periphery of the site.

THE ENVIRONMENTAL PROTECTION AUTHORITY CONCLUDES THAT WITH THE IMPLEMENTATION OF THE ABOVE CHANGES, THE PROPOSAL WOULD BE MORE ENVIRONMENTALLY ACCEPTABLE.

REGIONAL PRESSURES ON THE M47 AREA

The proposal to develop Lot 1 may be viewed as one among a number of other impacts on the System Six M47 area which need to be addressed on a comprehensive basis.

Apart from the proposed housing development for Lot 1 Stephenson Avenue, the Authority has identified four other potential developments which cumulatively, would threaten the integrity of the M47 area. These additional four potential developments are:

- the Western Suburbs Highway, the reserve for which runs through the western portion of the M47 area. The impact of the construction of the Highway would cause a direct loss of vegetation and alienation of a considerable area of M47 to the west of the proposed Highway;

- the extension of Underwood Avenue: a westward extension of this road has been proposed through the M47 area. Similar impacts to the Western Suburbs Highway would result;

- development of Perth City Council Endowment Land, some 53 ha of 'urban' zoned land in the southern portion of M47. Similar impacts to those outlined for the development of Lot 1 would occur if this land was developed for housing; and

- the dangerous curve in West Coast Highway near the intersection with Challenger Drive. A realignment of West Coast Highway to remove this bend would reduce the values of the M47 area.

With respect to these four potential developments, the Environmental Protection Authority has reached the following conclusions:

THE ENVIRONMENTAL PROTECTION AUTHORITY CONCLUDES THAT:

- ANY PROPOSAL TO CONSTRUCT THE WESTERN SUBURBS HIGHWAY ON THE ALIGNMENT CURRENTLY RESERVED IN THE METROPOLITAN REGION SCHEME WOULD BE LIKELY TO HAVE A SIGNIFICANT AND ADVERSE IMPACT ON THE PRESENT ENVIRONMENTAL, RECREATIONAL AND EDUCATIONAL VALUES OF THE M47 AREA;

- THE EXTENSION OF UNDERWOOD AVENUE ACROSS THE M47 AREA TO WEST COAST HIGHWAY AS PROPOSED BY THE PERTH CITY COUNCIL WOULD BE LIKELY TO HAVE A SIGNIFICANT AND ADVERSE ENVIRONMENTAL IMPACT ON THE PRESENT ENVIRONMENTAL, RECREATIONAL AND EDUCATIONAL VALUES OF THE M47 AREA;

- ANY CONNECTION OF STEPHENSON AVENUE THROUGH THE M47 AREA TO WEST COAST HIGHWAY WOULD REDUCE THE ENVIRONMENTAL VALUES OF THE WHOLE AREA AS WELL AS THREATENING PLACES (WITHIN THE SOUTHERN SECTION) OF ENVIRONMENTAL AND ETHNOGRAPHIC VALUE;

- ANY PROPOSAL TO DEVELOP THE PERTH CITY COUNCIL ENDOWMENT LAND WITHIN THE M47 AREA FOR RESIDENTIAL PURPOSES, WOULD (IN A SIMILAR WAY TO THE IMPACT OF LOT 1) BE LIKELY TO REDUCE THE EXISTING ENVIRONMENTAL, RECREATIONAL AND EDUCATIONAL VALUES OF THE M47 AREA;

- RECOGNISING THAT A REALIGNMENT OF WEST COAST HIGHWAY MAY BE JUSTIFIED ON THE GROUNDS OF COMMUNITY SAFETY, IT WOULD NEVERTHELESS RESULT IN A REDUCTION IN THE OVERALL VALUES OF THE M47 AREA. HOWEVER, SHOULD A REALIGNMENT TAKE PLACE, THE SECTION OF LAND ALIENATED WOULD HAVE REDUCED VALUES AND COULD BE USED FOR RESIDENTIAL PURPOSES ON AN EXCHANGE BASIS FOR LAND WITHIN THE M47 AREA BOUNDARY CURRENTLY IN PRIVATE OWNERSHIP; AND

- EXAMINING THE OVERALL VALUES OF THE M47 AREA AND THE POTENTIAL FOR CUMULATIVE IMPACTS, IT WOULD BE UNABLE TO SUPPORT ALL OF THE FIVE PROPOSALS WITHIN THE M47 AREA ON THE GROUNDS THAT THEIR CUMULATIVE IMPACTS WOULD BE CONSIDERABLE AND ENVIRONMENTALLY UNACCEPTABLE.

