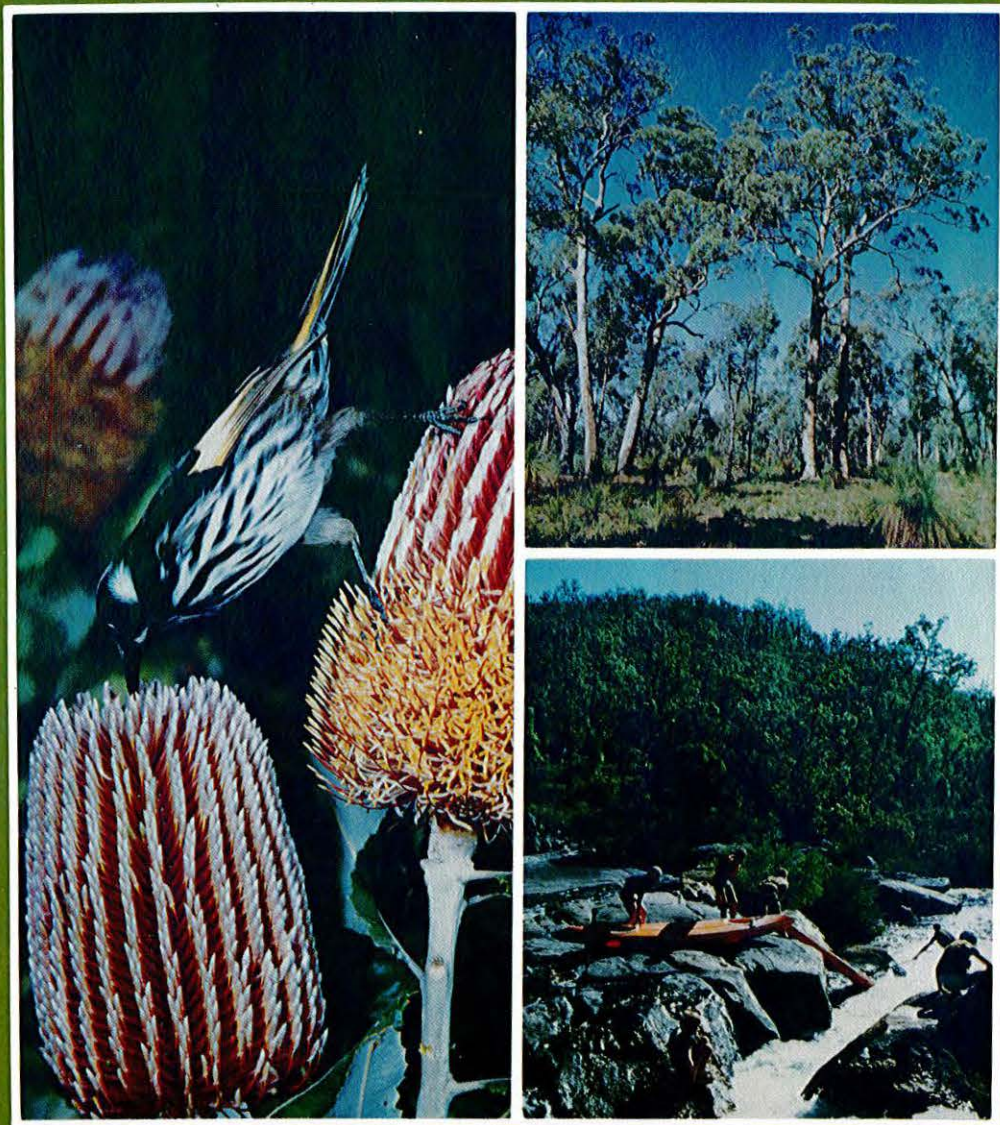


THE DARLING SYSTEM

WESTERN AUSTRALIA

Proposals for Parks and Reserves



The System 6 Study Report

to the
Environmental Protection Authority

Report No 8
April 1981



Department of
Conservation and Environment



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FOREWORD

For the past four years, the System 6 Study has been engaged in reviewing the requirements for National Parks, nature reserves and major recreational areas in the Darling System. The System 6 Committee has recently presented the Study's findings in a Report to the Environmental Protection Authority and it is now available for comment by the public. At this stage the Report does not necessarily reflect the views of the Environmental Protection Authority and therefore has no official endorsement.

It will be popularly known as the System 6 'Green Book' following the precedent established by the Conservation Through Reserves Committee reports on the other eleven Systems.

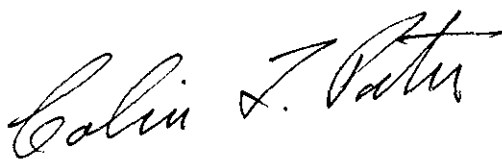
The Report is available for public scrutiny in the Department of Conservation and Environment's Information Centre, the State Reference Library, the Parliamentary Library, public libraries and local council offices within the region. A limited number of copies are available from the Department of Conservation and Environment.

Before making recommendations to the Government the Environmental Protection Authority will review the Report and the comments made on it, with advice from the System 6 network of committees.

The System 6 Study has broken new ground in a number of ways. The committees conducted far broader investigations than those made previously by the Conservation Through Reserves Committee. Public submissions were invited and these have been incorporated in the Report to a significant extent. The Report proposes important new ways of balancing idealistic and practical considerations, and reconciling conservation and development.

The Environmental Protection Authority wishes to thank all those who helped in the preparation of the Report, particularly members of the committees which reported to the System 6 Committee. A dedicated secretariat within the Department of Conservation and Environment has virtually lived and breathed System 6 for the past four years; for some of them it has occupied a significant part of their working lives; our gratitude goes to all of them for their patience and commitment.

A useful companion volume containing data assembled during the System 6 Study has been published as the 'Atlas of Natural Resources, Darling System', now available at major bookstores. The Environmental Protection Authority sees the publication of this Report and the calling for public submissions as important steps in conservation planning in Western Australia.



COLIN PORTER
CHAIRMAN
ENVIRONMENTAL PROTECTION AUTHORITY

December 1980.

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SUMMARY

Previous studies in Western Australia aimed at securing adequate provision for nature reserves, national parks and public recreation in natural surroundings are reviewed, and the implications derived from experience with them are presented as a background to the work of the seven committees which participated in this Study.

The natural features of the Darling System, often known as System 6, are described in terms of their conservation and recreation values. The problems involved in maintaining those values while providing for other land uses of importance to the community in general and for commerce and industry in particular, are discussed.

The stated aims of the System 6 Study were to identify areas within and near System 6 which are desirable for national parks, nature reserves and major associated recreation areas. To achieve this, the Study took two approaches. Firstly, it considered proposals for reservation under the Land Act, and objections raised to those proposals in respect of other uses affected by them. It also examined, in the same way, provisions for conservation and outdoor recreation in State Forest, where lies the greatest opportunity for these purposes in the System 6 area. Secondly, it considered provision for protection of natural areas and for outdoor recreation in the countryside generally, i.e. outside of land owned by the State. This led to a consideration of the adequacy of town and country planning procedures in that context. The general principles developed, and the general recommendations based on them, are presented in Chapters 1 to 7 of the Report, while Chapters 8, 9 and 10 describe their detailed application to specific localities.

In respect of proposals for Land Act reservation for conservation or recreation, or for setting aside areas of State Forest for those purposes, the main objections identified were from interests and authorities concerned with water supplies, and with the potential for mining or extractive industries. While the need to protect the areas concerned is accepted, the value to be attached to the competing uses, now or in the future, is often not known. The recommendations are intended to provide for protection while postponing decision by the Government on the final use of all or part of the areas in question until adequate information is available. In the case of Reserves, this may be done by vesting jointly in the appropriate Ministers, and declaring the Reserve for the three purposes of conservation or public recreation, water supply and mining. In State Forest, the main need was seen as being that of increased security of purpose of the Management Priority Areas for conservation and recreation already established. In view of the conflicts arising if these same areas contain bauxite or other valuable ores or minerals, the Study concluded that security for the purposes of conservation and recreation of the MPAs should be achieved by regulation under the Forests Act. However, it was further concluded that this should take place after further review of the location and boundaries of the MPAs in relation to effects on mining potential.

Recommendations

- p.22 1 (i) Where, because of mineral potential and water supply considerations, significant objections are raised to proposed Reserves for conservation or recreation, the land should, for the time being, be jointly vested in the appropriate Ministers, and the declared purposes should be 'conservation' and/or 'recreation' together with 'water' and 'mining'.
- (ii) A high priority should be given by the Geological Survey of Western Australia to an early evaluation of the mineral potential of areas proposed for reservation, taking into account other possible supplies.
- (iii) The Government should, if necessary, effect changes in legislation to enable multi-purpose vesting of Reserves, for conservation, water and/or mining, to be achieved.
- (iv) Where an objection is based on water supply requirements alone, joint vesting is unnecessary, but 'water' should be included as a declared purpose of the Reserve.
- (v) Management authorities of established Reserves should ensure that the Environmental Protection Authority is made aware of any activities on adjacent land having actual or potential effects on the conservation or recreation value of the Reserves.
- p.25 2 (i) The concept of specific areas of forest being delineated as Management Priority Areas for conservation or for recreation should be supported by Government.
- (ii) Where there is conflict between mining and these Management Priority Areas, then every endeavour should be made to resolve the conflict so that the value of the Management Priority Area for its primary purpose of conservation or recreation is not diminished.

- (iii) If this resolution of conflict necessitates an adjustment of boundaries or the relocation of such a Management Priority Area, then this may be allowed to take place, provided it can be done without diminishing the value of the Management Priority Area for its primary purpose.
- (iv) Any proposal to utilise a conservation and recreation Management Priority Area in a manner which affects the value for its primary purpose, and where satisfactory relocation is not feasible, should be considered by Government at the highest level and only then after there has been a thorough and rigorous study by authorities with responsibility in the matter of the value of the Management Priority Area and of the consequences of such utilisation.
- (v) The Darling Range Study Group and the Mining and Management Planning Group should proceed as a matter of urgency to review alternative land use options in the Darling Range and to address the question of the conflict between mining and the Management Priority Areas for conservation or for recreation so as to resolve such conflict.
- (vi) On resolution of such conflicts, the areas to be set aside as Management Priority Areas for conservation or recreation should be appropriately named, and such names and purposes of management formalised using the regulatory powers contained in the Forests Act, 1918-1976.

Despite a number of public submissions, the Study is not able to recommend changes in policy which would allow a greater recreational use of water supply catchments and reservoirs at present, but recognises that this may be required in the future when justified by demand. It is recommended that investigations should be carried out which may provide the basis for policy changes which will permit greater access and more intensive use in the future, if justified by a sufficient level of demand.

Recommendations

- p.26 3 (i) The State should initiate research on catchment and reservoir dynamics with a view to relaxing restrictions in the future through intensified management and controls, when this is justified by growing demands.
- (ii) Present policies on recreational use of reservoirs and catchments should remain unchanged for the present, other than in the Mundaring Weir Catchment, where the Public Works Department should consider allowing increased public access as soon as possible, for a trial period of five years during which studies of recreational usage and water dynamics should be carried out.
- (iii) The State should promote research on recreational demand patterns, which will assist in evaluating proposals for future increased recreational access to catchments and reservoirs.

The need for service corridors for powerlines, drainage and water supply installations, communications, etc. and their maintenance are not considered to be insuperable obstacles to the establishment of new Reserves, though care is required in their location and use in order to protect conservation and amenity values.

Recommendations

- p.27 4 (i) In exercising powers of access to services in conservation and recreation Reserves the public utility authorities should ensure that environmental damage is minimised and that full co-operation with the planning and management authorities is established.
- (ii) When planning new works which may affect conservation and recreation Reserves or areas recommended for such reservation, the public utility authorities should consult at an early stage with the planning and management authorities, or the Environmental Protection Authority, as appropriate.
- p.28 (iii) Planning authorities should consider the use of the multiple purpose-multiple vesting strategy proposed in Recommendation 1 (i) as an interim means of protecting land with sufficient conservation value, which also has mineral or water supply potential.

Town and country planning procedures are recognised as playing an important role in landscape conservation in general, since they enable land to be formally set aside as regional open space for public recreation. Such areas can provide links and access ways between State-owned forests and Reserves, and are a recreational resource for the use of the people of the region as a whole, rather

than of one locality. The absence of planning machinery for this purpose outside the Metropolitan Region is recognised as a serious deficiency, not only in System 6, but in the State as a whole. The Study emphasises the need for the co-ordination of open space planning and management, and for investigations of some open space concepts which are new to Western Australia. One of these is the concept of regional parks, the creation of which would provide for a variety of outdoor recreation activities within a largely natural setting. Much existing open space could be incorporated into regional parks.

Other planning concepts considered offer alternatives to the total acquisition of private land for open space. There is a need for special arrangements for co-ordination and for technical advice, so that privately owned land with significant conservation or scenic value can be managed for its protection, whether by State agencies, local authorities or private land owners as appropriate.

Recommendations

- p.36 5 (i) There should be an investigation into legislative means of achieving planning and conservation aims without necessitating public acquisition of land. Ideally, this could be carried out within the organisational framework proposed in Recommendation 5 (iii) below.
- (ii) The Government should recognise the need for a State-wide policy for open space planning and management, and the need to provide adequate funding for these purposes.
- (iii) A secretariat, with the responsibility for co-ordinating open space planning and management, should be established as a matter of urgency.
- (iv) The Town Planning Department should undertake an early study of any necessary changes to the Town Planning and Development Act, 1928-1977, in order to provide for the management of private open space by local authorities, as part of a Town Planning Scheme.
- (v) The Department for Youth, Sport and Recreation should undertake the production of a comprehensive State-wide Recreation Areas Strategy Plan, to include a survey of existing recreational resources and their management, and the development of policy recommendations on future provision, co-ordination, planning and management of recreation, in relation to open space.
- (vi) The Recreational Areas Strategy Plan should therefore include:
- a survey of the recreational resources available, particularly within System 6;
 - an assessment of current and likely future recreational demand.
- (vii) The secretariat, as soon as possible after establishment, should arrange for a number of specific tasks to be carried out, including the following:
- investigation of ways to provide for resort development, integrated with open space;
 - review of public health regulations covering camping, so that provision may be made for informal bush camping areas and low cost caravan and tent camping areas along scenic routes;
 - investigation of ways to provide more low cost accommodation such as youth hostels and dormitory style facilities;
 - compilation of an inventory of caves within System 6, together with recommendations for their use and management;
 - investigation of ways by which historic sites could be managed in conjunction with recreational facilities, in order to utilise fully their value to the public.

Town and country planning procedures are the main avenue for the protection of natural areas and recreational values outside of existing and proposed Reserves, State Forest and water catchments. Broad indications of the major features and regions to which the planning concepts outlined and the planning procedures recommended are applicable are given.

Recommendations

- p.39 6 (i) Selected portions of the Darling Scarp area, as shown in Figure 6.1, should be classed as regional parks and planning developed according to that concept.
- (ii) The Environmental Protection Authority should endorse the Metropolitan Region Planning Authority's recommendation to 'reserve' portions of the Darling Scarp for Parks and Recreation under the Metropolitan Region Scheme.

- (iii) The operators of existing and new quarries on the Darling Scarp should be required to present quarrying proposals, including an outline of options for the final use of the quarries when extraction is complete, to the responsible authorities. The option selected should be implemented when planning for future operations, and for use of the quarries following closure.
 - (iv) Further subdivision of land on the Darling Scarp should be restricted.
 - (v) Detailed land use planning should be carried out for the portion of the Darling Scarp indicated in Figure 6.1. This should aim at minimising the visual and other impacts of quarrying and other land uses on conservation, recreation and scenic values, and on each other. It is recognised that such planning is proceeding with respect to aggregate resources.
- p.40 7 (i) The Government should recognise the unique combination of attractive scenery and water supply potential of the northern Darling Range, and the need for overall protection and management in the area.
- (ii) The Metropolitan Region Planning Authority, local authorities and water supply authorities should collaborate to develop a plan for the northern Darling Range which takes into account the need for conservation of both the landscape and the water resource.
 - (iii) In the northern Darling Range, consideration should be given to the delineation of regional parks, landscape conservation areas, and pathway systems, and the classification of the river courses according to the wild and scenic rivers concept.
- p.41 8 (i) The Government should recognise the unique combination of attractive scenery and water supply potential of the eastern Darling Range, and the need for overall protection and management in the area.
- (ii) Local authorities and water supply authorities should collaborate, to develop a plan for the eastern Darling Range, which takes into account the need for conservation of both the landscape and the water resource.
 - (iii) In the eastern Darling Range, consideration should be given to the delineation of regional parks and landscape conservation areas, and the classification of the river courses according to the wild and scenic rivers concept.
- p.41 9 (i) The Government should recognise the need for regional planning to protect the conservation, recreation and other values of the southern Swan Coastal Plain beyond as well as within the Metropolitan Region.
- (ii) Planning procedures should take account of the potential for the establishment of regional parks on the southern Swan Coastal Plain, and the application of the conservation buffer zone concept for the protection of sensitive areas, particularly wetlands, estuaries and inlets, and the coastal zone.
- p.43 10 (i) The Metropolitan Region Planning Authority should proceed, through its planning processes, with the identification of linear parks as a type of regional park.
- (ii) Riverine linear parks should extend along at least one bank of all river systems with year round water, in such a way as to provide continual access. The width of the park should be sufficient to allow easy pedestrian access. Bearing in mind vegetation and terrain, this may vary from five metres upwards and should include occasional larger foreshore reserves, suitable for picnics and passive recreation generally.
 - (iii) Outside the Metropolitan Region, linear parks should be planned as part of the proposed system of regional parks.
 - (iv) In such planning, the responsible authorities should ensure that the views of the communities affected are taken into account.
- p.43 11 (i) The Environmental Protection Authority should ensure that the need to protect the environment of Cockburn Sound, and the community's recreation requirements there, are given proper recognition in the future management of the Sound and Garden Island.
- p.44 12 (i) The Environmental Protection Authority should ensure that results of the study of the Peel Inlet and Harvey Estuary are made available to planning and management

authorities as soon as possible, and that the implications for conservation and recreation are fully considered.

- p.45 13 (i) The recommendations of the Wetlands Advisory Committee are endorsed, and should receive careful consideration by planning and management agencies.
- (ii) In planning for the use of wetlands in System 6, a high priority should be given to the protection of their conservation value.
- (iii) Wetland conservation areas should contain the water and the fringing vegetation, and should have an appropriate buffer zone around the wetland margin.
- (iv) Wetlands should be used for other purposes such as mining only in such a way as to minimise long term effects on conservation values.
- p.46 14 (i) Those responsible for coastal lands should prepare and implement detailed management plans for specific areas, defining management procedures for locations which are heavily used and clearly identifying areas to be protected. The overall aim should be to maintain and even enhance the natural character of the coast.

Chapter 7 contains an attempt to assess the overall effects of the recommendations of the Study. A total area of 624 km², or 2.4% of the area of System 6 is proposed for addition to the 2.1% in existing Land Act Reserves. A further 261 km², or 1.0% of the area, has been identified as freehold land with conservation or amenity value, and worthy of protection through planning procedures. If all recommendations are implemented, then the total area dedicated in some way to parks and reserves in System 6, including the MPAs, will rise to 3807 km² or 14.6% of the land area. More than half of this, therefore, lies within State Forest. If the identified freehold areas are not included, then the proportion falls to 13.6%, which is not regarded as excessive.

The extent to which proposals for reservation appear to conflict with mining and extractive industries is approximately assessed and tabulated.

Finally, the implications of the increase in land areas which need to be managed for conservation and recreation are considered. An important consequence will be the need for additional staff and other resources required for management.

All the areas identified will require not only management, but also, in some cases, careful monitoring of the effects on them of other land uses.

Recommendations

- p.47 15 (i) A single government agency should be responsible for assembling data on the extent of natural areas, the condition of natural vegetation and the rates of clearing for various purposes.
- p.49 16 (i) The Government should recognise the increased responsibilities of the National Parks and Wildlife Authorities, the Forests Department, other government departments and many local authorities, arising from the recommendations, already accepted for reserves in other Systems, and the further responsibilities that would be incurred by the creation of new reserves within System 6.
- p.57 17 (i) Management and monitoring programmes should be developed in consultation with one or more of the Departments of Conservation and Environment, Fisheries and Wildlife, Public Works, and the Metropolitan Water Board, as appropriate.
- (ii) In respect of proposed works affecting natural areas, the matter should be referred to the Department of Conservation and Environment.