Further to these conclusions the Authority has made specific recommendations on these issues. These are addressed later in this summary.

THE REGIONAL PARK CONCEPT - M46 AND M47

In both assessing the proposed development of Lot 1 Stephenson Avenue and in reviewing the potential cumulative impacts of additional developments which could affect the M47 area, the Authority reviewed the regional park concept of M47 and its contiguous area covered by Recommendation M46. The Authority has recommended that a Regional Park encompassing both the M46 and M47 areas be established to protect these open space areas of regional significance. Furthermore, the EPA has recommended that the Perry Lakes open space, the

Wembley Golf Course, the Army land and the Cottesloe Golf Course be managed in sympathy with the Regional Park and that Perth City Council reviews the boundary of Bold Park. The Regional Park should be managed through a suitable management arrangement including public representation.

The EPA considers that the assessment of Lot 1 Stephenson Avenue has been complex and difficult because of the importance of the land in a regional context and because this development is not the only proposal known to have potential impacts on the System 6 M47 area.

The Authority concludes that in the assessment of Lot 1 has become necessary to examine cumulative impacts in a broad regional context and in doing so believes there is a need for a Regional Park to be established.

The Authority has reached the following major conclusions and makes recommendations accordingly:

CONCLUSIONS REGARDING THE DEVELOPMENT OF LOT 1

CONCLUSION

THE ENVIRONMENTAL PROTECTION AUTHORITY CONCLUDES THAT:

- THE DEVELOPMENT AS PROPOSED MAKES NO SIGNIFICANT CONCESSION TO THE OBJECTIVES AND INTENT OF THE SYSTEM SIX RECOMMENDATION FOR THE AREA,
- THERE IS A NUMBER OF INDIVIDUAL IMPACTS WHICH CUMULATIVELY WOULD UNACCEPTABLY REDUCE THE CONSERVATION, RECREATION AND EDUCATION VALUES OF THE AREA; AND
- ON THIS BASIS, THE AUTHORITY CONCLUDED THAT THE DEVELOPMENT AS PROPOSED IS NOT ENVIRONMENTALLY ACCEPTABLE.

CONCLUSION

THE ENVIRONMENTAL PROTECTION AUTHORITY AUTHORITY BELIEVES THAT THE UNDESIRABLE IMPACTS OF THE PROPOSAL COULD BE AMELIORATED IF THE PROPOSAL WAS MODIFIED BY:

- LIMITING THE SUBDIVISION TO THE AREA SOUTH OF THE RIDGELINE WHICH GENERALLY RUNS EAST-WEST ACROSS THE NORTHERN SECTION OF LOT 1;
- RELOCATING PUBLIC OPEN SPACE TO SEPARATE THE DEVELOPMENT FROM THE BALANCE OF THE M47 LAND:
- ENSURE THAT BUFFER AREAS ARE WITHIN LOT 1, AND
- RE-ARRANGE SUBDIVISION ROADS TO THE PERIFERY OF THE SITE.

THE AUTHORITY CONCLUDES THAT WITH THE IMPLEMENTATION OF THE ABOVE CHANGES, THE PROPOSAL WOULD BE MORE ENVIRONMENTALLY ACCEPTABLE.

CONCLUSIONS AND RECOMMENDATIONS REGARDING THE M47 and M46 AREAS

RECOMMENDATION 1

. AS THE PROPOSED WESTERN SUBURBS HIGHWAY IS LIKELY TO HAVE A SIGNIFICANT AND ADVERSE IMPACT ON THE M47 AREA, AND ON THE UNDERSTANDING THAT THERE ARE REALISTIC ENGINEERING AND PLANNING ALTERNATIVES (WITHOUT REQUIRING MAJOR INTRUSIONS INTO THE M47 AREA), THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT THE PROPOSED HIGHWAY SHOULD BE GENERALLY REMOVED FROM THE M47 AREA.