Recommendations for specific localities follow the general principles developed earlier. Chapter 8 briefly recapitulates the strategies which form the basis of the recommendations, and indicates how and to which localities they have been applied.

For each locality, the land affected by recommendations is described in Chapters 9 and 10. Its location is given, landforms, soils, flora and fauna are briefly described, and its status in terms of tenure, ownership, and the extent of its commitment to particular uses or purposes is outlined. Detailed recommendations then follow.

General Considerations and Proposals

Chapter 1

INTRODUCTION

1.1 General

The Darling System, the area often referred to as System 6, consists of Perth, its hinterland, and surrounding agricultural land and State Forest. It contains more than three-quarters of the State's population and extends from the Moore River in the north to the Blackwood River in the south and inland from the coast for about 80 kilometres, as shown in Figure 1.1.

This Report is the culmination of a series of studies initiated following the Report of the Western Australian Sub-committee of the Australian Academy of Science in 1962¹. That report took account of the rapid rate at which natural areas were at that time being cleared for agriculture, and highlighted the need for a set of reserves representative of 'all major communities of natural wildlife and scenery types in Western Australia'. Subsequently, some new reserves were created, and several more were recommended by a Reserves Advisory Council, appointed by the State Government in 1969. In 1972 the newly established Environmental Protection Authority (EPA) saw the provision of a representative set of reserves in natural areas as one way of carrying out its duty of enhancing the quality of the environment, and it appointed the Conservation Through Reserves Committee. The Committee, which first reported² in 1974, divided the State into twelve Systems or regions (Figure 1.2), and has since made recommendations for eleven of them. The exception was the Darling System, or System 6, which the Committee felt should be the subject of a more comprehensive study than they could provide.

The Conservation Through Reserves Committee's Reports on the eleven other Systems were made available for public comment and criticism, and the public's responses were taken into account by the EPA when it developed recommendations for ten of them, which were presented to and later endorsed by Government. The final Report for System 7 (Kimberley System) has now been considered by the EPA, and its recommendations are under consideration by the Government.

Sixty per cent of the recommendations endorsed by Government have now been implemented, while a further fifteen per cent are well advanced. Delays have arisen when proposals for reservation seemed to be in conflict with possible future uses such as agriculture, mining, quarrying or water supply. The balance of the recommendations have not been fully implemented for a number of reasons, one of the most important being the lack of funds to purchase recommended areas of land when they became available. Also, shortage of staff and operating funds has prevented the carrying out of biological surveys and the assessment of mineral potential of a number of areas where this had been recommended as a necessary condition, prior to complete implementation.

While the main thrust of the Conservation Through Reserves Committee's Reports has received significant general support, there were objections to some of the Committee's proposals. Conservation groups in the community felt that the Committee had not gone far enough in recommending areas of land for reservation, while industrial interests and property owners feared limitations on their freedom of action or on the availability of land and other resources. Difficulties were also foreseen by State and local government authorities having land and water resource planning and management responsibilities, and concerned with promoting development or ensuring the availability of mineral and other resources. Problems arose partly through conflicts with statutory responsibilities and prior commitments made by the State, and partly due to the likely legal and administrative difficulties in implementing the recommendations.

The main approaches of the System 6 Study have been to identify *firstly*, those areas which should be set aside within the System for conservation and recreation purposes, through reservation under the Land Act³, and *secondly*, those areas where planning and management should permit and encourage protection of conservation and scenic values and increase public access to and enjoyment of them.

Although the System 6 Study is not a total land use study and was never intended to be, it has gathered a great deal of information which would be highly relevant for such a purpose in the future. The System 6 Study's primary purpose is the selection of areas of land for national parks, nature reserves and major associated recreation resources. The use of land for other purposes has been considered only in terms of the effects our proposals may have on these uses.

The Study has identified a large number of areas which are still in a natural or near natural state, which appear to be suitable for nature reserves and national parks, and are available for those purposes without significantly affecting alienated land. We have supported the Forests Department's policies on conservation and recreation in State Forest. But, in addition, we consider that conservation and amenity values need to be protected on land not owned and managed by the

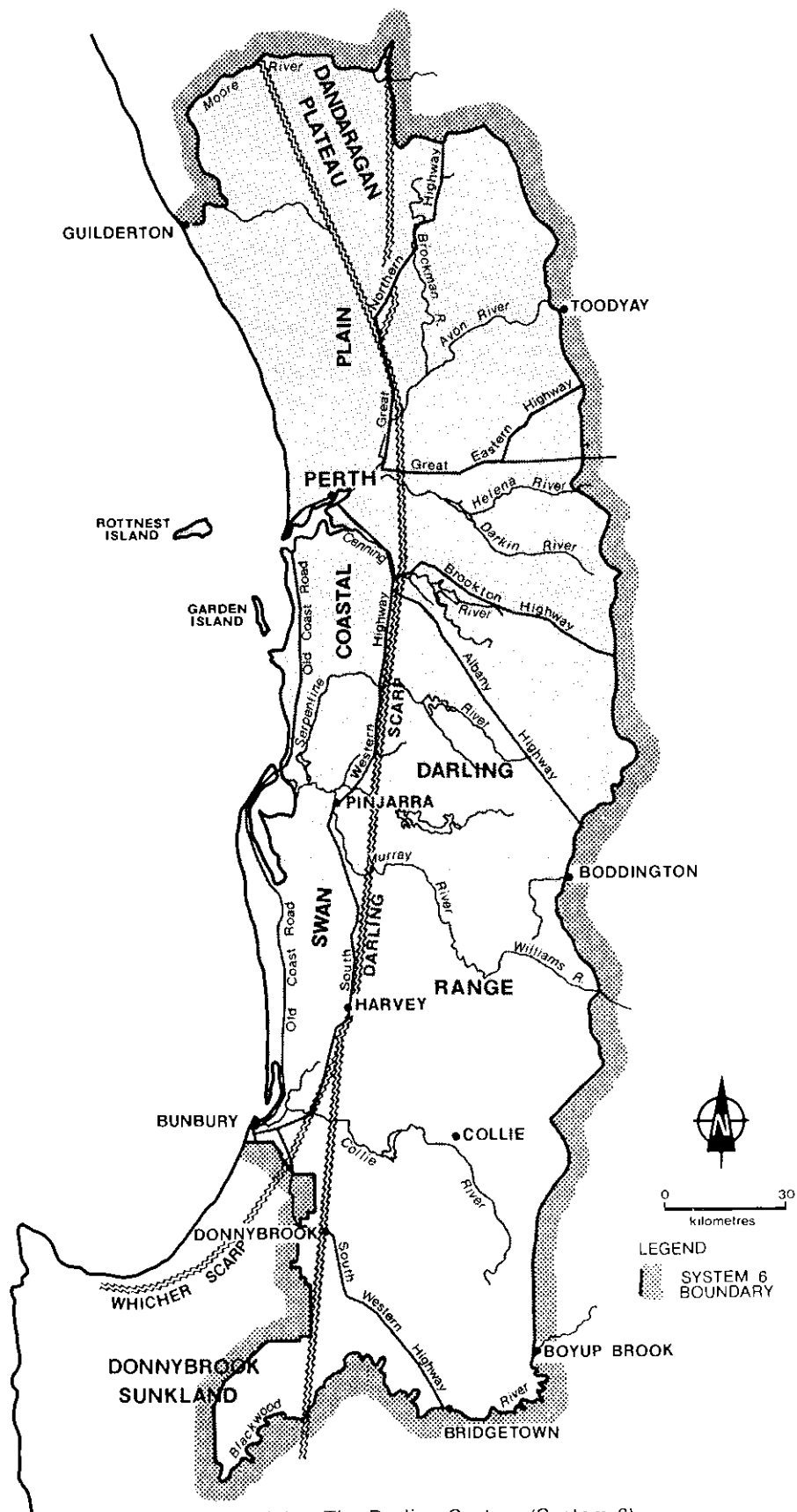


Figure 1.1 The Darling System (System 6)

State, and for this purpose have proposed public planning measures, rather than merely recommending that specific areas be set aside as Land Act Reserves.

The Darling Range Study Group, set up by the Government in 1979, will make a comprehensive study of land use in the Darling Range, which is only part of the System 6 area. The Study Group reports to Government on land use policy options and the co-ordination of land use planning by the various departments and other agencies involved. The relevant recommendations from the System 6 Study, and the submissions and reports arising from it will be a valuable input to the work of the Darling Range Study Group.

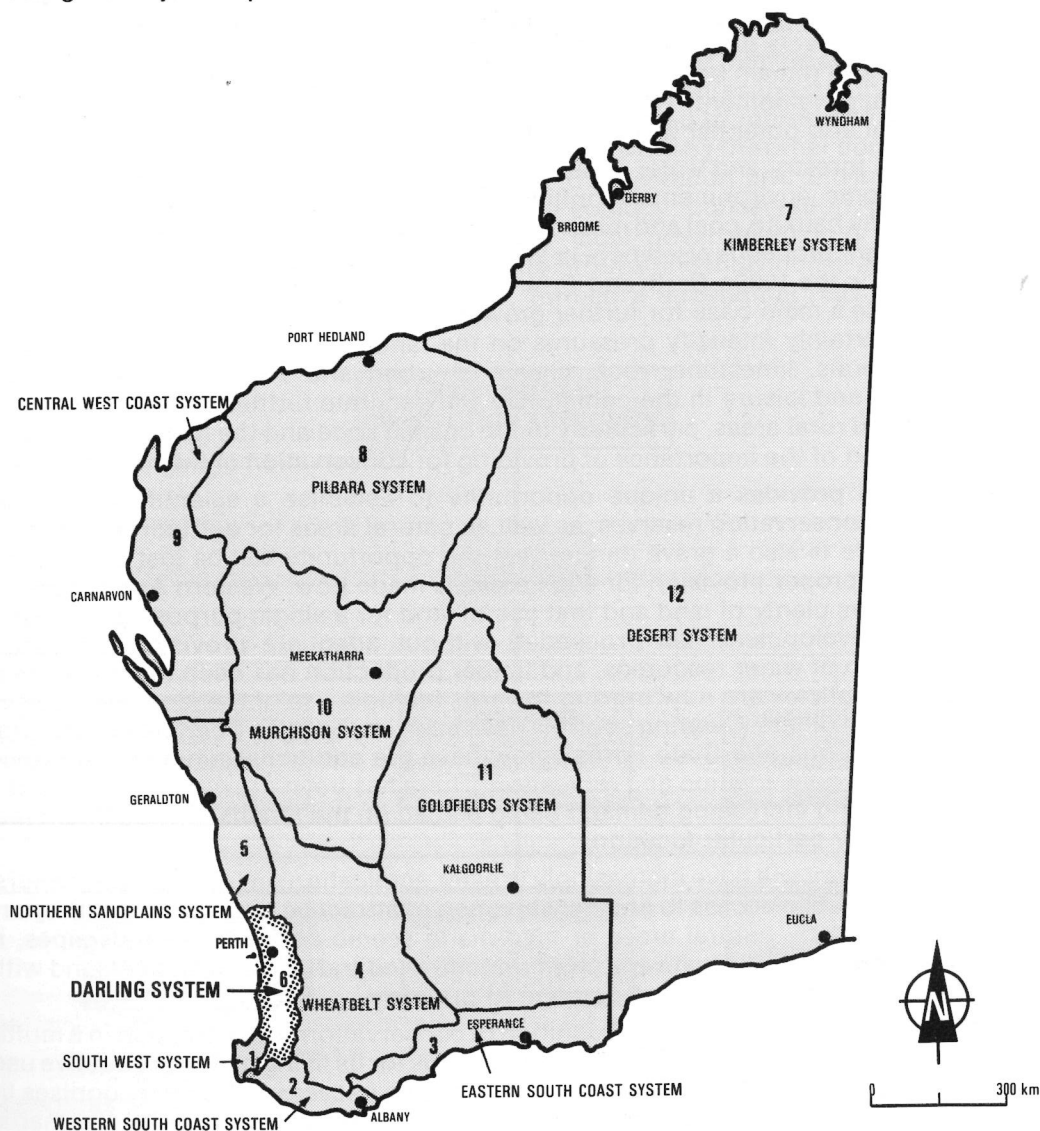


Figure 1.2 Western Australia's 12 Systems as defined by the Conservation Through Reserves Committee

1.2 The Need for a Special Study

The experience gained from the study of the other eleven Systems has been used to attempt to predict the difficulties which might arise from land reservation proposals for System 6, and to suggest ways of dealing with those difficulties prior to the proposals being considered by the EPA for submission to the Government. In the Darling System similar problems were expected as in the other Systems, but it was anticipated that there would be greater difficulty in developing solutions, as the State's main centres of urban and industrial growth are centred in System 6. This led to special arrangements being made before proposals could be developed and put to the Government. These arrangements consisted of the assembly of relevant data, a call for public submissions to get the views of the community, and the subsequent development of proposals and recommendations by committees with representatives from a range of government departments and bodies as well as private individuals. These recommendations were appraised, conflicts and difficulties identified and, where possible, ways found to resolve those conflicts.

The recommendations are now available for further comment from all concerned sectors of the community, particularly the general public, before the EPA finalises its recommendations for submission to the Government.

A further need for a special study arises from a unique combination of natural and other factors. Though the climate of South Western Australia is equable, the soils are generally poor and infertile. The way in which the natural ecosystems (that is, the communities of native plants, animals and micro-organisms) have adapted to survive on these soils is something which is only partly understood, but of great scientific importance. Agricultural development in the south-west was generally slow before modern fertiliser technology and machinery permitted rapid clearing and improvement of large tracts of land in the last few decades. Within the Darling System, however, large natural areas still remain between the inland farms and the coastal zone with its expanding urban and industrial development. These natural areas are mainly State Forest, and cover a large proportion of actual and potential water supply catchments.

While such uses as forestry and water supply essentially conserve the natural environment, they can give rise to some environmental conflicts. The System also contains important mineral resources, principally bauxite, coal and mineral sands, which are likely to be exploited at increasing rates. As development proceeds elsewhere in Western Australia, and it is widely predicted that the pace will accelerate in the 1980s, Perth and its hinterland, with already established infra-structures, will provide the State's main base for further growth of service industries. Economic growth and development will certainly intensify pressures on the land resources of the Darling System for water, timber, minerals, limestone, rock, clay and urban and industrial sites. The expected increased affluence and leisure in the community will generate further demands for recreational access to natural and rural areas, particularly in the coastal zone and the hills, accompanied by an increased recognition of the importance of providing for conservation of the natural environment.

The Darling System provides a unique opportunity to establish a scientifically valuable and essential system of conservation reserves, as well as natural areas for outdoor recreation close to Perth. However, there is also a grave danger that the opportunity will be lost under pressure of development unless proper provision for such areas is made now. Western Australians generally believe there is always plenty of land and that use of land for a single purpose is the norm. In the past, agricultural development has proceeded without adequate provision for conservation reserves or protection of water resources, and timber production has been the main use of forest areas. Government policies are now moving towards multiple use of the land, with no single use having priority over all others. Clearing controls have been imposed on freehold agricultural land in certain water catchments, and State Forests now have the additional functions of providing for watershed protection, conservation and recreation. There has been growing recognition that, with a limited forest area and increasing demand being placed on the forests, management must cater for several uses in any particular location.

The multiple use concept will have increasingly greater application on land in State ownership and also on private land. Public access to and conservation of attractive areas, whether they are ocean beaches, river foreshores, natural areas or man-made scenic agricultural landscapes, must be planned and managed. The alternative is often uncontrolled traffic on and use of land with loss of amenity and environmental values and damage to property.

While the Study aims at promoting the recognition of conservation and recreation in a multiple land use framework, it recognises that the community depends for its living on the productive use of land and that further changes to the natural environment may be necessary. It also recognises that such production helps generate the financial and technical resources necessary for the management and protection of the natural environment.

Thus the matter of conservation and recreation in the Darling System is not a simple one involving only the creation or extension of nature reserves. Adequate provision for these purposes, so important to the community, also requires a planning and managerial commitment. An objective of the EPA in making this Report available to the public is to increase awareness of the complexity of the issues, and to gain the community's responses to the draft recommendations before it finalises its recommendations for submission to the Government.

1.3 Study Organisation and Terms of Reference

In 1976, the EPA decided, very largely for the reasons outlined above, that a more complex organisation than a single Conservation Through Reserves Committee was required for System 6, and set up the committee structure illustrated in Figure 1.3 and described in Appendix 1. It consists of six specialist committees which have, collectively, assessed the many hundreds of submissions; provided an inventory of the natural ecosystems and current land uses; proposed areas suitable for reservation for conservation and recreation; assessed the effects of those proposals on other

potential land uses; resolved, where possible, the conflicts so identified; and examined some of the planning and management provisions then seen to be necessary. Their work and findings have been taken into account in this final Report, which has been the responsibility of the System 6 Committee under the following terms of reference:

To receive technical reports from the lower committees and, having regard to present and likely future developments, to make recommendations to the EPA on:

- (i) areas within System 6 desirable for national parks, nature reserves and major associated recreational resources;
- (ii) related matters in and near the area delineated as System 6.

The procedures used, outlined in Section 1.4 below, make it clear that the approach adopted is one of seeking a consensus between the large number of interests represented in the whole structure of committees. In this Report the System 6 Committee has tried to represent fairly the agreement which had been achieved, after a considerable amount of work by the other committees, supported by the Secretariat provided by the Department of Conservation and Environment (DCE). The committees have provided professional expertise in ecology, conservation, planning and a wide range of land uses, and representation of State, local government and industrial interests. Submissions from the public, including community groups and individuals, and from a number of government agencies and other organisations, formed a substantial part of the basis for the work of the various committees.

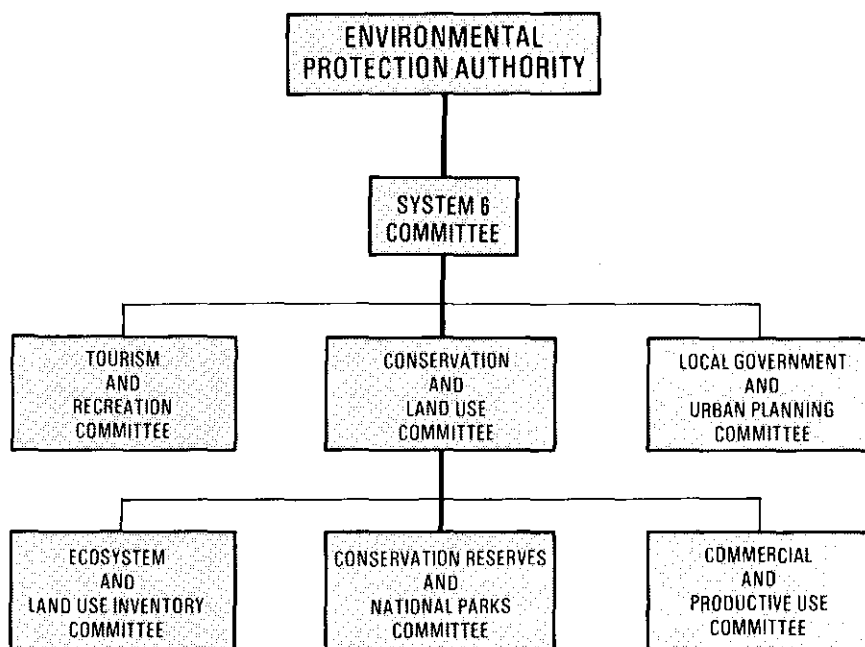


Figure 1.3 System 6: Study organisation chart

1.4 Procedures

Based on information from a variety of internal and external sources, including the 427 submissions received (see Appendix 4), and maps compiled by the Ecosystem and Land Use Inventory Committee, 223 specific localities were identified by the Conservation Reserves and National Parks Committee as having considerable value for conservation and recreation. It proposed that the identified areas of Crown land, apart from State Forest, should be set aside as Reserves under the Land Act³, with modification where required of the class, purpose and vesting of existing Reserves. Recommendations for multiple use of other areas, including State Forest and land held by a variety of public and private owners, in effect proposed the recognition of the conservation and recreation potential of those areas and the protection of this potential through planning procedures.

The need for recreation provision in natural surroundings was investigated by the Tourism and Recreation Committee. The Committee demonstrated an increasing demand for such provision, based on increasing population and rising standards of living, and the benefits to society from meeting the demand. The Committee has drawn attention to the need for comprehensive recreation planning and management in Western Australia and has proposed how this can be brought about. Its findings, and those of other constituent committees, were considered by the Local Government and Urban Planning Committee. This Committee assessed the significance of the findings for local government, as well as the part which town and country planning procedures could play in

protecting both specific areas set aside as Reserves under the Land Act³ and conservation and public amenity values of land in general. It has introduced some planning concepts new to Western Australia, and proposed new procedures for developing a system of regional open space, which could have some application throughout the State, though the most pressing need for them is in System 6. Thus the main thrust of the Study has been towards the provision for conservation and recreation in natural surroundings through two main avenues.

The *first* involves the setting aside of land, for the most part already owned by the State, to be managed at this stage primarily for conservation and recreation; it therefore involves reservation under the Land Act³, and the dedication of parts of State Forest under provisions of the Forests Act⁴.

The *second* avenue is through planning machinery, involving State and local government agencies at local and regional levels.

Reservation or planning provisions, of course, may partially or completely remove options for certain other potential land uses, and it has been a principal objective of the Study to take account of such constraints, and where possible, to minimise the conflicts arising from them. The Commercial and Productive Use Committee had the task of identifying the areas of conflict, while the Conservation and Land Use Committee was responsible for developing strategies for the resolution of those conflicts, mainly in respect of Land Act Reserves.

1.5 Structure and Content of the Report

Chapters 1 to 7 of the Report outline some of the broader issues and general principles which form the basis of the specific locality recommendations outlined in Chapters 8 to 10.

Chapter 2 outlines the characteristics of System 6 in terms of its landscapes, natural ecosystems, and human impact on the natural environment. It also points out the growing community demand for access to natural areas for recreational purposes, and at the same time an increasing awareness of the need to protect them. Chapter 3 discusses some of the main competing land uses in System 6 as they affect provision for conservation and recreation, outlining potential conflicts and compatibilities. Chapter 4 considers problems associated with reservation under the Land Act, and ways in which they may in principle be resolved. Chapter 5 turns to the problems of land outside Land Act Reserves, examines the procedures available in the State for the setting aside and protection of such land which is designated as public open space, and proposes ways in which those procedures could be improved. Chapter 6 describes some of those landscapes and regions in System 6 which offer opportunities for setting aside land for open space of regional importance. Emphasis is placed on areas in which there is little opportunity for reservation under the Land Act, so that public planning procedures requiring protection through planning assume added importance. Chapter 7 contains a discussion of some of the implications of our recommendations in terms of the amount of land and the resources which are affected, and the problems of management which have to be faced. Chapter 8 introduces the detailed recommendations for specific localities in accordance with the principles outlined earlier in the Report; the recommendations appear in full in Chapters 9 and 10.

The Study recognises that productive uses of land are necessary and that further changes to the natural environment may therefore have to be accepted. Careful planning will help to keep options open until decisions must be made, and relevant information is available. Planning strategies should utilise the compatibilities between land uses, for example, water supply and conservation, and adopt a multiple use approach where possible. Some of our recommendations call for improved co-operation and co-ordination between management authorities, and between them and private land owners, with respect to the planning, management and use of Land Act Reserves and of public open space.

Despite various problems and land use conflicts, System 6 still contains extensive natural areas, especially in the Darling Range. The natural systems of System 6 are unique, delicately balanced and of world-wide importance, as well as being valuable for outdoor recreation. This is the context in which our recommendations should be seen.

Important results of the Study include the locality recommendations presented in Chapters 8, 9, and 10. Despite objections to many of them, all those numerous localities identified by the Conservation Reserves and National Parks Committee as being of importance for conservation or recreation are the subject of recommendations in this Report, although in some cases the locality boundaries were altered during the Study.

The objections had been expected from experience with other systems studied by the Conservation Through Reserves Committee², and strategies or devices for meeting the objections of other land users have been evolved. If adopted, these will allow the protection and security of natural areas while making proper provision for other demands on the land. This constitutes an important new development in environmental planning for Western Australia.

Chapter 2

GENERAL DESCRIPTION OF THE DARLING SYSTEM IN RELATION TO CONSERVATION AND RECREATION

2.1 General

Until 150 years ago the south-western corner of Australia supported Aboriginal cultures which, though often considered primitive, were in fact highly developed in the sense of being extremely well adapted to their environment. According to Berndt and Berndt⁵, the Aborigines 'had a special view of their environment. They were intimately familiar with everything within it'. Because of isolation there could be little external trade, thus the ways in which the Aborigines took their living from the land were adapted to and in equilibrium with its low levels of natural productivity, as shown by the survival of their cultures for many thousands of years.

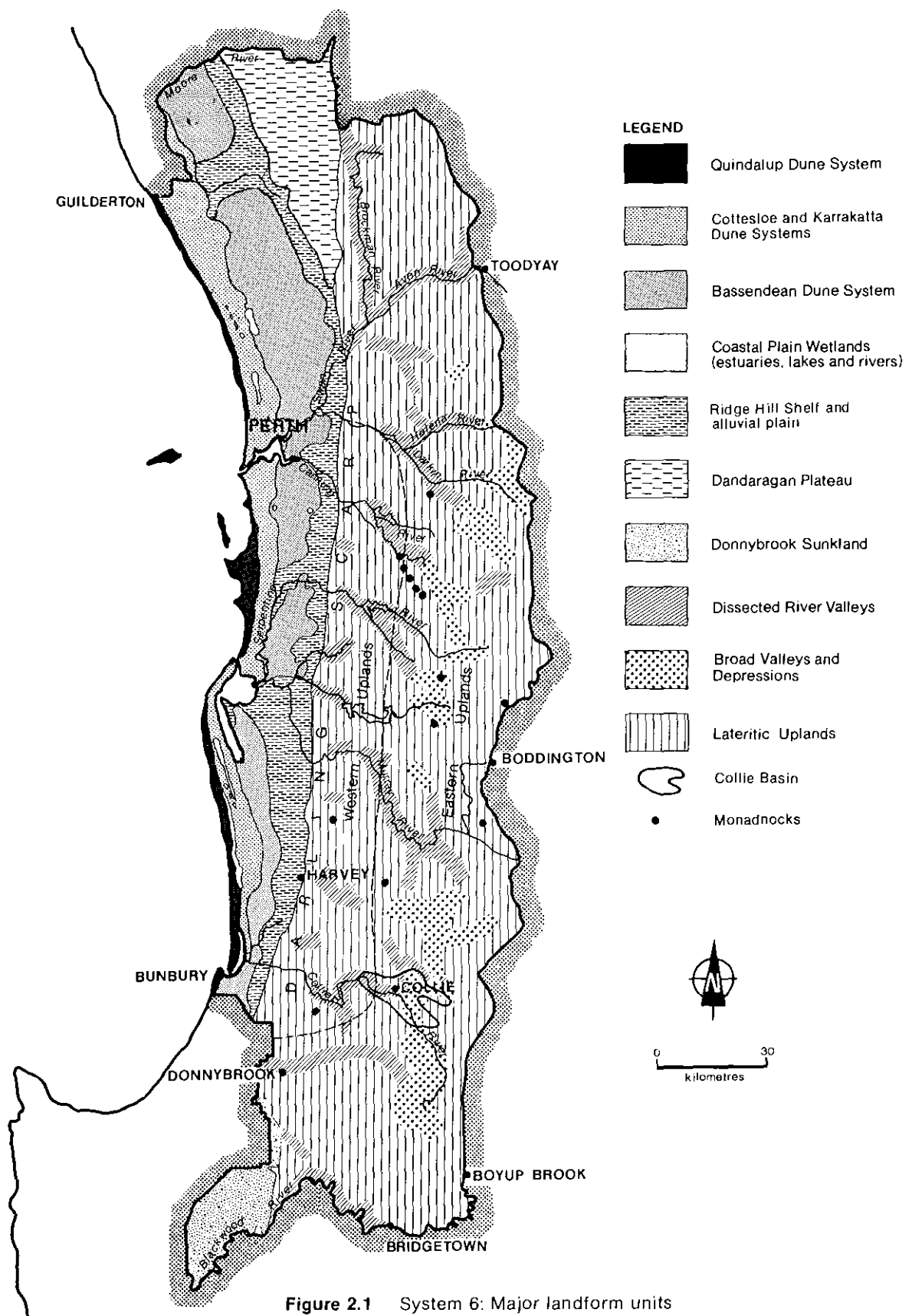
The land's natural productivity is very low, due to the geological history of the landscape. Australia is an old continent, and the south-western corner is older than the rest. Over many millions of years, the landscape here has remained stable and been progressively worn down by wind and water to its present low relief. It now has virtually no mountains to catch rain, so rainfall is low except near the coast. Thus, there are no major rivers of significant length; even the Avon and the Blackwood Rivers become chains of pools upstream and do not flow over their whole length except in wetter winters. The old soils are weathered and infertile, deficient in most of the major and minor nutrient elements necessary for productive farming, though the weathered products may be rich in iron or aluminium, important to industry. The subsoil clays are very deep, and often loaded with sea salts carried on to the land by the winter rains.

2.2 Landscapes

The landscapes of the Darling System, in terms of the geology of the underlying rocks, the landforms and soils, natural vegetation, and current land uses, are described in the Atlas of Natural Resources of the Darling System⁶, published separately as a by-product of the Study. Only a brief outline is required here.

The major landform elements are shown in Figure 2.1, the most prominent being the Darling Scarp, which marks the western margin of the Darling Range. The latter is more properly described as a plateau, with gentle slopes and occasional prominent hills or monadnocks, such as Eagle Hill and Mounts Vincent, Cooke and Ross, rising above it. The valleys upstream are usually broad, flat-floored and swampy, while downstream towards the Scarp where rainfall is higher and gradients are steeper, they become deeply incised and V-shaped, with fast-flowing, often perennial rivers. The plateau, or lateritic upland, with its deeply weathered bauxitic soils, is the most extensive landscape element and supports a native forest dominated by jarrah (*Eucalyptus marginata*), a species found throughout the south-west. Other characteristic ecosystems occupy the grey sandy soils and wetlands of the flat-floored eastern valleys, the more fertile soils of the steep slopes of the western valleys and the escarpment, and the rocky outcrops associated with the monadnocks. Forestry, managed for multiple use including timber production, water catchment and conservation, is an important land use in the Darling Range. Outside the main forest areas, agricultural clearing for pastures and orchards has produced pleasantly varied landscapes, particularly along the escarpment near Perth, and in the western valleys. Open-cut mining for bauxite and coal is an established land use, with a great capacity to modify the landscape.

The Swan Coastal Plain lies to the west of the Scarp. It consists essentially of a flat, narrow alluvial strip (see Figure 2.1), separated from the ocean by a wider belt of rolling, sandy country, which originated as beach dunes left stranded as the sea retreated over the last several thousand years. The alluvial part of the plain is now extensively cleared and retains little of the original native forest. Intensive forms of agriculture, such as vineyards or irrigated pastures, are practised on more fertile soils where younger alluvium has been laid down on the plain by the larger rivers emerging from the hills. Notable examples are the wine and dried fruit producing areas of the Swan Valley, and the irrigation districts at Waroona, Harvey and Brunswick. The most extensive uncleared areas are to be found in the dune sands further west, with substantial amounts of land in State Forest or National Parks. Near the coast the dunes carry a sparse low scrub readily damaged by pedestrians and vehicles, so that they may become unstable and subject to erosion by the strong winds from the sea. Further inland the older more stable Spearwood Dunes carry eucalypt forest, often dominated by tuart (*Eucalyptus gomphocephala*). Further east the Bassendean Dunes consist of poor grey sands, relatively flat, generally carrying a low scrub, with banksia species often dominant. Shallow groundwater, mostly within the Bassendean sands, is an important water resource, which is exploited by the water supply authorities and local residents. There are major bore fields north of Perth, at Gnangara, and in a smaller field to the south, at Jandakot, which provide for a significant



part of Perth's current annual water consumption, especially in dry years. Wetlands are an important part of the Darling System landscape, and have been seriously affected by agricultural and urban development. The greatest number are to be found on the Coastal Plain, associated with river and estuarine foreshores, and in depressions within and between the dune systems. In the Darling Range, wetlands are associated with the drainage lines and are most extensive in the broad flat floors of the valleys at the heads of the river systems. Here they have often been afforded some protection because they lie within water supply catchments, under State control.

2.3 Human Impact

The advent of large numbers of Europeans, seeking higher living standards than the natural environment could support, has disturbed the balance between man and his environment previously represented by the Aboriginal cultures, though the Aborigines may have produced changes to the flora and fauna specially through their use of fire.⁵ European settlement brought an end to isolation, and the soil fertility which had been lost through millenia of weathering could be restored through an agricultural technology dependent on imports of rock phosphate and introduction of exotic legumes compatible with European-style agriculture. Availability of machinery and the fuel to drive it enabled agricultural clearing to spread rapidly, resulting in high levels of farm production for export markets. The discovery of gold greatly accelerated the pace of development, and modern technology permitted the finding and exploitation of new mineral deposits, again largely for export. Income derived from such primary production today supports an affluent society, generates capital, and attracts secondary industry.

The potential impact of these developments on a delicately balanced and fragile environment is considerable. While change is inevitable with increasing levels of human activity, what is now needed is a new and stable balance between man and his environment, in which irreversible adverse effects are minimised and natural areas are preserved as far as possible. It can hardly be argued that this has been generally achieved to date. One only has to look at the hydrologic imbalances and salinity problems of the agricultural areas and water catchments, the paucity of conservation reserves, particularly in the wheatbelt, the declining productivity of pastoral areas, the rapid and continuing loss of wetlands, and the unhealthy condition of much of the jarrah forest, to realise that the environment has been greatly altered and sometimes degraded.

Despite these problems, and the concentration within it of population and development, the Darling System still contains significant natural areas with great potential for conservation and recreation. Figure 2.2 shows the extent to which the natural vegetation still remains. Clearly the most extensive remaining natural or near natural areas lie in the State Forest and water catchments of the Darling Range (see also Figure 3.1). On the Swan Coastal Plain, where industrial and urban development and clearing for agriculture have been much more extensive, few such areas are left.

Overall, the natural vegetation has been preserved in roughly half of the area of the Darling System, and this is largely in State ownership. These two factors together constitute an enviable opportunity for the establishment of conservation and recreational areas close to a major city, through reservation under the Land Act.³ However there still remains the matter of conservation of natural areas and the less tangible 'amenity' values outside Reserves maintained by the State, a major problem in town and country planning. It is important that these areas should be provided and their values maintained at suitable levels, as their availability to the community brings significant benefits, including improved health standards and a consequent reduction in costs of public health services.

2.4 Conservation

The natural ecosystems of the Darling System are uniquely adapted to the harsh conditions of the region in many ways which are only just beginning to be understood. Native plants tend to be deep rooting, so that they can survive the dry summers by drawing on the water from winter rains stored in the deep subsoils. The roots explore large volumes of soil for scarce nutrients, which are then retained in the plant or in the organic surface soil litter to be taken up and used over and over again, without contact with the mineral soil, where they may be lost in drainage or rendered unavailable by fixation. Many plants are fire resistant, while others, particularly some legumes, need fire for germination. The legumes provide an important source of nitrogen, an essential nutrient for the whole system, through fixation by root nodule bacteria. Insects, above and below ground, may play a part in returning nutrients to the soil, and they and the larger animals are adapted in many ways to the environmental conditions.

Such ecosystems are easily disturbed, resulting in adverse environmental effects. Mechanised traffic on unsealed roads or through the bush can readily spread pathogens like *Phytophthora cinnamomi*, the causal agent for jarrah dieback disease; altered burning practices may interfere with the all-important functions of the organic surface soil layers and cause changes in plant

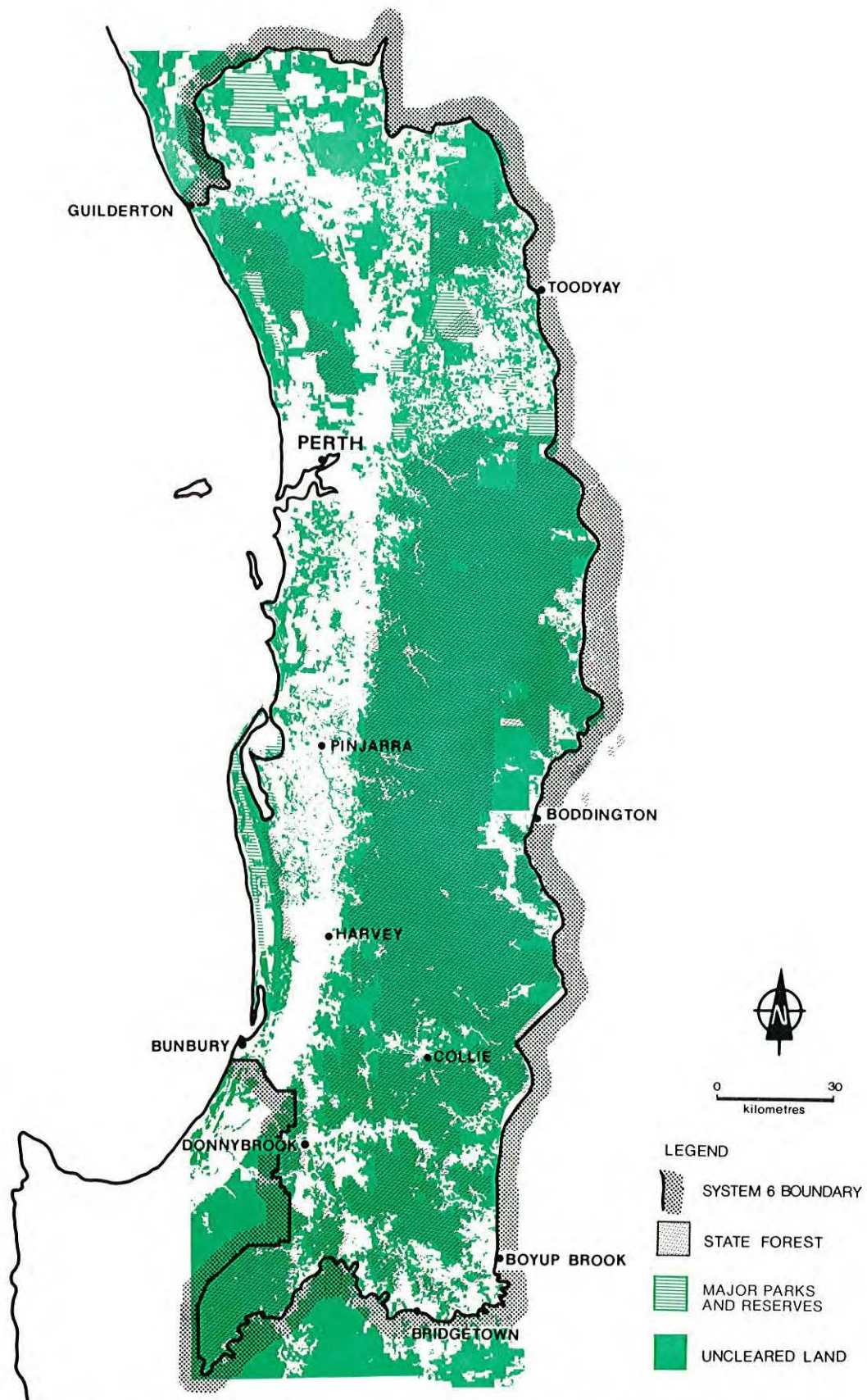


Figure 2.2 System 6: Cleared and uncleared land, including State Forest

species composition in ways which favour disease-prone species such as banksias, or tend to eliminate the beneficial native legumes. Loss of the protective forest cover leads to problems of salinity in water supplies due to changes in the water and salt balances of the landscape.