. THE ENVIRONMENTAL PROTECTION AUTHORITY NOTES THAT THE WESTERN SUBURBS HIGHWAY STAGE II STUDY CONCLUDED THAT THERE WAS NO FURTHER BASIS FOR A NORTH/SOUTH HIGHWAY AND ACCORDINGLY THE AUTHORITY RECOMMENDS THAT THE FURTHER DETAILED STUDIES REQUIRED TO DETERMINE ROAD REQUIREMENTS FOR FUTURE NORTH/SOUTH VEHICULAR ACCESS IN THE LOCALITY OF THE M47 AREA, SHOULD BE UNDERTAKEN BY THE STATE PLANNING COMMISSION, PERTH CITY COUNCIL AND THE MAIN ROADS DEPARTMENT AS SOON AS POSSIBLE. IN DUE COURSE, IF THE WESTERN SUBURBS HIGHWAY IS CONSIDERED NECESSARY, ANY PROPOSAL SHOULD BE REFERRED TO THE AUTHORITY. THE AUTHORITY NOTES THAT MINOR INTRUSIONS INTO THE M47 AREA MAY BE NECESSARY IN ORDER TO PROVIDE FOR A FUTURE ALTERNATIVE FOR THE WESTERN SUBURBS HIGHWAY

CONCLUSION

THE AUTHORITY CONCLUDES THAT THE EXTENSION OF UNDERWOOD AVENUE ACROSS THE M47 AREA TO WEST COAST HIGHWAY AS PROPOSED BY THE PERTH CITY COUNCIL WOULD BE LIKELY TO HAVE A SIGNIFICANT AND ADVERSE ENVIRONMENTAL IMPACT ON THE PRESENT ENVIRONMENTAL, RECREATIONAL AND EDUCATIONAL VALUES OF THE M47 AREA.

RECOMMENDATION 2

. THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT THE EXTENSION OF UNDERWOOD AVENUE ACROSS THE M47 AREA TO WEST COAST HIGHWAY NOT PROCEED.

CONCLUSION

THE AUTHORITY CONCLUDES HOWEVER, THAT ANY CONNECTION OF STEPHENSON AVENUE THROUGH THE M47 AREA TO WEST COAST HIGHWAY WOULD REDUCE THE ENVIRONMENTAL VALUES OF THE WHOLE AREA AS WELL AS THREATENING PLACES (WITHIN THE SOUTHERN SECTION) OF ENVIRONMENTAL AND ETHNOGRAPHIC VALUE.

RECOMMENDATION 3

. AS THE AUTHORITY IS CONCERNED OVER THE POTENTIAL ENVIRONMENTAL IMPACT OF ROADS IN THE M47 AREA, THE AUTHORITY RECOMMENDS THAT NO SUCH ROADS BE PLANNED OR CONSTRUCTED WITHOUT FIRST BEING REFERRED TO THE ENVIRONMENTAL PROTECTION AUTHORITY.

CONCLUSION

THE AUTHORITY NOTES THAT THE SECTION OF LAND ALIENATED FROM THE M47 AREA BY A POSSIBLE REALIGNMENT OF WEST COAST HIGHWAY WOULD BE OF CONSIDERABLY REDUCED VALUE IN THE LONG TERM. ACCORDINGLY, THE AUTHORITY CONCLUDES THAT IT COULD BE USED FOR RESIDENTIAL PURPOSES ON AN EXCHANGE BASIS, FOR LAND WITHIN THE M47 AREA BOUNDARY CURRENTLY IN PRIVATE OWNERSHIP.

RECOMMENDATION 4

. THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT THE NECESSARY ENVIRONMENTAL AND ENGINEERING STUDIES INTO THE POSSIBLE REALIGNMENT OF WEST COAST HIGHWAY (IN ORDER TO RESOLVE THE DANGEROUS CURVE NEAR CHALLENGER PARADE) SHOULD BE UNDERTAKEN AS SOON AS POSSIBLE AND THE RESULTS REFERRED TO THE AUTHORITY FOR ASSESSMENT BEFORE ANY APPROVALS ARE GIVEN.

RECOMMENDATION 5

. THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT ANY LAND ULTIMATELY AGREED UPON TO BE EXCISED FROM THE M47 AREA (AND BOLD PARK) BY THE POSSIBLE REALIGNMENT REFERRED TO IN RECOMMENDATION 4 OF WEST COAST HIGHWAY, COULD BE USED FOR DEVELOPMENT BUT ONLY ON AN EXCHANGE BASIS FOR LAND WITHIN THE M47 AREA BOUNDARY CURRENTLY IN PRIVATE OWNERSHIP.