Thus the natural environment of south-western Australia is delicately balanced, unique in many respects, far from fully understood, and of great scientific importance, because of its diversity and genetic resources, not only to us who live here, but to the whole world. These are perhaps the main arguments for its protection.

2.5 Recreation

Natural areas are important for recreation, providing opportunities for physically strenuous activities often requiring special skills, such as rock climbing, caving, canoeing, diving, bushwalking and orienteering, and for less energetic activities, such as picnicking, camping, sightseeing, touring by car and nature study. Regardless of the activity, the natural setting can provide inspiration and relief from society's urban life style.

As indicated in the Tourism and Recreation Committee's Report, the existing demand for outdoor recreation areas and facilities, and recent trends in the most significant social factors influencing demand show that:

- (i) Recreation demand is increasing at a much greater rate than the population.
- (ii) There has been significant growth in certain outdoor activities such as camping and travelling and this is reflected in the rapid development and expansion of additional camping areas in caravan parks and improved facilities for caravaners and campers. The growth in travel is further evidence of changes occurring, and in this respect, the number of tourists to Western Australia nearly doubled in the years between 1971 and 1979.
- (iii) People are engaging in a wider variety of outdoor recreation activities.

Population size is the fundamental factor determining recreation demand. It has been estimated, from various population projections, that the population of both Western Australia and System 6 will approximately double by the year 2000⁷. Increased urbanisation, at regional centres as well as around Perth, will bring additional recreation pressure to the outskirts of urban areas. The population itself will change in structure and this will influence the type of facility demanded.

Increases in long service leave and flexitime, coupled with earlier retirements, will result in an increase in the quantity and quality of leisure time available.

There are prospects for increased expenditure on recreation, resulting from increased real incomes. It has been demonstrated that as real incomes increase, the percentage of family income devoted to leisure also increases. Nearly 8% of total family income was spent on recreation in 1974-1975.⁸

Increased mobility brings about an increase in recreation demand. However, rapidly escalating fuel prices are likely to result in demand for more local recreation resources, as well as greater emphasis on public transport and low-energy transportation, such as bicycles.

The special needs of less mobile sectors of the population such as the very young and the old, the poor and the disabled remain; in addition, adequate provision for cyclists is becoming more urgent. In general, recreation planning needs to be flexible enough to cater for a range of possibilities in respect to mobility.

Education standards are rising and greater emphasis is being placed on leisure activities in the education system, on creating greater awareness and appreciation of recreation opportunities, and on promoting the skills and desire to use the resources available.⁹

The implications of the growth pattern in each of these factors led the Tourism and Recreation Committee to conclude that the most conservative estimate of future demand for outdoor recreation is a **trebling** by the year 2000.

There are benefits both to individuals and to society from increased provision for recreation. Recreation adds substantially to the 'quality of life', improves physical and mental health and in doing so saves on health expenditure. It also brings major benefits to the economy by generating demand for goods and services (Figure 2.3).

A conservative estimate¹⁰ suggested that Western Australians spent more than \$419 million on leisure in 1976; and the industry ranked as the seventh most important employer in Western Australia, supporting more than 25 000 people.

According to the Western Australian Department of Tourism, total expenditure within Western Australia by all tourists is now in the order of \$900 million annually, with the tourism component (i.e. souvenirs, accommodation, tours, etc.) alone estimated at \$560 million in 1979.

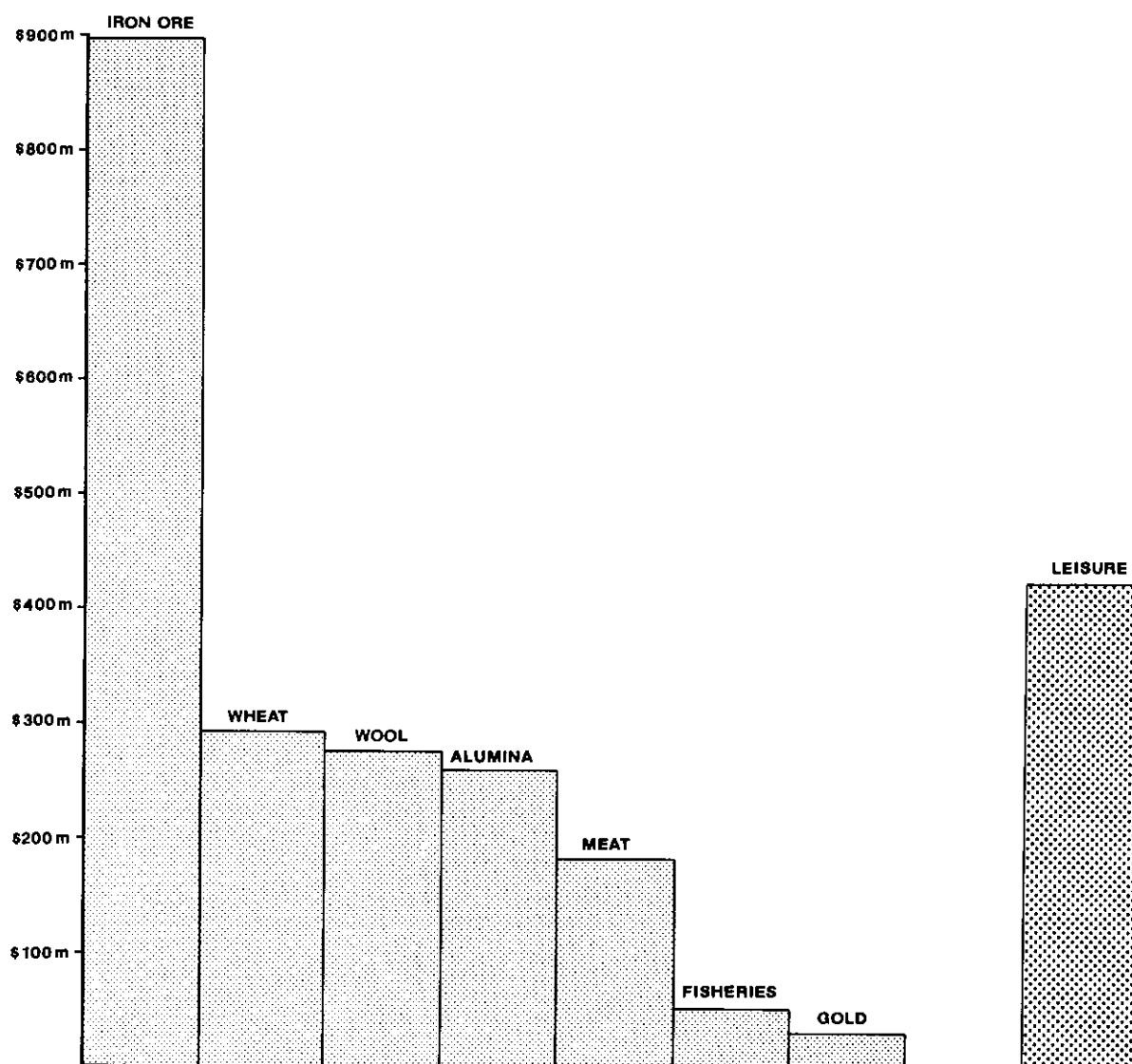


Figure 2.3 The dollar value of productive industries in Western Australia, 1976-77, compared with personal expenditure on leisure

The estimate of Western Australians' expenditure on leisure is based on the following assumptions and calculations:

- (i) Australia's private final consumption expenditure for 1975-76 was \$41 603 million¹;
- (ii) Western Australia's population is approximately 8.4% of the Australian total;
- (iii) the assumptions that Western Australians spend 12% of private consumption expenditure on leisure including expenditure on transport and vehicles.

Source: The Western Australian Economy, 1976-77. Government Printer, 1977.

Minerals and Mineral Development. Department of Industrial Development, 1979.

2.6 Conclusion

Land use planning in System 6 should take into account the importance of protecting the fragile and unique natural environment, the recent phenomenal growth in recreation demand, and the important benefits to society and the economy of providing for recreation and conservation.

Recreational use of natural areas is steadily increasing while the resource remains finite, causing overcrowding and damage to the environment. This emphasises the urgency of setting aside more areas for conservation, developing less sensitive areas for recreation, and increasing expenditure on management for both. The recommendations in later chapters are aimed at maintaining the still significant opportunities for conservation and outdoor recreation in System 6.

Chapter 3

CONSERVATION, RECREATION AND COMPETING LAND USES

3.1 General

Population growth and economic development in Perth and its hinterland have produced steadily increasing demands on the land. The complexity of the Study arises partly from this. Another factor is the community's recognition of the importance of adequate provision for conservation and recreation, which is growing as affluence and leisure time increase.

On the Swan Coastal Plain the principal land uses competing with conservation and recreation are agricultural, industrial and urban development. These involve the clearing of natural areas which have conservation value and, as industrial and urban development spreads onto farmland, the loss of attractive open space, which often has some amenity or recreational value.

In the Darling Range the land use demands, and their effects on the land, are different. They arise mainly from uses such as farming, water conservation, mining and forestry, and combinations of these, and can have a substantial effect on the availability of land for conservation and public recreation.

Changes in the type and location of economic development may produce variations in the intensity of conflicts between land uses, but careful planning will enable options for conservation and optimum use of recreational resources to be kept open for the future and will help to resolve differences between incompatible land uses.

The major land uses, conflicting to some degree with conservation, recreation and scenic values, considered in this Report are:

- urban and industrial development
- solid waste disposal
- roads and services
- water supply
- mining
- quarrying and extractive industries
- forestry
- agriculture.

3.2 Urban and Industrial Development

The Darling System Atlas⁶ includes a land use map giving a general impression of the areas already affected by urban and industrial development. In 1974, 251 453 ha (46.8% of the Perth Metropolitan Region) was zoned for urban, industrial and related uses. Planning proposals, such as the North-West Corridor Strategy Plan released in 1977¹¹, suggest that the proportion will increase in the future. However, not all the land zoned in this way is already developed. At present much land retains its rural or natural character, but as planning proposals are implemented the public will notice a steady decrease in the open space apparently now available.

Outside the Metropolitan Region there are similar pressures, and some zonings for rural use may be changed to allow urban and industrial development. Examples include Wilbinga (north of Two Rocks), the Muchea and Wagerup industrial sites, the Geelorum-Australind area, which will cater for Bunbury's expanding urban population, and the coastal strip around Mandurah and its adjacent water ways.¹²

An example of the need to provide for recreation in the face of development is provided by Cockburn Sound, a prime recreational resource, where the areas available to the public are heavily used. A very large part of the mainland shore is zoned industrial under the Metropolitan Region Scheme, much of the land is already acquired by the Industrial Lands Development Authority and there is already considerable industrial development. To the west, Garden Island is largely committed to a Royal Australian Navy base, and to the south there are further shipping facilities under consideration by the Fremantle Port Authority. The study of the Sound initiated by the EPA has provided much of the data for assessing the effects of development on conservation and recreation values, and for planning and management for the future.¹³

3.3 Solid Waste Disposal

Perth's solid waste generation is increasing rapidly. Forecasts made in 1974^{14 15} suggest a doubling of the amount to be disposed of by the mid 1980s. In 1973, of the 47 sites assessed for possible use for disposal purposes during the next 20 years, 34 were located in Metropolitan Water Board (MWB) Underground Water Control Areas, in wetlands, or adjacent to river foreshores. These 34 sites

comprised 73% of the land area assessed as available for waste disposal. Thus there is a clear conflict with conservation values, and there is also the potential to affect groundwater resources and public health through effluents derived from the waste.

The grassed recreation areas now occupying former wetlands and extensive areas of the Swan River foreshore are largely the end result of solid waste disposal activities. Thus while it can be argued that there has been some contribution to the community's recreational resources, there has also been a substantial impact on natural wetlands, and undeveloped river foreshore areas could become rare in the future if adequate reserves are not established now.

3.4 Roads and Services

Large urban and industrial developments create demands for roads, railways, water mains, sewerage and drainage works, gas pipes, electric powerlines, and telecommunications, extending far beyond the areas of actual development. Within System 6, many roads and services run through existing and proposed reserves, and the construction and servicing of new service corridors will be needed in the future. Foreshores are particularly attractive for highway construction. Maintenance of powerlines can spread disease and weeds in forest areas and may have serious adverse effects on the amenity and aesthetic values of landscapes. In the last 20 years, 10 000 ha of State Forest have been lost to public utilities.¹⁶

During the Study, the Commercial and Productive Use Committee identified a number of such conflicts, which could be seen as reasons for opposing recommendations for new reserves. Certainly the presence of service corridors and the necessity for access to them can diminish the conservation or recreation value of a natural area but the proposal may nevertheless remain a significant and valuable opportunity for reservation. Where recommended areas are affected in this way it would clearly be unrealistic to suggest that access to existing service corridors should be prevented. In the case of future service requirements, the presence of the reserve will indicate its conservation and other values which should be taken into account by the responsible authorities.

3.5 Water Supply

Perth has the highest per capita water consumption of any Australian city. To satisfy this demand and that for irrigation and country water supplies at minimum cost, all major rivers in System 6 except the Murray, the Swan-Avon and the Blackwood have been dammed. Almost the whole of the Darling Range from the Perth-York Road southwards including the Wellington Dam Catchment is in declared Water Control Areas under the relevant Acts of Parliament. In addition, groundwater resources of the Swan Coastal Plain are drawn upon through bore fields established in Underground Water Pollution Control Areas at Gngangara and Jandakot. All these developments are indicated in Figure 3.1.

In general, conservation of the natural environment is highly compatible with water resource conservation, and the extensive areas set aside as Water Reserves in System 6 also have great potential for recreational use. Yet there are significant areas where these uses conflict.

Reservoirs and dams tend to be sited in the steep-sided valleys in the western portion of the Darling Range, and their construction results in inundation of ecosystems not widely found elsewhere. While reservoirs form attractive scenic areas, they have been built at the cost of losing other amenity and recreational values associated with flowing rivers in narrow rocky gorges, which are certainly rare in South Western Australia. Thus, on the one hand, submissions to the Study from the water supply authorities clearly express their desire to keep the options open for additional dam building in such scenic valleys as those of the Murray and Lower Harvey and Collie Rivers. On the other hand, the submission from the Department of Tourism, and many others from the public, argue for the retention of the valleys for recreational use. Dam construction may also conflict with conservation and recreation Management Priority Areas (MPAs) delineated by the Forests Department.¹⁷

Both the MWB and the Public Works Department (PWD) have placed a number of restrictions on public use of active catchment areas in the south-west of the State. This they justify by the need to avoid expensive treatment facilities*, in order to minimise the cost of water to consumers. With few exceptions, such as fishing in Harvey Weir and Samson Dam, all water based activities are prohibited on dams used for domestic supplies. Certain land based activities such as camping and picnicking are also prohibited, except in designated areas usually where suitable sanitary facilities have been provided. In the case of dams used solely for irrigation, a variety of land and water based activities have been permitted on them to date.

*The Metropolitan Water Board has estimated that it would cost \$20 to \$25 million to provide treatment in addition to chlorination at either Canning or Serpentine Dams.

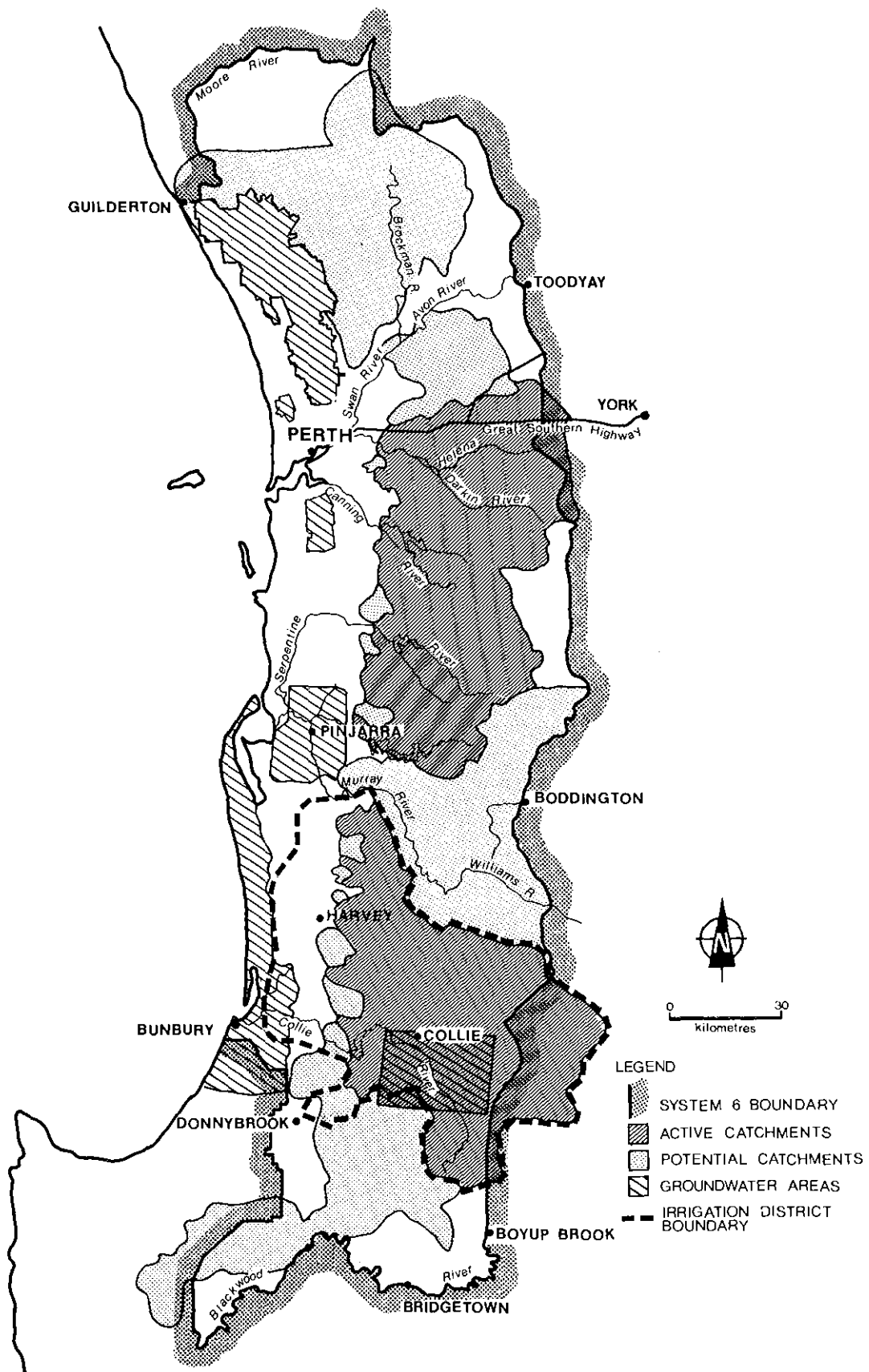


Figure 3.1 System 6: Areas committed for water supply

The Water Purity Advisory Committee, on which public health and water supply authorities are represented, made a submission to the System 6 Study (see Appendix 4) proposing further restrictions in the form of zonings of catchment areas so as to provide various levels of control over the location and type of recreation activities. The effect of these controls, if implemented, would be to exclude all public use, except for vehicular through traffic along main roads, from:

- (i) all the catchment area within a boundary line at least 2 kilometres (and generally considerably further) from the top level of any reservoir used for domestic water supply;
- (ii) the total area within the catchment of any domestic water supply pipehead dam, since retention time is considered inadequate to buffer or reduce possible biological contamination;
- (iii) the area within 250 metres upstream of the wall of any irrigation water supply reservoir.

Outside these areas the Water Purity Advisory Committee proposed that recreational use be limited to bushwalking, orienteering and picnicking at designated locations, with other forms of recreation permitted in 'special areas' if a need is established in the future. In addition, overnight camping in domestic water supply catchments would be prohibited, and there would be a considerable tightening of controls over the future recreational use of irrigation reservoirs.

On the Swan Coastal Plain the water resource consists of both shallow and deep groundwaters which are increasingly being utilised to supplement surface water supplies drawn from hills catchments. Particularly in the case of the shallow groundwater, preservation of the natural vegetation helps to protect the resource, but exploitation can result in changes to the natural ecosystems, caused by lowered groundwater levels. However, the study by Layton and Associates¹⁸ indicates that such effects are in general small and localised.