RECOMMENDATION 6

. IN VIEW OF THE POTENTIAL ADVERSE IMPACTS THE DEVELOPMENT OF PERTH CITY COUNCIL ENDOWMENT LAND WITHIN THE M47 AREA WOULD HAVE ON THE OVERALL ENVIRONMENTAL, RECREATIONAL AND EDUCATIONAL VALUES OF THE AREA, THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT THIS LAND SHOULD NOT BE SUBSTANTIALLY DEVELOPED, BUT PRIMARILY REMAIN AS PART OF THE LARGER REMNANT BUSHLAND OF THE M47 AREA. ENVIRONMENTALLY DEGRADED LOCATIONS WITHIN THE AREA (SUCH AS THE TURF FARM) COULD BE CONSIDERED FOR ACTIVITIES OR USES WHICH ARE COMPATIBLE WITH AND SYMPATHETIC TO THE VALUES OF THE SURROUNDING BUSHLAND AND IN ACCORDANCE WITH THE OBJECTIVES OF THE REGIONAL PARK. ANY DEVELOPMENT PROPOSALS BY THE PERTH CITY COUNCIL FOR THIS AREA SHOULD BE REFERRED TO THE ENVIRONMENTAL PROTECTION AUTHORITY FOR ASSESSMENT.

RECOMMENDATION 7

. THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT THE STATE PLANNING COMMISSION AND PERTH AND NEDLANDS CITY COUNCILS SHOULD INITIATE THE NECESSARY AMENDMENTS TO THE METROPOLITAN REGION SCHEME AND CITY PLANNING SCHEMES RESPECTIVELY, TO REFLECT ANY GOVERNMENT AND COUNCIL DECISIONS ARISING OUT OF THESE RECOMMENDATIONS.

RECOMMENDATION 8

THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT A REGIONAL PARK ENCOMPASSING THE M46 AND M47 AREAS BE ESTABLISHED IN ORDER TO PROTECT THESE OPEN SPACE AREAS OF REGIONAL SIGNIFICANCE AND TO FACILITATE MANAGEMENT AND USE FOR A RANGE OF PURPOSES INCLUDING CONSERVATION, RECREATION AND EDUCATION.

RECOMMENDATION 9

THE ENVIRONMENTAL PROTECTION AUTHORITY AUTHORITY RECOMMENDS THAT THE WEMBLEY GOLF COURSE AND THE PERRY LAKES OPEN SPACE AREA SHOULD BE MANAGED BY THE PERTH CITY COUNCIL IN SYMPATHY WITH THE VALUES OF THE LAND CONTAINED WITHIN THE SYSTEM 6 M47 AREA AND THE REGIONAL PARK CONCEPT (SEE FIG 11).

RECOMMENDATION 10

GIVEN THAT THE ORIGINAL AREA HAS HAD VARIOUS DELETIONS AND ADDITIONS OVER THE YEARS, THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT THE PERTH CITY COUNCIL SHOULD REVIEW THE BOUNDARIES OF BOLD PARK IN THE LIGHT OF CURRENT COMMUNITY EXPECTATIONS AND ANTICIPATED FUTURE NEEDS.

RECOMMENDATION 11

THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT AREAS CONTAINING NATIVE VEGETATION ADJACENT TO THE AUTHORITY'S M46 RECOMMENDATION SHOULD BE MANAGED BY THE COMMONWEALTH, THE NEDLANDS CITY COUNCIL AND THE COTTESLOE GOLF CLUB, IN SYMPATHY WITH THE VALUES OF THE LAND CONTAINED WITHIN THE SYSTEM 6 M46 AREA AND THE REGIONAL PARK. (SEE FIG 13).

RECOMMENDATION 12

THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT AS A MATTER OF PRIORITY, THE INVOLVED AGENCIES INVESTIGATE THE ESTABLISHMENT OF A SUITABLE MANAGEMENT ARRANGEMENT (INCLUDING PUBLIC REPRESENTATION) TO OVERVIEW AND CO-ORDINATE THE OVERALL MANAGEMENT OF THE REGIONAL PARK. IN THIS REGARD, THE ENVIRONMENTAL PROTECTION AUTHORITY IS PREPARED TO ASSIST WITH ANY INITIAL CO-ORDINATION REQUIRED.