The water supply authorities wish to keep the options open for their use of groundwater, to meet future demands; they tend to oppose proposals for conservation reserves, in case water extraction and conservation should prove incompatible.

3.6 Mining

Most of the mining taking place within System 6, whether for heavy minerals, coal, bauxite or other minerals, is open-cut and involves clearing native vegetation. Hence mining is frequently in direct conflict with proposals for reservation of particular pieces of land for conservation purposes. In the case of National Parks and recreational areas, it may be possible to confine mining in such a way as to minimise adverse effects, and to plan rehabilitation to restore amenity values, at least in part, or even provide new ones. Yet there remains a grave danger of loss of such values, at least temporarily.

Government authorities concerned, such as the Mines Department and the Department of Resources Development, supported by the industries likely to be affected, have tended to oppose reservation proposals in order to keep options open for the future, when likely demands will be more clearly known and the mineral resources more accurately assessed.

Particular types of ore bodies tend to be associated with particular natural vegetation types; thus in System 6 heavy mineral sand mining mainly affects the Coastal Plain dune and beach systems while bauxite and coal mining affect the forests of the Darling Range, most of which are in State control.

Clearly, open-cut mining has effects not only on conservation and recreation, but also on other land uses including water supply and timber production. Bauxite mining presents particular problems, since the ore bodies are widely distributed, and large areas of forest are likely to be directly or indirectly affected. The nature and extent of the impact on forestry, water supply, conservation and recreation were comprehensively reviewed by a Technical Advisory Group appointed by the EPA.¹⁹ Under existing projects the mining takes place almost entirely within State Forest under Special Agreement Acts. The potential effects on the environment are now largely recognised²⁰ and a procedure has been established for Alcoa's bauxite mining operations, whereby mining and rehabilitation plans prepared by Alcoa are regularly assessed by a State Mining and Management Planning Group, which advises the Government on their acceptability. The System 6 Study is especially concerned with the security of those areas of State Forest designated by the Forests Department as MPAs for conservation and recreation, against the effects of bauxite and other forms of mining. This has been and is a matter of some public concern.

As a result of coal mining operations in the Collie Basin and tin mining around Greenbushes, it is estimated that over 500 ha of forest has been destroyed in each area.²¹ While the future scale of these operations is not known, it appears certain that coal production by open-cut methods will increase substantially as the price of crude oil and the demand for electricity increases.

3.7 Quarrying and Extractive Industries

These industries tend to conflict with conservation and recreation in a similar way to open-cut

mining. However, as materials such as limestone, clay or sand are used in bulk and are of low initial value, supplies close to the site of industrial use are especially desirable, since transport costs are kept low. Occurrence of particular materials tends to coincide with particular landscape situations and natural vegetation types.

As limestone underlies the Quindalup, Cottesloe and Karrakatta Dune Systems of the Swan Coastal Plain (see Figure 2.1), it is widely distributed and is associated with the coastal heaths and tuart forest. Another source of lime is through dredging in Cockburn Sound. Lower grades of limestone are used for roadmaking, and the higher grades for cement. Lime produced from limestone is extensively used in alumina refining. Due to lack of information on variations in grade and thickness, industrial interests generally object to reservation in limestone areas in case a valuable but unproven deposit becomes unavailable in the future.

Clay extraction affects the alluvial deposits and river foreshores of the Swan Coastal Plain, and some limited areas of weathered shale on the Darling Scarp. The main conflicts are with proposals for conservation reserves in and close to the rivers and wetlands, and with zoning of such areas through planning procedures so as to give priority to recreation and provision of open space. Riverine areas present particular difficulties because of their length and linear shape.

There is a strong demand for rock for road metal and construction to support other forms of development. Several quarries are widely visible on the Darling Scarp. It is, of course, possible to landscape old quarry sites, and to develop them for specialised recreational use, such as rock climbing.

Peat and diatomaceous earth are used for a variety of purposes and are naturally associated with wetlands. Extraction, if well planned, can result in artificial lakes which act as summer refuges for water-birds and which may possess some amenity value.

As well as these direct conflicts between conservation and amenity values and quarrying and extraction, there may be indirect effects. Industrial and residential developments tend to displace quarrying and extractive industries from locations close to major centres, thus affecting other natural areas further out. The adverse effects of displacement could be minimised by planning procedures which rationalised extraction, development and construction programmes. This would permit earth resources to be exploited before becoming unavailable as a result of urban or industrial development on the land surface above them. But for such planning to be effective, it is first necessary to assess the value of the earth resources relative to alternative sources of supply. In this connection, it is to be noted that a Basic Raw Materials Committee has been established to examine and report to the Metropolitan Region Planning Authority on the overall situation in the Metropolitan Region.

3.8 Forestry

Forest management policies broadly recognise the need to provide for recreation and conservation as well as protection of water catchments and timber production.¹⁷ Harvesting, burning and other management operations present risks to public safety and therefore involve restrictions on access. But being localised and temporary, such operations cause little disruption to recreational use. However, protection of the forest gives rise to more severe constraints. Camping and lighting of fires is prohibited in pine plantations due to the fire risk, and entry except on foot is restricted in the dieback quarantine areas. Combined with the restrictions imposed in water supply catchments, the overall effect on recreation is considerable.

In addition to its value as a recreational resource, State Forest, particularly in the Darling Range, presents the greatest potential for the establishment of nature reserves, although at the cost of timber and other commercial production foregone. This has been recognised by the Forests Department in both its Working Plan¹⁷ and in its submission to the Study, which outline a number of areas throughout State Forest where conservation or recreation take priority over other uses. If the problems related to bauxite and other mining can be overcome, then the conservation and recreation MPAs will be an invaluable set of reserves, surrounded as they are by remaining forest, which is managed to protect them.

3.9 Agriculture

Agricultural clearing is widespread on the Swan Coastal Plain and in certain parts of the Darling Range, notably north of the Perth-York Road and, in the Collie and Murray River catchments. There are over 4 825 rural holdings in System 6, having a total area of approximately 980 000 ha. Most of the farmland is devoted to beef and dairy cattle grazing and includes the three irrigation districts on the Swan Coastal Plain. It is unlikely that the extent of agricultural land will expand greatly within System 6, as most of the region is now committed for one form of land use or another. It is more likely that the area of farmland will decrease due to urban and industrial growth.

There will, however, be other changes to agricultural land brought about by the development of new farming techniques, and changes in social and economic factors. Examples that have recently occurred include the transformation of pasture to cash crops, increased sprinkler irrigation, and increased numbers of hobby farms, all of which may detract from conservation and amenity values of the land.

While reserves surrounded by farmland are especially subject to invasion by exotic animals and plants, it is also true that a reserve may appear to the farmer as a bad neighbour. Fauna and flora protected in a reserve may be seen as vermin or regrowth, and burning regimes suitable for the reserve may be seen as a fire hazard to adjoining crops and pastures.

Agricultural land constitutes an important recreational resource, mainly because of the views from the road network which it provides. Much of the System 6 countryside is attractive to urban residents merely because the farmland is a change from the confined urban environment. Pleasure driving is the most popular form of year-round recreation activity in which people of all ages participate. There are some rural areas in System 6 which most people would agree are particularly outstanding (see Chapter 6). A combination of factors contributes to the quality of the countryside, including the type of farming practised, the nature of the topography, and the character of the rural roads. For example, 'parkland' grazing can produce attractive scenery and people find winding roads with vegetation extending almost to the seal to be appealing.

3.10 Conclusion

An objective of the System 6 Study is not only to identify the conflicts with other land uses, which may be generated by proposed provisions for conservation and recreation, but also to explore possible ways of resolving those conflicts through consideration of compatible land uses. Conservation and protection of water catchments provide an obvious example. There is too, unlikely as it may seem at first, a community of interest between conservation, mining and extractive industries, and water supply. All three uses may have to compete with residential or industrial development for the use of particular areas.

There appear to be two main avenues for resolving the conflicts between conservation and recreation and other land uses. The first applies to major tracts of Crown land, which consist largely of State Forest, existing National Parks, and a considerable number of Land Act Reserves of various sizes throughout the System 6 region. Such land may be dedicated or committed to a variety of purposes, and vested in government agencies whose management responsibilities are often defined by statute. Other legislation, including Special Agreement Acts, the Mining Act and the Environmental Protection Act, may limit or constrain the statutory responsibilities of the managing agency. When additional reserves are proposed or when a change from Class B or C to A is recommended in order to increase security of purpose, then government agencies with competing statutory responsibilities or policies are obliged to object. They do so on the grounds that reservation appears to close off future options which they wish to keep open, but which they cannot choose between at present as the necessary information, including that on future demands, is not available. For example, the Murray River Water Reserve offers several options for water supply development. Each could be considered, as well as the alternative of never using the valley. All options could have major implications for the conservation and recreation value of the valley. In such circumstances the rational solution must be through joint planning, decision making and management, involving the appropriate responsible authorities. Provision for conservation and recreation would then take its proper place with other existing and potential land uses.

The second main avenue for resolving conflicts with other land uses is through town and country planning machinery. This provides for conservation and amenity in areas where there is a complex mix of land ownership, including some Crown land, land owned by or vested in local authorities and other agencies, and freehold land in private ownership. Within the Metropolitan Region such planning is the responsibility of the MRPA, which 'reserves' and acquires land for Parks and Recreation, and other purposes under the provisions of the Metropolitan Region Scheme. Although conservation is not a primary purpose of 'reservation' in this planning sense, protection of natural areas may be an objective because of its contribution to the general public amenity.

Outside the Metropolitan Region, the planning responsibility rests with local authorities, who prepare their own planning schemes for approval by the Minister for Urban Development and Town Planning. Problems arise because many local authorities may be unable to provide all the technical expertise needed for reserve and park management, and they may not have the finance to manage areas such as beaches and foreshores which attract people from a large region. Some areas of conservation value may traverse land under the control of several councils.

There is considerable overlap between the two main avenues for resolution of conflicts, as outlined

above. Many types of land, including State Forest, Parks and Reserves and land at present zoned rural may be regarded as contributing to open space at regional and local levels. Many of the locality recommendations detailed in Chapters 9 and 10, involve combinations of Land Act reservation and action by planning and management authorities. Nevertheless there is some convenience in discussing them separately. Suitable strategies and recommendations for Land Act Reserves and MPAs are given in Chapter 4, while the complex question of conservation and recreation in a planning framework is considered in Chapter 5.

Chapter 4

CONSERVATION AND RECREATION IN RESERVES AND STATE FOREST

4.1 General

Chapter 3 identifies some of the problems arising from proposals for reservation under the Land Act, or for the establishment of conservation or recreation MPAs in State Forest. The underlying conflicts of interest are not always irreconcilable, but certainly appear to be so when each of the parties involved wishes to retain all its options for the future. However, these conflicts should not be over emphasised, since there are also compatibilities to be exploited. Even mining and other extractive industries have a common interest with conservation in that both are adversely affected by uses such as industrial or urban development, which not only lead to clearing of the vegetation, but may also effectively render the underlying rock or earth resource unavailable for extraction. Extraction of high value materials, or those which can be processed to high value, can also generate financial resources for subsequent rehabilitation. If carefully planned this could result in some augmentation of recreational values through development of the open space made available. However, the direct conflict with conservation remains.

In this Chapter we propose strategies for resolving some of the problems of reservation which are of particular relevance to the two main types of conservation area — Land Act Reserves and conservation MPAs in State Forest. The possibility of accommodating public attitudes on recreation in water catchments, given the policies of the water supply and public health authorities, is also examined.

The strategies developed are embodied in the recommendations made in this Chapter. It is intended that the recommendations establish general principles, to be applied in Chapters 9 and 10 to more detailed and specific proposals, concerned with particular areas of land.

4.2 Multiple Vesting of Multiple Purpose Reserves

Most objections to the proposals of the Conservation Reserves and National Parks Committee from either government agencies or the private sector, arose from a concern that valuable resources might be foregone as a result of reservation. Water, mineral and earth resources were of most concern. In these cases, information on the extent of resources is expensive to obtain and is unlikely to be assembled until as close as possible to the time when decisions about development need to be made. Dam sites do not have to be intensively investigated nor a mineral potential fully proven until there is considerable degree of certainty that development will proceed.

Consequently, as was the case with the Conservation Through Reserves Committee's recommendations to Government for reservation in the other Systems², the Mines Department and the water supply authorities argued that the formally stated purpose of many new Reserves should include water as well as conservation. Further, the Mines Department also argued that already existing mining tenements should stand, given that prospecting and mining on existing and proposed Class A Reserves and National Parks in the South West Land Division (which includes all of System 6), requires Parliamentary approval under the Mining Act²² of 1978, which is yet to be proclaimed.

On the initiative of the Commercial and Productive Use Committee, the Surveyor General convened a meeting of senior officers of the Lands and Surveys Department, the Geological Survey and the Public Works Department in October 1978. The outcome was general agreement that multi-purpose Reserves could be established under Section 29 of the Land Act, 1933.³ The Conservation and Land Use Committee therefore proposed that where new Land Act Reserves for conservation and recreation are recommended, they should be jointly vested in the appropriate Ministers and that the declared purposes should be 'conservation' or 'recreation' as appropriate, and also 'water' and/or 'mining'. It should be noted that this strategy will also protect the potential for quarrying, since extraction of rock and earth materials in Reserves is controlled by the provisions of the Mining Act.²²

The intent of the proposed multiple vesting procedure is to set aside the area of land in question in such a way that its potential for all three uses (conservation and/or recreation, water supply and mining) is protected, until such time as the value of the mineral, earth or water resource, and the need for their development in the light of community demands has been determined. The continuing work of the Basic Raw Materials Committee of the MRPA and the Geological Survey, and by industries themselves, is constantly improving the basis for decision making in this controversial area.

While recognising that this strategy may not be possible without some amendments to existing legislation, Lands Department policies and administrative practices, the Study still recommends it to the EPA as an interim means of safeguarding the land until priorities can be established and final decisions rationally made by the Government. In the meantime, management policies would be by mutual agreement between the Ministers who are party to the vesting, possibly within the planning and management framework proposed in Chapter 5. Planning procedures offer a means of ensuring that the end use of the land, which could include recreation, is allowed for in any development permitted. Any disagreement of sufficient importance could be taken to Cabinet for early decision. It should be accepted that any activity or moves by one party to overcome the powers of another should occur in consultation with the department concerned, and with the EPA, as a matter of urgency. The role of the EPA in such cases would be to independently assess and report on the issue, and the EPA's report should provide Cabinet with the best possible information on which to base a decision.

Recommendations

- 1 (i) Where, because of mineral potential and water supply considerations, significant objections are raised to proposed Reserves for conservation or recreation, the land should, for the time being, be jointly vested in the appropriate Ministers, and the declared purposes should be 'conservation' and/or 'recreation' together with 'water' and 'mining'.
- (ii) A high priority should be given by the Geological Survey of Western Australia to an early evaluation of the mineral potential of areas proposed for reservation, taking into account other possible supplies.
- (iii) The Government should, if necessary, effect changes in legislation to enable multi-purpose vesting of Reserves, for conservation, water and/or mining, to be achieved.
- (iv) Where an objection is based on water supply requirements alone, joint vesting is unnecessary, but 'water' should be included as a declared purpose of the Reserve.
- (v) Management authorities of established Reserves should ensure that the Environmental Protection Authority is made aware of any activities on adjacent land having actual or potential effects on the conservation or recreation value of the Reserves.

4.3 The Security of State Forest Management Priority Areas for Conservation and Recreation

In its General Working Plan No. 86, the Forests Department¹⁷ divided the whole State Forest into areas in which the dominant and secondary uses would be specified and their priority ranking nominated. Each unit, known as a Management Priority Area (MPA) has been described according to its dominant use, and where aspects of prescribed management for two or more land uses are in conflict, the priority between them has been indicated. In this Report, attention is focussed on those areas managed primarily for conservation of flora and fauna or for recreation (see Appendix 5). The Forests Department's proposals for a system of MPAs for conservation, as outlined in the General Working Plan and in its submission to System 6, amount to setting aside a system of nature reserves within State Forest. Each MPA consists of a core area surrounded by a buffer, managed to protect the conservation value of the core. Further protection is provided by adjacent forest, though this may be managed for a variety of other purposes. To a lesser extent, the same is true of the recreation MPAs, only one of which occurs in System 6.

Conservation MPAs within State Forest afford one of the most valuable opportunities for reservation within System 6, although at a cost of timber and other commercial forest production foregone. The selection of conservation MPAs has been a difficult task, particularly in the western high rainfall areas of the Darling Range, due to the desirability of avoiding areas badly affected by dieback disease, fire damage, over-exploitation in the past, or weed or feral animal infestation in proximity to cleared or settled areas. Thus the areas concerned were selected only after careful study of the forest as a whole, and consideration of all possible alternatives.

Virtually all State Forest within System 6 is subject to bauxite mining leases (Figure 4.1), and mining can occur subject to conditions which are specified in several agreements entered into by the State with mining companies. These agreements have been ratified by Parliament. Since the General

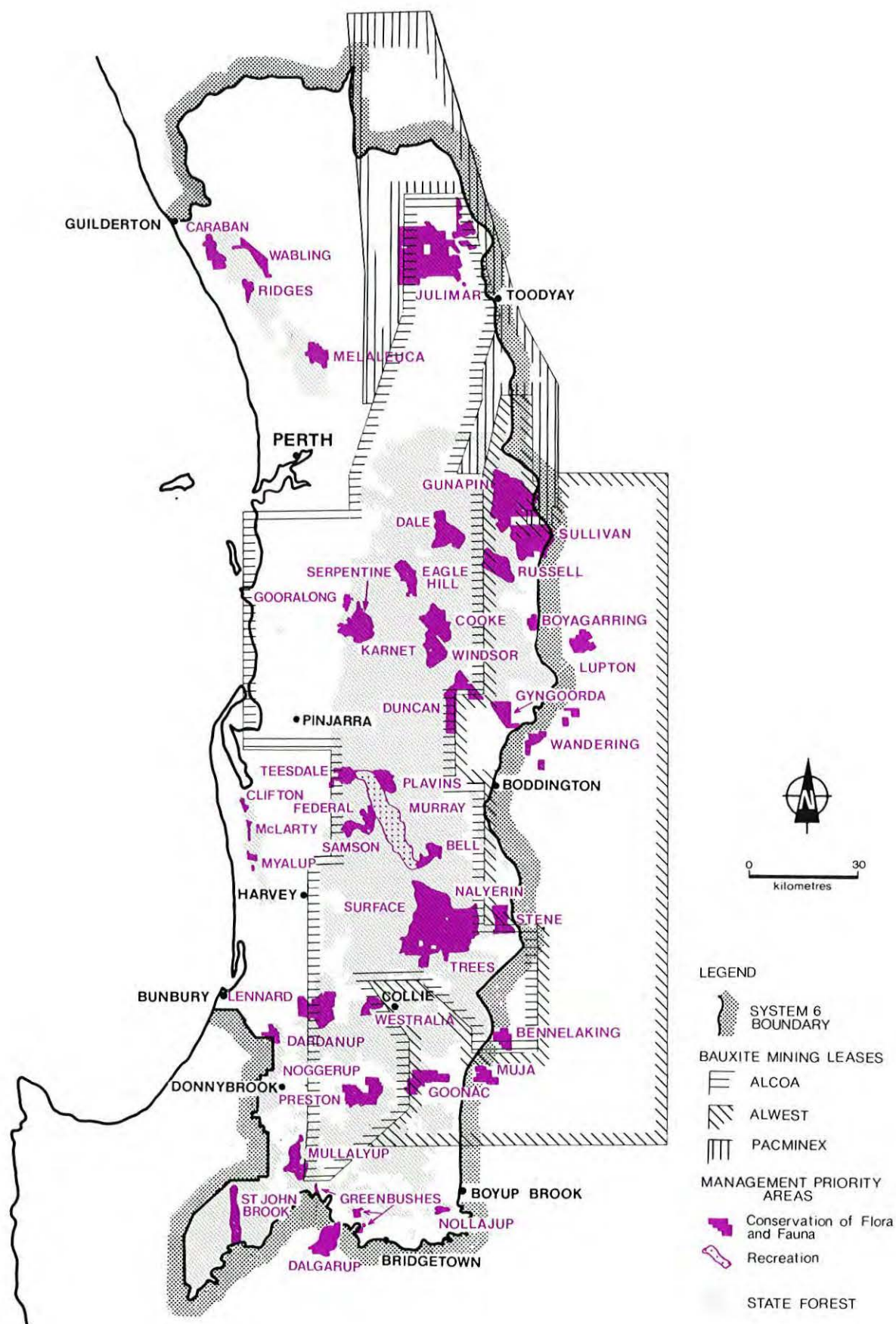


Figure 4.1 System 6: Bauxite mining leases and Forests Department's Management Priority Areas for conservation of flora and fauna and recreation

Working Plan No. 86 has been accepted by Cabinet and approved by the Governor, there is a potential conflict between mining and the purpose of MPAs established for conservation, or for recreation.

The basis for reconciliation between conflicting management objectives for State Forest differs from that in Land Act Reserves since water catchment protection and recreational use are already catered for as part of the declared policy of the Forests Department. In addition, there is a government-appointed Mining and Management Planning Group which has the responsibility of ensuring that the State's interests are taken into account in joint planning with Alcoa of Australia for bauxite mining within their lease. While the same requirement for joint planning has not been imposed on Worsley Alumina Pty. Ltd. for their initial operations at Mount Saddleback, 20 km to the south of Boddington, it seems that no conservation or recreation MPAs are threatened by the mining itself in that area.

The security of tenure of land in State Forest is equivalent to that of Class A Reserves in that revocation of the dedication of the land is subject to the agreement of Parliament. The main problem is to ensure that the security of purpose of the MPAs for conservation and recreation, is similarly protected. This problem is difficult, since dedication to maintenance as a natural area means that the bauxite present in the MPA cannot be mined, and must remain in the ground. This matter was carefully studied by the Conservation and Land Use Committee which formulated the recommendations presented here.

The agreements with mining companies^{23 24} require that the Conservator of Forests 'unless he has good and sufficient reason to the contrary ... grant to the company any permit or license necessary for these purposes subject to usual or proper conditions'. Thus the Conservator can deny access to specific forest areas for mining but his decision could be subject to arbitration.

The Study considered that by-passing such MPAs would have some effect on the economics of the bauxite alumina industry, but that certain areas with bauxite potential could be by-passed without significant detriment to the mining companies or the State. However, such constraints to mining must be taken into consideration along with other constraints.

It was also noted that in the Forests Department's preparation of its General Working Plan No. 86¹⁷ and the related document²⁵, the assessment of the economic and social impact of the formation of MPAs for conservation or recreation could not include a cost benefit appraisal of alternative mining strategies.

The System 6 Study fully endorses the concept of MPAs for the reservation of areas for conservation and recreation as appropriate in State Forest in the Darling Range and elsewhere. However, it is recognised that investigations of the flora and fauna of the Darling Range, more detailed than those already carried out, may possibly reveal acceptable alternatives to some of the areas currently nominated as conservation or recreation MPAs. These alternatives may have a lesser impact on the economic and social benefits that are likely to arise from other land uses. It may also prove possible, following more detailed investigation of each MPA, to modify the detail of boundaries, since they were generally chosen along existing access tracks and other easily identifiable landmarks.

The establishment of the Mining and Management Planning Group, which is convened by the Department of Resources Development, with representation from DCE, Forests Department, Public Works Department, and Metropolitan Water Board, will allow for the consideration and assessment of the most recent research information in developing mining plans. This will help determine an optimum land use strategy in Alcoa's lease area, so far as mining and other land values and uses are concerned. In principle, it is possible that changes to areas currently nominated as conservation or recreation MPAs may occur through this mechanism. Such alterations to the area and purpose of MPAs could be seen as detracting from their security of purpose, although their security of tenure as State Forest is already sufficient because any change requires the agreement of both Houses of Parliament. The Study has therefore given consideration to the further security of MPAs against major changes in area and purpose, and in particular to the use of the regulatory powers in Part VI, Section 43 of the Forests Act⁴, for the naming of each area and establishing its purpose of management. Establishment of purpose by regulation would ensure that it could not be changed without the agreement of both Houses of Parliament.

Attention is drawn here to the potential conflict between the legal requirements for access under bauxite mining leases and agreements and the purpose of MPAs as laid down in the Working Plan. However, it is considered that the conflict should be resolved in the light of specific mining proposals and detailed investigation of each MPA. In the meantime, the Study notes the significant level of protection against bauxite and other mining as well as other forms of land use, which various mechanisms have already afforded the MPAs. With respect to those MPAs with mineral potential, changes could occur by agreement or, if agreement cannot be reached, through

arbitration. This indicates that the security of purpose of conservation and recreation MPAs is not absolute at present. It should be increased in the future, but only after the question has been considered in relation to mining plans for the Darling Range. However, early decisions are required so that planning for suitable management of the MPAs in question can take place.

The Study has also considered the further development of the concept of MPAs, as outlined in the Forests Department's General Working Plan No. 86, and the need for its reconciliation with the 'Forest Park' concept as outlined in the EPA's Red Book for Systems 1, 2, 3 and 5.²⁶ It is considered that the name chosen should be appropriate where management is primarily for recreation pursuits, but 'Forest Sanctuary' would be more appropriate where wildlife conservation is the main purpose.

Recommendations

- 2 (i) The concept of specific areas of forest being delineated as Management Priority Areas for conservation or for recreation should be supported by Government.
- (ii) Where there is conflict between mining and these Management Priority Areas, then every endeavour should be made to resolve the conflict so that the value of the Management Priority Area for its primary purpose of conservation or recreation is not diminished.
- (iii) If this resolution of conflict necessitates an adjustment of boundaries or the relocation of such a Management Priority Area, then this may be allowed to take place, provided it can be done without diminishing the value of the Management Priority Area for its primary purpose.
- (iv) Any proposal to utilise a conservation and recreation Management Priority Area in a manner which affects the value for its primary purpose, and where satisfactory relocation is not feasible, should be considered by Government at the highest level and only then after there has been a thorough and rigorous study by authorities with responsibility in the matter of the value of the Management Priority Area and of the consequences of such utilisation.
- (v) The Darling Range Study Group and the Mining and Management Planning Group should proceed as a matter of urgency to review alternative land use options in the Darling Range and to address the question of the conflict between mining and the Management Priority Areas for conservation or for recreation so as to resolve such conflict.
- (vi) On resolution of such conflicts, the areas to be set aside as Management Priority Areas for conservation or recreation should be appropriately named, and such names and purposes of management formalised using the regulatory powers contained in the Forests Act, 1918-1976⁴.

4.4 Reservoirs, Catchments and Recreation

A number of public submissions (see Appendix 4) to the Study, including one from the Department of Tourism, argue for relaxation of restrictions on public recreational activities on reservoirs and within catchment areas. The Tourism and Recreation Committee has made recommendations calling for planning by the State to ensure that growing demands for recreational use of natural areas are met. They have also recommended that there should be no further restrictions on access to catchments on foot beyond those already in force, and that back-pack camping should be allowed in remote areas of catchments.

The water supply and public health authorities are opposed to the relaxation of restrictions on the grounds of increased health risks. They argue that additional expensive water treatment would consequently be required, resulting in unacceptable increases in costs to the consumer. Their arguments, and the further restrictions under consideration, are outlined in more detail in Chapter 3, Section 3.5. They should not be accepted without question.

While the upper catchment areas of many Darling Range rivers with water supply potential need protection because of the danger of salinisation, it is also true that water yield from these areas is low. For example, Figure 4.2 shows that for the Mundaring Weir Catchment, the proportion of total annual inflow to the reservoir derived from the upper portions of the Helena and Darkin Rivers, and from the Berakin River during the wildflower season, that is September, October and November, is only 3.3%. While the dieback quarantine regulations are in force and many roads and tracks are closed, these areas offer an opportunity for experiencing 'wilderness' conditions. But the possibility of them being used in this way by the few bushwalkers likely to enter them is limited, unless discrete camping is permitted.

An analogous argument can be applied to the question of public recreation on the reservoirs themselves. Patterson²⁷ has reviewed evidence which suggests that studies of the interaction between the dynamics of water circulation in the reservoir, pathogen biology, and operational

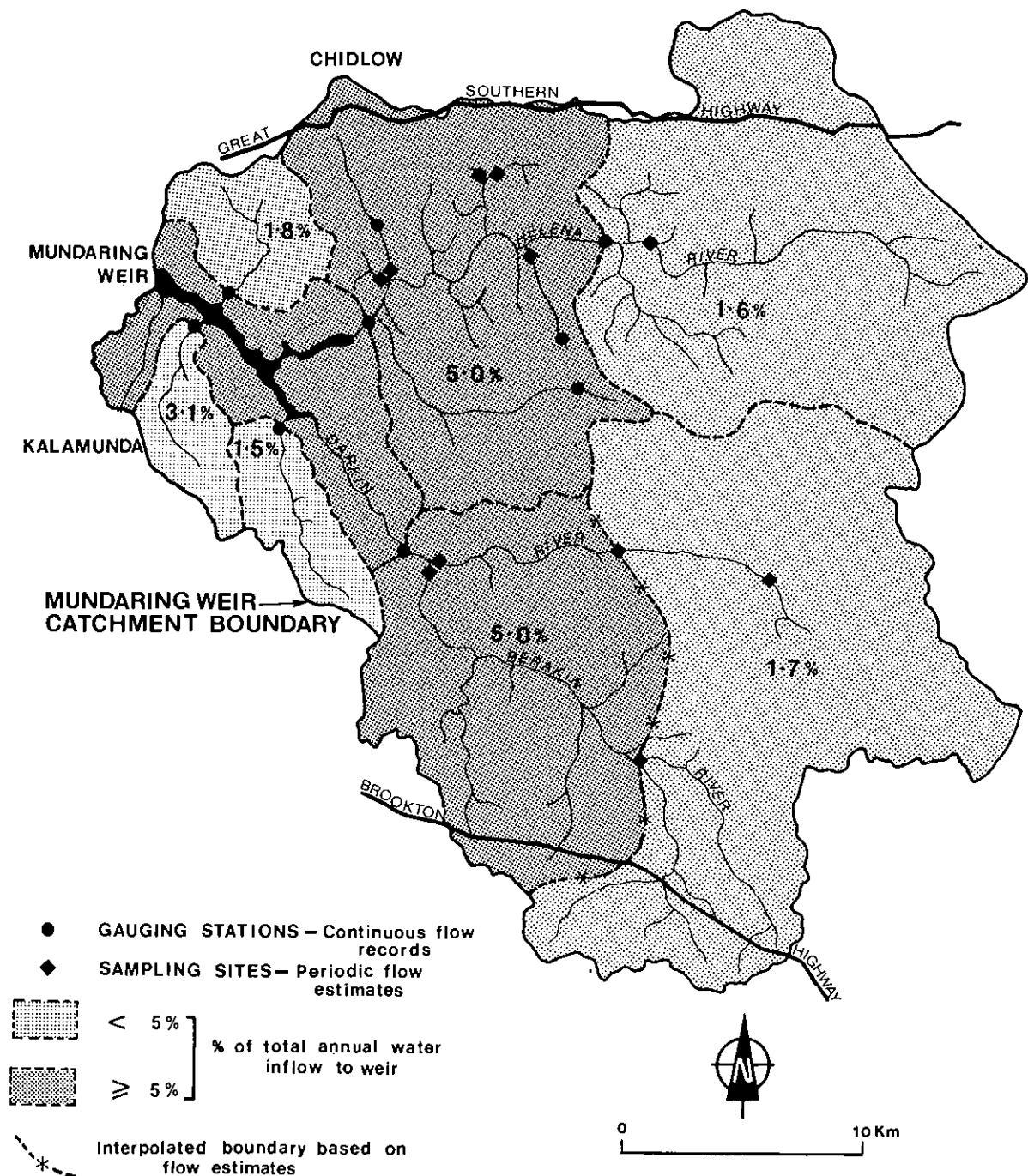


Figure 4.2 Spring run off in the Mundaring Weir Catchment

control could provide guidance in formulating policies for permitting recreational use without multi-stage treatment facilities.

In the absence of adequate technical data on specific catchments and reservoirs, perhaps the restrictive view may be the correct one, but it can be argued that investigations should begin now, to provide the technical basis for reviewing access policies in the future if the need arises.

Recommendations

- 3 (i) The State should initiate research on catchment and reservoir dynamics with a view to relaxing restrictions in the future through intensified management and controls, when this is justified by growing demands.
- (ii) Present policies on recreational use of reservoirs and catchments should remain unchanged for the present, other than in the Mundaring Weir Catchment, where the Public Works Department should consider allowing increased public access as soon as possible, for a trial period of five years during which studies of recreational usage and water dynamics should be carried out.

- (iii) The State should promote research on recreational demand patterns, which will assist in evaluating proposals for future increased recreational access to catchments and reservoirs.

4.5 Service Corridors

Water mains, sewerage and drainage works, gas pipes, electric powerlines, telecommunications, roads and railways run through existing and proposed reserves. New works have already been proposed and others are under consideration in some areas recommended for reservation. The Metropolitan Water Supply, Sewerage and Drainage Act²⁸, the State Energy Commission Act²⁹ and the Water Boards Act³⁰ confer extensive powers on the respective public utility authorities, including the power to enter any land and carry out works with respect to existing services, to enter any land and survey with respect to proposed works and, subject to procedures for objection, to construct new works. The acquisition of land for the purposes of these Acts, and for roads, railways and other works is provided for in the Public Works Act³¹. This Act includes the power of the Governor to take or set apart any part of any Reserve, except that the taking of land in a Class A Reserve for any purpose other than a road must be enacted by Parliament. The Telecommunications Act³² confers similar powers in many respects, relating to telephone lines, transmitters, and so on.

Despite these threats to the conservation and recreation values of existing or proposed reserves, environmental damage can be prevented or reduced by co-operation between the public utilities and Reserve management authorities, so that reservation of the new areas for conservation is justified and multiple land use is realised. The various parties should advise each other of their operational requirements and consult together as early as possible when planning new works. As far as possible, new service corridors should be located outside Reserves rather than running through them. The aesthetic advantage of placing powerlines along the borders between land uses has been emphasised by Seddon and Polakowski¹⁶ (see also Chapter 3).

Recommendations

- 4 (i) In exercising powers of access to services in conservation and recreation Reserves the public utility authorities should ensure that environmental damage is minimised and that full co-operation with the planning and management authorities is established.
- (ii) When planning new works which may affect conservation and recreation Reserves or areas recommended for such reservation, the public utility authorities should consult at an early stage with the planning and management authorities or the Environmental Protection Authority, as appropriate.

4.6 Conclusion

The earlier sections in this Chapter, with their recommendations, offer solutions to some of the problems posed by proposals for increasing the amount of Land Act Reserves dedicated to conservation and recreation. They also propose raising the level of priority or security accorded to these uses in land primarily set aside as State Forest or Water Catchments, though our proposals would not seriously alter the intent of existing Government policies in these areas for the present. In respect of State Forest, we recommend increased security of purpose of areas where conservation or recreation is already accepted as of high priority. In respect of water catchments, we advocate that the possibility of changes of policy in the direction of greater recreational use by the public in the future should be examined and recommend investigations that may permit such changes if they are required.

However, the matter of additional Land Act reservation, whether for conservation or public recreation, poses more difficult problems. New land for these purposes must, of necessity, come from land already owned by the State, including vacant Crown land and Reserves already established for other reasons, or from suitable freehold land which would have to be purchased, or acquired in some other way. The approach adopted in the past by the Conservation Through Reserves Committee was to identify areas suitable for Land Act reservation, and to recommend appropriate purposes, class of Reserve, and vesting bodies. Where conservation was a primary purpose, and of high priority, Class A was recommended, in order to establish their security as firmly as possible. Where it seemed necessary, freehold land was to be acquired by purchase.

A similar approach was adopted in the early stages of this Study, with the additional strategy of multiple vesting (Section 4.2) to safeguard the potential for water supply and/or mining. However, the work of the Local Government and Urban Planning Committee showed that these approaches were not fully adequate to deal with the complexities of System 6, where competing demands on the land resources are greater. Reasons for their conclusions include the following:

- Firm allocation of uses to particular areas of land, such as is involved in the declaration of Land Act Reserves, require a land use planning framework if decisions are to be made on a rational basis.
- Within the Metropolitan Region some such planning already takes place through the agency of the MRPA, though there is doubt as to whether it has the powers to provide for conservation, other than to the extent that it contributes to public amenity. This Study is not intended to conflict with or duplicate the MRPA's planning activity, though it may complement it where necessary.
- Beyond the Metropolitan Region, there is no regional planning authority. The significance of this in the context of the Study is discussed in Chapter 5.
- Due to the scarcity of uncleared land outside State Forest in System 6, many of the areas affording opportunities for conservation, for the enlargement of existing parks and Reserves, for the rationalisation of boundaries, or for the creation of new reserves, involve freehold land. The amount of land affected is so large, amounting to 300 km², and so valuable, that it is unlikely that sufficient funds for acquisition by purchase will become available, nor is compulsory acquisition or resumption likely to be favoured by the community.

Thus, although there are valuable opportunities for the establishment of conservation reserves in System 6, there will clearly be difficulties in establishing many of them. It follows that the protection of the conservation values of the land resource in general must depend heavily on public planning procedures. These should have the function of protecting existing parks and nature reserves, and of providing for additional ones, through Land Act reservation, purchase of freehold land, or planning controls on freehold land as appropriate.

Our proposals for planning and management advanced in Chapter 5 will, if accepted, help to provide a framework within which decisions on the matter of reserve location and classification can be rationally made, taking into account such factors as ecological importance, scarcity of alternative sites, and the value to the community of alternative uses of the land in question.

The freehold land identified in the detailed locality recommendations in Chapters 9 and 10 should therefore be dealt with by planning processes, through which decisions may be reached on the most suitable form of protection of the land, whether by planning controls or by acquisition if seen to be necessary.

However, planning procedures take time to develop and become effective. Alternative potential uses which conflict with the protection of natural areas take time to evaluate. Thus the establishment of potential reservation areas pending final decisions involving other competing land uses, through the device of multiple vesting of multiple purpose reserves (Section 4.2) should receive serious consideration. We have, however, not generally proposed its direct application in most of the localities detailed in Chapters 9 and 10, though we have indicated where it might be found useful by planning authorities.

Recommendation

- 4 (iii) Planning authorities should consider the use of the multiple purpose-multiple vesting strategy proposed in Recommendation 1 (i) as an interim means of protecting land with sufficient conservation value, which also has mineral or water supply potential.

Chapter 5

PLANNING AND MANAGEMENT OF OPEN SPACE FOR RECREATION AND CONSERVATION

5.1 General

In Chapter 3 (Section 3.10), a distinction was made between Land Act reservation on the one hand and provision for conservation and recreation under town and country planning legislation on the other. Conservation often requires setting aside areas which must meet specific criteria such as size, representation and lack of disturbance. Such needs may be partly met under Land Act reservation. However, planning and management strategies for open space under planning legislation need to be dynamic. The requirements for outdoor recreation vary widely and may change with time, depending on the forms of use proposed and the needs of those for whom they are being provided.

Chapter 2 discussed the value of natural areas as a recreational resource, and the growing public demand for access to them as a result of population growth and increases in other pressures on

land resources. Unplanned and uncontrolled recreational use of natural areas can be damaging, particularly when concentrated in such fragile zones as river foreshores or the coastal dunes and beaches. Most planning authorities aim to alleviate this situation by providing and managing land for public recreation.

5.2 Definition of Open Space

The term 'open space' can be defined in a number of ways, varying from a narrow statutory sense to a very broad definition which encompasses all land not built on. In this Report the term is used in three main ways: in a general sense, referring to land which has conservation and recreation values, though not set aside primarily for that purpose; as a planning concept; and in the statutory planning sense.

In the general sense, open space is all land not built on, no matter what its formal use classification may be. Examples of such 'functional' open space are farmland and other types of rural areas, State Forest, vacant Crown land, and water supply catchments. They tend to be of regional significance, and provide access to and visual links between areas formally designated as open space through planning procedures.