CONCLUSION

IN VIEW OF THE CURRENT VALUES AND LIMITED LONGTERM VIABILITY OF THE M46 AREA SOUTH OF ROCHDALE ROAD, THE ENVIRONMENTAL PROTECTION AUTHORITY CONCLUDES THAT ITS DEVELOPMENT MAY BE ACCEPTABLE IF CARRIED OUT IN AN ENVIRONMENTALLY SENSITIVE MANNER. AREAS OF HIGHER CONSERVATION VALUE SHOULD BE PROTECTED IN AN OPEN SPACE SYSTEM. WHILST ANY DEVELOPMENT WOULD REDUCE THE AMOUNT OF REMNANT VEGETATION IN THE LOCALITY, IT MAY NOT BE SIGNIFICANT IF DECISIONS ARE MADE WITH RESPECT TO THE M47 AREA WHICH RESULTS IN PROTECTING THE EXISTING ENVIRONMENTAL VALUES OF THAT AREA.

RECOMMENDATION 13

THE ENVIRONMENTAL PROTECTION AUTHORITY RECOMMENDS THAT A PRIORITY MATTER FOR CONSIDERATION BY WHATEVER ARRANGEMENT IS SUBSEQUENTLY AGREED UPON TO MANAGE THIS REGIONAL PARK (RECOMMENDATION 8), IS TO UNDERTAKE A DETAILED REVIEW OF THE BOUNDARIES OF THE PARK AND TO MAKE A RECOMMENDATION ON THAT MATTER TO THE ENVIRONMENTAL PROTECTION AUTHORITY.

CONCLUSION

THE ENVIRONMENTAL PROTECTION AUTHORITY HAS CONCLUDED OVERALL, THAT IF THE RECOMMENDATIONS CONTAINED WITHIN THIS REPORT ARE ACCEPTED AND IMPLEMENTED, THE EXISTING VALUES OF THE M46 and M47 AREAS IN THE REGIONAL CONTEXT WILL HAVE BEEN ADEQUATELY PROTECTED AND THAT IN PARTICULAR, THE ESTABLISHMENT OF A REGIONAL PARK OVER THESE AREAS WILL BE A MAJOR ACHIEVEMENT TOWARDS SECURING, FOR FUTURE GENERATIONS, CONSERVATION AND RECREATION LANDS WITHIN THE INNER METROPOLITAN AREA.

Appendix I

ADVERTISEMENTS AND NEWSPAPER ARTICLES

CITY OF PERTH

BOLD PARK & ENVIRONS PER

PUBLIC SEMINAR TO DISCUSS FUTURE LAND USE AND MANAGEMENT

Mitchell McCotter and Ecoscape are preparing a Land Use and Management Structure Plan for Bold Park and surrounding lands for the City of Perth. In doing so, we wish to hear the views of the community.

In order to do this we will be holding a seminar on Saturday, 18 July 1992 between 12.30pm and 4.30pm at a venue in the City Beach area. This seminar will include small group workshops where you will be able to express your view on the future of the area.

Places are limited and will be allocated on a first-come first-serve basis. If you wish to attend we suggest you contact us before Friday, 10 July 1992. Prior to the seminar we will notify you of the venue and the program. To register your name or gain further information please contact:

Mandy Hill
Mitchell McCotter
Phone: 321-5200, Fax: 321-5262

CITY OF PERTH

BOLD PARK AND ENVIRONS PER

LAND USE AND MANAGEMENT STRUCTURE PLAN

Perth City Council has commissioned Mitchell McCotter and Ecoscape to prepare a conservation, land use and management structure plan for an area within the City of Perth which includes Bold Park and environs. The study will investigate the conservation, recreation and social value of the area and make recommendations on its future use and management.

The study team would like to hear the views of any persons or groups who have an interest in the area. An information newsletter providing full details of the study has been prepared and is available from:

Mandy Hill
Mitchell McCotter
P.O. Box 144
WEST PERTH WA 6872

Phone: 321-5200
Fax: 321-5262

Time to air your Bold ambitions

Bold Park is to come under the scrutiny of a firm of West Perth environmental consultants for the next eight months.

Perth City Council will pay Mitchell McCotter $58,000 to prepare a plan for the best management and use of the City Beach park.

The study area, which also includes some land south of the park and west following the City of Perth boundary, is one of the biggest areas of bush close to the city.

It is enjoyed by bushwalkers, horse-back riders, joggers, picnickers and archers.

Most of the area is zoned for parks and recreation and a small section for residential.

Last year the group Friends of Bold Park, successfully lobbied the PCC to incorporate a 53ha chunk of council-owned land, just south of Bold Park into the park.

Mitchell McCotter consultant David Snashall said the study would cover conservation, recreation, visual, scientific, education, social and economic issues.

Once these had been assessed the consultants would recommend a strategy for preservation, or if appropriate, development.

The study will also suggest new boundaries of Bold Park, how the park be managed and by whom.

The Environmental Protection Authority (EPA) has issued guidelines for the study which will be open for public comment when finished.

This study is the second stage of a process started by the City of Perth in 1990; the first stage is the recently released report on straightening the dangerous bend in West Coast Highway at City Beach. This is open for public comment until May 1.

Mitchell and McCotter would like to hear from any person or group who use the park or value it.

Later in the year a workshop will be held encouraging people to debate options for the study area.

Mitchell and McCotter are at 981 Wellington Street in West Perth and their telephone number is 321 5262.

The consultants won the tender from four other companies. Quotes ranged from $90,000 to their price of $58,000.

SUBIACO POST

14-4-92

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Perth considers its Bold Park options

By NATALIE O'BRIEN

THE Perth City Council is investigating development and conservation options for the 490ha Bold Park, the largest remaining piece of bushland in the Perth metropolitan area.

The environmentally sensitive Bold Park, a coastal strip of bushland with views to the Indian Ocean and the city skyline, is estimated to be worth several hundred million dollars.

It is also a conservation reserve used by hundreds of nature lovers and was listed by the Environmental Protection Authority in its 1981 System Six report as a valued area.

A study recently commissioned by the council will canvass the option of developing a residential subdivision on a portion of the land.

But any sell-off of part of the land may not reap the expected windfall for council's treasury.

Although the land already has a sector zoned for development, a condition of the original land grant to the council will stop the cash leaving the coastal area.

The land was granted to the council under the City of Perth Endowment Land Act 1920 on condition any income

Assessment guidelines

from the sale of the land must be re-invested in the same coastal strip, which incorporates Bold Park and its neighbouring suburbs of City Beach and Floreat Park.

A council spokesman said any proceeds from the sale of the land could not be frittered away in other areas of council spending.

Environmental consultancy Mitchell McCotter has been commissioned to carry out a $60,000 Public Environmental Review of the Bold Park area.

At the end of the eight-month study, the council wants a blueprint for the future of the 490ha property and a recommended management structure.

The review's recommendations will be open for public comment.

It is expected the large parcels of land already zoned for parks and recreation will be preserved.

In fact, last year the council agreed to extend the Bold Park reserve by 53ha, extending into its own possible development site, which it has previously indicated may never be used.

Mitchell McCotter's West Australian manager Mr David Snashall said Bold Park was a large economic resource that could generate a substantial amount of money, although development was only one possibility and not a certainty.

Mr Snashall said the report would study the area and identify which areas, if any, could be developed without detrimental effects on the native flora and fauna.

The study would also establish guidelines for the council's assessment of future development proposals.

The largest strip from the northern boundary of the park is presently zoned for parks and recreation, although a retirement complex, a high school and a disused drive-in site are located within it.

The southern side of the parkland, part of which holds a parcel of land zoned residential, borders the troubled Knightsbridge residential subdivision proposed by Bond Corp.

Lobby groups have opposed past developments in the Bold Park region and the EPA has rejected two proposals by Bond Corp for its Knightsbridge plan.

Mr Snashall in the 490ha Bold Park coastal strip . . . a large economic resource that could generate a substantial amount of money — Picture: KEN MATTS

THE AUSTRALIAN

22-5-92

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Consultants commissioned for Bold Park review

As part of its investigations into the future of Bold Park and adjoining lands, Perth City Council has commissioned consultants Mitchell McCotter to prepare a Stage 2 Public Environmental Review (PER).

The purpose of this report will be to prepare a land use and management plan for the study area. It will investigate the range of ecological, recreational and social values provided in the study area, and the development proposals that have been put forward in recent years. These include a major road reserve that runs through the study area and development proposals for active recreational facilities, educational facilities and tourism facilities.

The report will make recommendations on appropriate land uses including conservation and provide a management structure for the study area.

The consultants are keen to hear from organisations or persons who make use of the study area. They have prepared a newsletter which provides full details of the study, and how the community can be involved.

It is available by calling Mitchell McCotter on 321 5200.