As a planning concept, open space may be seen as a hierarchy of three levels, local, district and regional, depending on the size, characteristics and intended use of the areas.³³ Public open space 'reserved' by local government authorities under their planning schemes to serve their own communities, is often referred to as either local or district open space. Regional open space, on the other hand, usually consists of larger areas set aside for the use of the community generally, rather than just for local residents, and it may extend beyond the jurisdiction of a single local authority. It may have unique natural features which need protection, and in addition it should be capable of providing a visual and psychological relief from the urban environment, a buffer to urban and residential development, and a variety of recreational opportunities³⁴.

Open space areas may comprise river and estuarine foreshores, ocean beaches, picnic areas, sports centres, zoos, nature reserves, urban parks and others. Identification of such land as public open space for outdoor recreation clearly may embody an element of conservation as well as development of recreational facilities, since one way of meeting the above criteria can be the enjoyment of areas in their natural state. In this Chapter and in the locality recommendations of Chapters 9 and 10, the Study has primarily been concerned with regional open space, rather than local or district open space.

In statutory planning terms, local open space is provided for in Western Australia by land set aside by the Crown from original holdings, land acquired by local authorities, and land revested in the Crown as a condition of subdivision approval imposed by the Town Planning Board. Local authorities throughout the State have the power to make town planning schemes, and to incorporate land set aside as open space as an essential part of the scheme.

At present, planning legislation provides for land to be set aside as open space at the regional level only within the Metropolitan Region. Land which is privately owned, Crown land, or land held in fee simple by government agencies or local authorities may be zoned or 'reserved' for various purposes under the Metropolitan Region Scheme.³⁵ The terms of reference for the System 6 Study direct us towards land of regional significance which might be reserved in this way for Parks and Recreation, and thus set aside as regional open space. This is obviously a very valuable means of ensuring co-ordinated planning for public recreation, and it must, as already suggested, involve some degree of conservation of natural areas as a contribution to amenity values.

However, there is no machinery for setting aside land for regional open space beyond the Metropolitan Region, though the need for this type of planning activity is pressing throughout the State as a whole. This is particularly true in the System 6 area because of the land use pressures referred to in Chapters 2 and 3. There is, therefore, a serious deficiency in the State's planning provisions outside the Metropolitan Region.

5.3 Current Planning and Management of Open Space

Within the Metropolitan Region, 32 000 ha are 'reserved' for Parks and Recreation under the Metropolitan Region Scheme³⁶ as at May 1980. Of this total, 17 000 ha are controlled by State agencies (e.g. National Parks Authority, Kings Park Board), and local government authorities, and 12 000 ha are owned by the MRPA (July 1980). The remaining 3000 ha (11% of the total area so 'reserved') are in private ownership and have not yet been acquired. In its submission to the System 6 Study, the MRPA has recommended that areas totalling a further 13 700 ha be considered as possible extensions to the existing open space resource. The System 6 Study has endorsed almost all of the MRPA proposals and has incorporated them in the specific locality recommendations in Chapters 9 and 10.

To date, the MRPA has concentrated on planning, acquisition and interim maintenance of open space. It has undertaken preliminary design and use studies of a number of areas and initiated preliminary development at Mussel Pool (Whiteman Park). However, the Authority has indicated that it sees its future role as co-ordinating and planning for open space and its use, rather than ongoing management. The MRPA's role as a developer and manager of open space has yet to be clarified.

A decision that the MRPA should not undertake a management role would leave a vacuum in the management of regional open space at present. Although local authorities have taken over the development and ongoing management of some areas, there are others which, because of their complexity, would be beyond the financial resources and expertise of councils. There are also some legislative deficiencies which may need to be rectified. It is hoped that our recommendations will assist in remedying this situation.

In the country areas of System 6, 33 000 ha (or 1.6%) have been set aside specifically for recreation as at April 1977. This includes National Parks, and reserves for recreation, parkland and camping. However, as pointed out above, there are no statutory regional planning schemes for areas outside the Metropolitan Region, and thus no authority with the statutory responsibility for setting aside open space of regional importance.

The question arises as to whether open space provision in System 6 as a whole is adequate. Standards by which to make this judgment are difficult to establish. However, it is clear from its submission to the Study that the MRPA regards setting aside open space within the Region as a continuing activity, so that the present provision within the Metropolitan Region cannot be taken as a guide for areas beyond it. Outside the Metropolitan Region, while there appears to be an abundance of land which functions as open space, areas formally dedicated for outdoor recreation and conservation are small, thus the potential for designating further such areas is considerable.

Although areas of functional open space are managed primarily for such uses as timber or water supply, management authorities may provide recreation facilities where this does not conflict with the primary use. In particular, facilities are provided at dam sites and other places of interest within State Forest, and some of them, e.g. the Murray Valley, are heavily used. However, as recreation use may be severely restricted in other areas (e.g. in certain parts of water catchments, valleys flooded for reservoirs, dieback quarantine areas, mining areas, privately owned farmland), the existence of State Forest and rural areas appearing as functional open space should not preclude formal provision for open space under planning schemes.

But the dedication of more land as open space, through planning schemes, is not in itself sufficient. Because of limited funds for purchase, much of the land will and should remain in private ownership. Planning procedures throughout the State should recognise the need for a flexible management system which will apply to both private and public land owners. In valuable scenic areas and in buffers around conservation reserves, there is obvious potential for co-operation between private and public land owners, with advantages to both in working within a joint management plan. Special legislation has made such arrangements common elsewhere in Australia and overseas.

Under these sorts of arrangements, the owners retain their land and the right to use and develop it and can get specialist advice on its management. The resultant protection of amenity values could benefit both owners and the community interest, and compensation would be provided where it is necessary for owners to make concessions for public pathways and other facilities, or to forego specified land uses. A number of owners in suitable areas are already interested in managing their properties to retain scenic and conservation values, and would probably prefer an agreed management scheme rather than loss of their land to public ownership. The concepts of landscape conservation areas and conservation buffer zones, outlined in the next Section (5.4), are directly relevant.

The main deficiencies in the present arrangements for providing for open space through town and country planning may be summarised as follows:

- There is a lack of co-ordination of the overall planning and management of areas 'reserved' for Parks and Recreation under the Metropolitan Region Scheme, partly because of the number and diversity of management bodies. The MRPA and other bodies with overall planning responsibilities for recreation and conservation have considered the need for co-ordination as well as the need for continuing management of regional open space. Clearly, a comprehensive plan for the classification and use of all open space within the Metropolitan Region would assist the MRPA in formulating its land purchase programme.
- The provision, planning and management of each category of open space in the hierarchy (local, district and regional) needs to be co-ordinated with that of the other categories.
- Insufficient consideration has been given to the possibility of linking existing areas of open

space by providing pathways between them. The importance of linear open space for this purpose requires further emphasis.

- Although the MRPA maintains properties which it has acquired, much open space consisting of vacant Crown land or private land not yet acquired is deteriorating in quality, due to inappropriate use or lack of maintenance.
- Management bodies, including local and other authorities responsible for areas where recreation is not a primary use, may genuinely want to provide for recreation and conservation needs. However, they are likely to be hampered by a lack of funds and some lack the technical expertise to cope with the increasing intensity and diversity of recreation activities.
- Current restrictions on the recreational use of areas which are primarily managed for water supply, forestry, agriculture, mining and other land uses require reappraisal.
- Outside the Metropolitan Region, there is no provision for open space and outdoor recreation at the regional level, due to a lack of regional planning bodies with specific powers. This is a problem, especially in the larger country centres, such as Mandurah, Pinjarra, Collie and Bunbury. Unless land is dedicated for this purpose, public outdoor recreational resources may well be frittered away under pressure of other land use demands. If land is dedicated for open space, adequate management arrangements are essential.
- It is not possible or desirable to bring all potential public open space into public ownership, if only because of the prohibitive costs of acquisition and management. However, there are many privately owned areas which require protection and co-ordinated management. The System 6 wetlands are a good example. Many have already been lost and only a small number of those remaining have been recommended by the Study as nature reserves. This is due to the high costs of acquisition of both the water bodies and protective buffer zones. Specifically, the cost of acquiring Lakes Neerabup, Carabooda and Pinjar, north of Perth, and surrounding buffer zones would amount to several million dollars.

5.4 Concepts and Terminology

The existing terms relating to open space as defined in Western Australian statutes, and as general planning concepts, do not provide an adequate framework for planning and management. They tend to be fairly broad so as to encompass a wide range of resource uses under one term (e.g. 'public open space'). One particular type of open space may be described by several terms, each with a different shade of meaning. For example, a linear shaped open space can be described as being a linear park, trailway, walkway, foreshore reserve, or parkway. What is required is a terminology identifying classes or types of open space in such a way that their appropriate management is generally indicated. In this Section we introduce a number of terms to assist in developing new proposals for open space planning and management; each (with some suggested applications) is described in the following paragraphs and summarised in Table 5.1.

The demand for large accessible areas of open space for fairly intensive outdoor recreation is increasing. Areas of this type are defined here as **regional parks**. They have three basic functions: to provide for recreation, conservation of the natural environment, and conservation of attractive man-modified landscapes. The term may, where appropriate, be qualified, as in 'linear regional park' or 'riverine regional park'. 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 also consist entirely or partly of attractive man-modified rural landscapes or involve other land uses, providing these have recreational potential. Currently, there are a number of areas which could be described as regional parks; significant ones in this Study being Yanchep National Park (M3)*, the Murray Valley (C73), Kings Park (M49), and Whiteman Park (M13). The lack of formally defined regional parks in Western Australia represents a gap in our present reserve system.

The need for **landscape conservation areas** is becoming more obvious with increasing pressures on rural land; for example, sub-division or intensification of agriculture may detract from the countryside's scenic appeal. Landscapes may be important for their scenic, historic, educational, recreational or environmental value. The term 'landscape conservation' is defined here as the conservation of natural or man-modified landscapes through identification and protection of the most attractive, valuable or sensitive portions. While such areas may consist largely of land in private ownership, it is not intended or implied that the land should necessarily be acquired for its protection, or that uncontrolled public access should be encouraged. Instead, negotiations by

*Reference in parenthesis identifies localities which are the subject of detailed recommendations in Chapters 9 and 10.

Table 5.1 Concepts for open space planning and management

	Function/Purpose	Location/Accessibility	Current Management	Examples of Areas* where the Concept could apply
Regional Parks	To provide for a variety of outdoor recreation activities within a largely natural setting	Close to or within easy access from population centres	Some areas managed by National Parks Authority, local authorities, water supply authorities, Forests Department.	John Forrest National Park (M21), Yanchep National Park (M3), Canning Dam, Lake Leschenaultia (M25), Kings Park (M49), Peel-Preston area
Landscape Conservation Areas	To protect an area of attractive man-modified landscape	Within view of publicly accessible areas and roads	Privately owned	Darling Scarp (M80), Chittering Valley Balingup-Nannup area
Wild and Scenic Rivers	To protect major valleys which have value as a wilderness, scenic or recreational resource	Major undammed valleys. Accessibility dependent on classification of valley as either wild, scenic, or recreational	Forests Department, water supply authorities, or privately owned	Avon Valley (M16, M18), Murray Valley (C72, C73, C74, C77), Lower Colliie Valley (C87), Blackwood Valley
Pathway Systems	To provide for the needs of walkers, cyclists, horseriders, often within a natural setting	Located according to demand. Hierarchy of paths located within urban areas, on outskirts of urban areas or more distant. Often linking areas of open space	Local authorities, Forests Department	Bibbulmun Track, cycle path along Canning River at Rossmoyne, Kings Park paths
Conservation Buffer Zones	To protect conservation and conservation/recreation areas from harmful effects of incompatible land uses adjacent to such reserves	Adjacent to conservation/recreation reserves	Privately owned, or managed by various government authorities (e.g. SEC, water supply authorities)	To protect Ellen Brook and Twin Swamps Wildlife Sanctuaries (M17)
Road Corridors	May be of value for conservation of flora, movement of fauna, scenic value or recreational/tourist value	Especially roads passing through cleared, privately owned countryside	Local government, adjacent landowners, Forests Department. Also activities of other government authorities, (e.g. SEC, MRD)	Brookton Highway (C37), Old Coast Road by Leschenault Inlet, South West Highway at Ludlow Forest, many verges in the South-West

*Reference in parentheses identifies localities which are the subject of detailed recommendations in Chapters 9 and 10.

planning and management authorities should be held with private land owners, to identify ways in which the latter could develop and manage their properties, while safeguarding their landscape value. This would often be in their common best interests. Incentives and compensation would be offered where appropriate. The public would then be able to enjoy these areas by viewing them from roads, pathways, lookouts, adjacent public land, water courses and so on. Landscape conservation often brings increased income to a region through tourism, and it can increase property values, as attractive surroundings are ensured. A number of local authorities in System 6 are developing ways to protect the quality of the landscape within their shires.

The major undammed valleys in System 6 are important scenic and recreational resources. Especially significant are the valleys of the Avon, Murray and Lower Collic Rivers, all of which are the subject of specific recommendations in Chapters 9 and 10 of this Report (see Recommendations M16, M18, C72, C73, C74, C77, C87). However, as long as Perth's water consumption remains high, there will be pressures to dam these valleys. The U.S.A.'s '**wild and scenic rivers**' concept, as embodied in legislation³⁷, could usefully be applied to the situation here. Rivers may be designated by the Nation or State as being 'wild', 'scenic' or 'recreational'. Designation has two results. Firstly, recreation and conservation are established as important objectives of development and management; and secondly, the three categories are a guide to specific management. 'Wild' rivers are inaccessible, primitive and undammed; 'scenic' rivers have some vehicular access, are largely primitive and are undammed; and 'recreational' rivers are readily accessible, may have been developed on their banks and have been dammed. Each river or section of river should be managed in accordance with its particular classification.

The need for networks of **pathways** was made clear in public submissions (Appendix 4) to the System 6 Study. River foreshores and other potential linear parks were especially mentioned. People want pathways for walking, cycling or horseback riding, passing through and between areas of open space. The term 'pathway system' is used here to refer to a hierarchy of connecting paths, including local, district, regional, State or even national levels. The paths would serve a variety of users and purposes, and potential users might participate in the planning and design of the pathway system. In Chapters 9 and 10 of this Report, there are a number of recommendations related specifically to linear parks along river foreshores, and pathways would be appropriate in these and in many other areas.

Conservation reserves may be jeopardised by incompatible activities on adjacent privately owned land, thus the need for **conservation buffer zones** to protect them is becoming more urgent. Conservation buffer zones could be created around certain nature reserves, National Parks and areas 'reserved' for Parks and Recreation under planning schemes. Their creation would imply various measures such as construction of fences and fire breaks, weed and vermin control, retention of natural vegetation and measures to maintain water quality and natural drainage patterns, especially where wetlands are concerned. Compensation could be involved in cases where restrictions were imposed on private land owners.

The concept of a **road corridor** includes not only the roadside, but the whole road reserve, and its relationship to the surrounding land. As more land is cleared and alienated, the value of road corridors increases. New roads need to be carefully planned and designed to allow for management of roadside vegetation which would otherwise deteriorate.

Relevant objectives for planning and management of road corridors include: conservation of flora and fauna; provision for such recreational activities as sightseeing, walking, cycling and picnicking; provision for a readily accessible educational resource; and helping to maintain the general landscape through which the road passes.

5.5 Planning and Management Organisation

In the previous section a conceptual framework was proposed, which in effect classifies different types of open space as a basis for management. We now turn to a consideration of the organisational aspects. During the course of the System 6 Study a strong feeling has emerged that there is a real need for the co-ordination of planning and management of open space, not only in System 6, but throughout the State.

Open space planning and management for System 6 as a whole requires the co-ordination of the activities of responsible authorities, the provision and exchange of technical information and advice to and between them, and the establishment of a hierarchy of open space, consisting of areas and facilities at local, district and regional levels. Together, these needs point to the necessity for statutory provisions for the integrated planning and management of all open space. This should include land for which recreation is an important, even if not the primary use, encompassing both public and private land. The need for statutory provisions for co-ordination has been recognised both overseas and in the Eastern States of Australia.

- The U.S.A. has a Heritage, Conservation and Recreation Service (formerly Bureau of Outdoor Recreation), which fulfils this function. Each State is required to produce a comprehensive outdoor recreation plan before becoming eligible to receive Federal funds.
- As an example of a plan produced by one of the States, Florida has identified and examined major outdoor recreation activities, trends, and recreation resources throughout the State, and has arrived at some standards for recreation provision. It has also examined the effects of some management policies and has proposed ways to implement its plan.
- In Australia, Tasmania has recently completed its Recreation Land Use Study. Its basic aim is to establish a Tasmania-wide system of parks and recreation areas on State-owned land and to establish a framework for further planning.

In Western Australia there is no co-ordination or overall planning for open space except within the Metropolitan Region, although the MRPA has certain statutory powers that enable it at least partly to rationalise the situation. The result is that although a great variety of open space is available within System 6, and also in the State as a whole, these areas do not appear to completely meet community demands. These problems are only going to be overcome by planning processes such as those which have taken place elsewhere. This must involve the setting up of an organisation having the following principal goals and responsibilities:

- to co-ordinate the planning and management of the State's open space resources, including both land formally designated as such, and land which has that function, though perhaps used primarily for other purposes;
- to ensure that future acquisition of land for open space is properly integrated with existing provisions;
- to advise the Government on appropriate management policies and guidelines;
- to formulate policy recommendations concerning open space procurement and classification;
- to negotiate, where necessary, for a suitable body to undertake the day to day management of various open space resources;
- to provide for the co-ordination of technical and other advice to managing authorities;
- to service one or more committees, advisory to the managing authorities;
- to co-ordinate and collate relevant research and to disseminate the findings;
- to co-ordinate financial programmes;
- to advise on budget allocations and staff deployment;
- to co-ordinate development and use programmes;
- to maintain a pool of trained administrators and scientists who could advise ongoing managers and perhaps recruit and train open space managers for later appointment to local authorities and/or specific management organisations;
- to foster a greater public awareness and involvement in open space planning and management.

In addition, the following more specific tasks are urgent:

- (i) A detailed study of the legislation and the roles of existing management bodies, leading to recommendations on necessary changes in the present structure and legislation and the need or otherwise for new management bodies with appropriate areas of expertise.
- (ii) An examination of the present funding of management of open space leading to recommendations for future funding and co-ordination of development programmes.
- (iii) An investigation of legislative means of achieving conservation planning aims without necessitating public acquisition of land.
- (iv) The development of a Recreational Areas Strategy plan (RASP), involving inventory and planning for a system of recreation areas and facilities. This would require:
 - assessment of current and future recreation demand, taking into account current activities and preferences, the needs of various sectors of the community, and trends likely to influence future recreation, e.g. population growth, education, income levels, transportation and leisure time;
 - the development of a comprehensive strategy plan, taking into account the special features of existing and potential open space, the possibilities for access links between areas of open space, the inadequacies of current provision for aquatic recreation and the costs likely to arise due to conflicts with other land uses.

Although the tasks outlined are complex, a completely new open space planning and management

organisation may not be necessary. Existing bodies have the advantage of being established and having plant, equipment and an organised labour force. Local authorities are especially important in that they have intimate knowledge of their districts and the requirements of the local community.

However, the basic need for a State policy for co-ordinating open space planning and development, including the provision of finance, still remains unfilled at present. No single Cabinet Minister has this responsibility and consequently some important innovative recommendation seems necessary.

Co-ordination could be achieved by means of a secretariat added to an appropriate ministerial portfolio. We propose the organisation shown in Figure 5.1. The secretariat could set up advisory committees, to be appointed by the Minister as working groups, and, as appropriate, advise on specific issues. Membership could be drawn from management bodies and planning authorities and could perhaps include a representative of the Treasury.