Study on Bold Park use

PERTH City Council has commissioned two environmental consultants to prepare a future land use study of one of its biggest bushland areas.

Planning, environmental and engineering consultants, Mitchell McCotter and landscape ecologists Ecoscape will develop a land-use and management-structure plan for Bold Park, which stretches from West Coast Highway and The Boulevard in City Beach to Perry Lakes.

The 500ha park, mainly owned by the council, was identified as having conservation value in a Department of Conservation and Environment report in 1981.

The area is zoned for parks and recreation as well as residential uses.

The study, to be conducted under Environmental Protection Authority guidelines, will recommend appropriate land uses for different areas of the park.

Appendix J

SUMMARY OF COMMUNITY SUBMISSIONS
TOTAL SUBMISSIONS 41

Comments regarding development:

a. Opposition to the realignment of West Coast Highway (7).
b. Opposition to the proposed Western Suburbs Highway (5).
c. Opposition to the development of Lot 1 Stephenson Avenue (Knightsbridge) (3).
d. Opposition to urban development on Mt. Claremont bushland (5).
e. Opposition to the Rochdale realignment (3).
f. Opposition to any development proposal on existing bushland (17).

Comments regarding conservation:

a. Support Regional Park or System Six status (8).
b. In favour of rehabilitation of pine plantation (3).
c. In favour of retention of pine plantation (2).
d. Increased need for flora and fauna conservation (9).
e. Comments upon boundary change retention of existing expansion and use of corridors (4).
f. Need for continued use for scientific and educational purposes (5).
g. Need for rehabilitation of degraded areas (6).

Comments regarding recreation:

a. Retainment of walking trails and/or establishment of nature trails (6).
b. Reintroduction of orienteering (2).
c. Those in favour of retention of horse riding (4).
d. Those opposed to horse riding (2).
e. Those opposed to the use of trail bikes (2).
f. Those in favour of retaining archery (1).

Comments regarding management:

a. Need for increased facilities (3).
b. Need for better management controls (4).
c. Change in usage levels (2).
d. Need for better fire management (3).

Origin of submission and primary theme:

R. Lutterell & C. Somas	for riding use
E. Vis	revegetation of pine plantation
J. Crandell	general opposition with revegetation & nature conservation
N. Brockman	no development
J. Price	preserved as System Six Report
P. O'Connor	no Knightsbridge
J. Crandell	retain pine plantation facilities
R. Fernie	no development
L. Moon	no development
S. Crannigan	preserved as System Six Report
Orienteering Association	walking, re-establish orienteering
Perth Bushwalkers	no development, walking, conservation, horse riding
D. Beattie	no development, as System Six Report
S. Loney	no horse riding or trail bikes
D. Perret	no development, as System Six Report
A & S Martino	dog exercise area
RX Parkin	no Stephenson Highway, Oceanic Drive
WSHAG	no Stephenson Highway, Oceanic Drive
R. Smart	tourism, System Six Report, no development
Wildflower Society	as System Six, conserve flora and fauna
CCGS	education and scientific use, playing fields
RX Parkin	no development, Stephenson Avenue, West Coast Highway
M. Hodgson	walking, conserve flora and fauna
Mt. Claremont Bird Banding Group	bird banding
D. Gudgeon	no Stephenson Highway
Local Plants Group	corridors, vegetation and soil description
RAC	road reserves
Bond Corporation	Knightsbridge
WA Museum	education, scientific
Scout Association	community care

YMCA	survival of archery location
L. Crackel	comprehensive horse/bridle establishment
CBSHS	education, flora/fauna
D. Downs-Storey	pro horse riding, walking
J. Orsini	threatened species
V. Glauser	no development
C. Bennett	recreational value
Tree Society	species list, rehabilitation area
Kings Park Board	management options
L. Lightfoot	flora and fauna, conservation, System Six
Prestage Family	no development

Appendix K

PROJECT TEAM

The team involved in preparing this PER including the following:

❑	Mitchell McCotter:	Paul Mitchell - Project Director David Snashall - Project Manager Stephen Samuels - Noise Robert Bullen - Noise Daniel Graham - Traffic Planning Richard Gordine - Environmental Scientist Keryn James - Planner Mandy Hill - Secretary
❑	Ecoscape:	David Kaesehagen - Flora/Fauna Ben Carr - Flora/Fauna
❑	Dunnart Mapping:	Judit Bonisch - Graphics