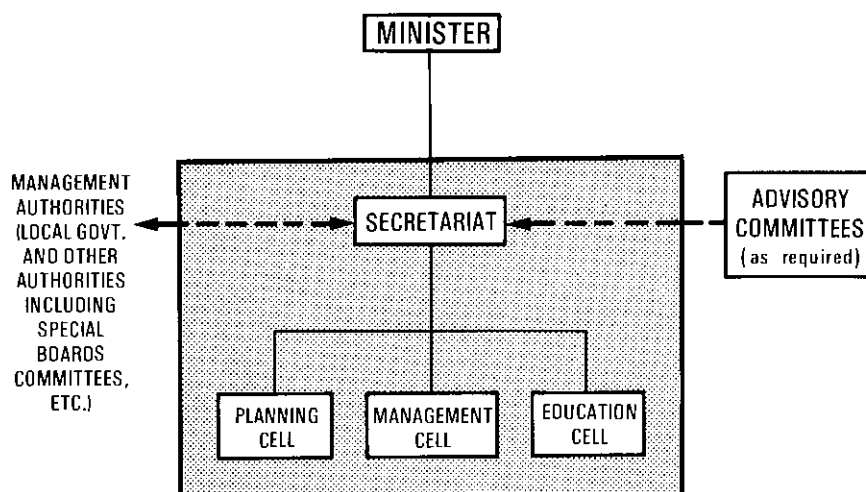


Figure 5.1 Structure for co-ordinating planning and management of open space

The secretariat should be responsible for initiating the following investigations in conjunction with the Department for Youth, Sport and Recreation, and other relevant authorities.

Regional Parks — This investigation should:

- (i) Examine the statutory means by which areas beyond the Perth Metropolitan Region could be 'reserved' and acquired for Parks and Recreation, on a regional basis, including application of the concept of extra territorial responsibility.
- (ii) Identify those areas which are potential regional parks, as defined in Table 5.1. Road corridors should be considered as potential linear regional parks. Other areas investigated should include the major river valleys, the coastline, estuaries, inlets, lake systems, forest areas and attractive rural areas in System 6.
- (iii) Define management objectives for regional parks in general and for each particular park.
- (iv) The investigation should draw on examples from the Eastern States (e.g. Melbourne's 'Metropolitan Parks', N.S.W. 'State Recreation Areas') and overseas, and should include consideration of financial and legal aspects.

Landscape Conservation — This investigation should:

- (i) Identify areas suitable for landscape conservation and establish priorities for their management, based on clearly defined and justifiable criteria, taking into account their inherent qualities, and the demands of other land uses.
- (ii) Consider the alternative legislative means for providing landscape protection, including compensation arrangements and incentives. Various mechanisms used in the Eastern States and overseas should be evaluated, and the possibilities of amendments to existing West Australian legislation should be considered. It may be that several alternatives would be appropriate to cover the range of areas to be protected.
- (iii) Be coupled with a major public relations and participatory exercise aimed at increasing public awareness of the need for landscape conservation and of the various techniques for achieving it.

- (iv) Result in recommendations directed at those bodies which would be responsible for developing specific landscape conservation plans. In making such recommendations, the investigators should draw on experiences such as that at Mornington Peninsula, Victoria, and consider the need for flexible and clear guidelines which recognise the dynamic quality of landscapes.
- (v) Consider those road verges which function as 'visual corridors'. 'Scenic routes' should be classified and administrative arrangements developed for their management.

Wild and Scenic Rivers — This investigation should:

- (i) Classify the river valleys of System 6 on similar lines to the U.S.A.'s Wild and Scenic Rivers Act³⁷, and identify broad management objectives for each valley or section of valley, these objectives to include recreation, conservation, landscape conservation, forestry, water supply and other uses where appropriate.
- (ii) Result in recommendations for appropriate management authorities and arrangements for each designated valley (suitable authorities may include, for example, National Parks Authority, or the Forests Department) or other arrangements stemming from the classification of some of the valleys as regional parks.

Pathways — This investigation should:

- (i) Examine the requirements of users of pathways (including pedestrians, cyclists and horse-riders).
- (ii) Examine the requirements of those using pathways for various purposes, including shopping, going to school and commuting, and recreation purposes, such as short trips, day trips and overnight trips.
- (iii) Consider the relationship between the pathway system and existing and proposed open space hierarchy.
- (iv) Examine means of co-ordinating the management of pathways, including consideration of the use of volunteer labour and the need for local authorities to receive expert technical advice.

Conservation Buffer Zones — This investigation should:

- (i) Examine appropriate objectives for setting aside conservation buffer zones.
- (ii) Identify reserves or areas where conservation buffer zones could be implemented.
- (iii) Examine legislative means for implementing the concept of conservation buffer zones.

Road Corridors — This investigation should:

- (i) Classify and identify road corridors in System 6, and recommend objectives and means to manage them.
- (ii) Consider the various roles of road corridors, viz. as resources for biological conservation, landscape conservation, recreation and tourism, when investigating appropriate management objectives and design criteria.
- (iii) Result in recommendations for appropriate legislative and administrative machinery to achieve the objectives.

The recommendations which follow lend force to arguments for the establishment of a secretariat. They mainly call for general planning and management arrangements, rather than referring to specific areas or to particular issues where they may be applied. Such detail is contained in the Reports of the Local Government and Urban Planning Committee and the Tourism and Recreation Committee, as well as in Chapters 9 and 10 of this Report.

Recommendations

- 5 (i) There should be an investigation into legislative means of achieving planning and conservation aims without necessitating public acquisition of land. Ideally, this could be carried out within the organisational framework proposed in Recommendation 5 (iii) below.
- (ii) The Government should recognise the need for a State-wide policy for open space planning and management, and the need to provide adequate funding for these purposes.
- (iii) A secretariat, with the responsibility for co-ordinating open space planning and management, should be established as a matter of urgency.
- (iv) The Town Planning Department should undertake an early study of any necessary changes to the Town Planning and Development Act, 1928-1977 in order to provide for the management of private open space by local authorities, as part of a Town Planning Scheme.
- (v) The Department for Youth, Sport and Recreation should undertake the production of a comprehensive State-wide Recreation Areas Strategy Plan, to include a survey of existing

recreational resources and their management, and the development of policy recommendations on future provision, co-ordination, planning and management of recreation, in relation to open space.

- (vi) The Recreational Areas Strategy Plan should therefore include:
 - a survey of the recreational resources available, particularly within System 6;
 - an assessment of current and likely future recreational demand.
- (vii) The secretariat, as soon as possible after establishment, should arrange for a number of specific tasks to be carried out, including the following:
 - investigation of ways to provide for resort development, integrated with open space;
 - review of public health regulations covering camping, so that provision may be made for informal bush camping areas and low cost caravan and tent camping areas along scenic routes;
 - investigation of ways to provide more low cost accommodation such as youth hostels and dormitory style facilities;
 - compilation of an inventory of caves within System 6, together with recommendations for their use and management;
 - investigation of ways in which historic sites could be managed in conjunction with recreational facilities, in order to utilise fully their value to the public.

Chapter 6

OPEN SPACE RESOURCES OF SYSTEM 6

6.1 General

In this Chapter major features and regions of System 6 are considered in terms of their value as an open space resource. Specific recommendations for zoning or 'reservation' of land as open space are not made, since, as we have already indicated, these should result from public planning processes by appropriate planning authorities. Instead, broad planning and management goals in respect of conservation and recreation are indicated for certain parts of System 6.

Consequently the considerations presented earlier, particularly the planning concepts outlined in Chapter 5, are especially relevant. We indicate parts of System 6 where, in areas with a mixture of private and public land, there are important opportunities for conservation of natural areas and for their recreational use. These opportunities can be exploited through town and country planning processes. The areas concerned are largely outside the State Forests of the southern Darling Range and northern Coastal Plain. They also include a number of natural features of regional importance where the regional parks concept is applicable. Nevertheless, this Chapter only draws attention to and does not comprehensively review the open space resources of System 6.

Within the Metropolitan Region the MRPA has made significant moves towards providing land for public recreation. Substantial areas have been zoned or 'reserved' for this purpose, and a large proportion of the land has been purchased by the Authority.

The Study has generally endorsed the MRPA's 'reservation' proposals though some modifications and a few recommendations for 'reservation' of new areas have been made. These are detailed in Chapter 10. Outside the Metropolitan Region there are many attractive areas where the opportunity for 'reservation' or zoning exists, but the necessary planning is difficult to implement at present. This is partly because many features, for example river valleys, come under the control of several local and other authorities.

While the areas discussed in this Chapter are not the subject of recommended zonings, they could usefully be considered by planners in the future. They are based on submissions to the Study from such bodies as the Department for Youth, Sport and Recreation, the Department of Tourism, and various individuals and associations, as well as work by constituent committees of the System 6 Study.

6.2 The Darling Scarp

The Darling Scarp is the dominant physical feature of System 6. It is most conspicuous immediately to the east of Perth, where it rises abruptly to a maximum height of about 300 m. The Scarp is extremely important in providing an attractive visual backdrop to Perth. As shown in Figure 6.1, most of the portion of the Scarp under consideration, together with the Avon Valley upstream to

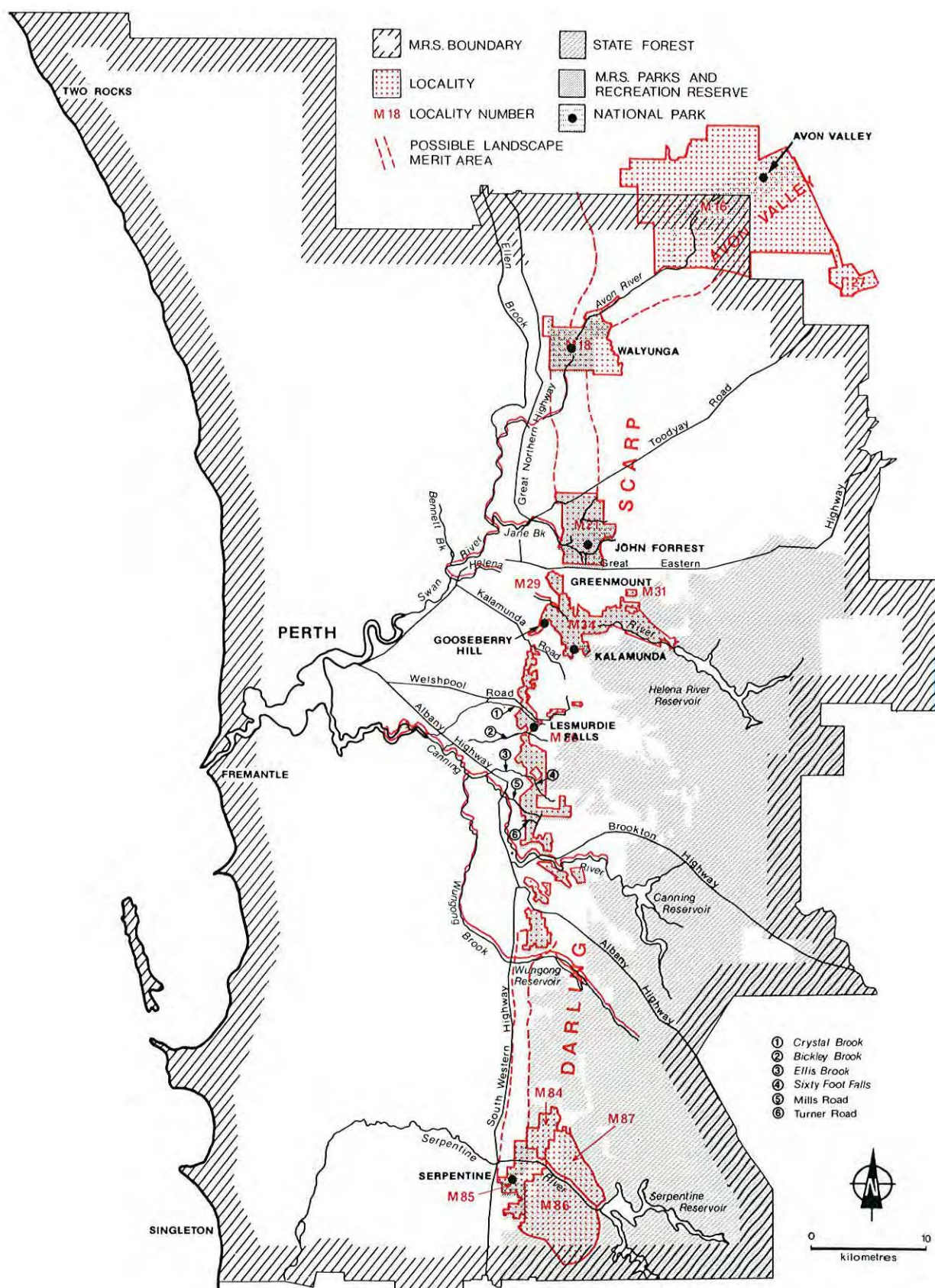


Figure 6.1 Proposals for the Darling Scarp and Avon Valley

Avon Valley National Park, is either 'reserved' for Parks and Recreation under the Metropolitan Region Scheme or has been identified by the MRPA in its submission to the Study as having landscape merit. These areas comprise most of the uncleared land on the Scarp, together with some attractive rural areas.

Together, they form an elongated area of potential open space which is almost continuous for roughly 100 km. Several specific localities are the subject of detailed recommendations in Chapter 10 (see Figure 6.1). Major land uses on the Darling Scarp include large areas of residential development and, to the east, orchards and small holdings, and vast uncleared areas of State Forest and water supply catchment. To the west the Scarp is linked to built up areas by open space in the form of narrow river valleys. These include the valleys of the Canning and Southern Rivers (M75)*, Helena River (M33), Jane Brook (M20), and the Swan-Avon River (M19).

The Darling Scarp between Lesmurdie Falls and Turner Road, Roleystone, contains some of the best Scarp bushland remaining near Perth. It includes picturesque scenery on the Scarp itself and within the valleys, and provides vantage points for panoramic views across the Coastal Plain.

Many valleys have a winter-flowing stream and several have attractive waterfalls and rapids. Wildflowers display from August to October, and some areas are still relatively undisturbed and have high value for flora conservation.

The Darling Scarp as a whole supports vegetation and plants found nowhere else, even within the south-west. Due to the variety of landform and rock formations, such as granite outcrops and the edge of the laterite plateau, there is a variety of vegetation types present including heath, forest and woodland. The heath and understorey of the forest and woodlands are rich in shrubs and herbs. A more detailed description of the geology, landforms, soils, vegetation and land use is given in the Darling System Atlas.⁶

Floristically, the most important areas close to Perth are the spur and valley to the south of Crystal Brook; the north side of Bickley Valley; Ellis Brook Valley, where there is an occurrence of the rare *Eucalyptus lane-poolae* above the waterfall, and the spur to the north; and the valley through which Mills Road passes. These areas require further protection and careful management.

The Darling Scarp near Perth is particularly valuable for recreation, due to its ready availability to large numbers of people, especially within the Metropolitan Region. It is suited to non-motorised active uses such as bushwalking and rock-climbing, and contains numerous scenic vistas and potential picnic areas.

The Scarp is also an important source of prime aggregate rock used for building and other purposes. This is an industry which is long established, nearly 50 years old in the case of at least one quarry. The resiting of quarries would cause substantial increases in the cost of aggregate rock. Conceivably, areas from which basic raw materials are secured are useful both before and after extraction for a multiplicity of uses and are not rendered permanently sterile for community use. The Darling Scarp is also subject to pressures for residential subdivision, additional roads, powerlines and other services. All these uses have or would have adverse impacts, reducing the area's conservation, scenic and recreational value.

Quarrying operations may be constrained by other uses, particularly residential development, thus exerting pressures to displace the quarrying into areas of prime conservation or aesthetic value. The Darling Escarpment Aggregate Resources Committee, which is currently investigating quarrying on the escarpment, reports to the Basic Raw Materials Committee of the MRPA.

A number of submissions to the Study discussed the possibility of a scenic drive along the face of the Scarp. As they envisaged it, such a road would cross a number of spurs and valleys, would thus require extensive earthworks and would have a particularly damaging effect in the area described above as being the most important floristically. While the majority of submissions opposed the proposal, several agreed with it. The concept of such a scenic drive has not been supported by this Study.

The detailed recommendations in Chapter 10 largely endorse the MRPA 'reservations' and zonings which, with some additions, would provide for the protection of the visual backdrop provided by the Darling Scarp. The long and attenuated shape of the area, and the variety of ownership and priorities of use clearly indicate the need to co-ordinate planning and management in the ways outlined in Chapter 5. The regional parks concept will have particular relevance.

Recommendations

- 6 (i) Selected portions of the Darling Scarp area, as shown in Figure 6.1, should be classed as regional parks and planning developed according to that concept.

*Reference in parenthesis identifies localities which are the subject of detailed recommendations in Chapters 9 and 10.

- (ii) The Environmental Protection Authority should endorse the Metropolitan Region Planning Authority's recommendation to 'reserve' portions of the Darling Scarp for Parks and Recreation under the Metropolitan Region Scheme.
- (iii) The operators of existing and new quarries on the Darling Scarp should be required to present quarrying proposals, including an outline of options for the final use of the quarries when extraction is complete, to the responsible authorities.
- (iv) Further subdivision of land on the Darling Scarp should be restricted.
- (v) Detailed land use planning should be carried out for the portion of the Darling Scarp indicated in Figure 6.1. This should aim at minimising the visual and other impacts of quarrying and other land uses on conservation, recreation and scenic values, and on each other. It is recognised that such planning is proceeding with respect to aggregate resources.

6.3 The Northern Darling Range

The area under discussion is that part of the Darling Range lying to the north of the Perth-York road. It is mainly outside State Forest and Water Reserves (see Figures 3.1 and 4.1), and much of the land is privately owned. There is an attractive mixture of cleared and uncleared land, particularly along the old Perth-Northam railway line and the Red Hill road to Toodyay. The area is traversed by the scenically attractive Avon Valley, which contains some of the most rugged scenery close to Perth. Much of the valley is still in its natural state, as it was almost inaccessible until the standard gauge railway was constructed through it. A number of existing reserves lie within or close to the valley and escarpment. The Julimar State Forest (C21) which is an MPA for conservation of flora and fauna, lies to the north.

Thus the northern Darling Range is very attractive for outdoor recreation. But there are also pressures for rural subdivision for residential, holiday home and hobby farm developments, and a limited amount of agricultural clearing is still taking place.

Only a small proportion of the area lies within existing or proposed reserves, or State Forest. These include the Avon Valley National Park (M16) and Julimar MPA for conservation of flora and fauna (C21). These are insufficient in themselves to protect the scenic qualities of the area as a whole, despite the fact that it is those very qualities which help to generate pressure for subdivision. In general, the main avenue for landscape conservation in this area must be through planning processes, involving the MRPA and local authorities. The latter may be disadvantaged in handling the problem due to their lack of resources, although landscape protection is in the interests of the community as a whole, as well as local ratepayers.

The discussion of concepts for regional parks, landscape conservation, pathway systems, and wild and scenic rivers in Chapter 5 is relevant to the northern Darling Range. In particular, attention is drawn to the opportunity, through planning procedures, to link existing and proposed reserves by access ways along the Avon Valley (see Figure 6.1).

The area contains the catchments of Jane and Wooroloo Brooks and Brockman River, three important but as yet undeveloped water resources close to Perth. The need to protect these water resources against any further deterioration resulting from clearing is a further strong argument in support of landscape conservation.

Recommendations

- 7 (i) The Government should recognise the unique combination of attractive scenery and water supply potential of the northern Darling Range, and the need for overall protection and management in the area.
- (ii) The Metropolitan Region Planning Authority, local authorities and water supply authorities should collaborate to develop a plan for the northern Darling Range which takes into account the need for conservation of both the landscape and the water resource.
- (iii) In the northern Darling Range, consideration should be given to the delineation of regional parks, landscape conservation areas, and pathway systems, and the classification of the river courses according to the wild and scenic rivers concept.

6.4 The Eastern Darling Range

The eastern margin of the Darling Range, extending across the inland boundary of System 6, lies beyond State Forest and Water Control Areas and presents similar attractive features to those of the northern parts of the Darling Range.

Very early land settlement patterns of historic significance occur in a pleasant rural setting in the York and Toodyay areas. Further south the rocky hills of the Dale district and the variegated farm and forest landscapes of Boddington, Quindanning, and the upper Collie and Boyup Brook districts, have special character.

Pressures for subdivision and intensified recreational use are severe in some parts. In addition, the agricultural land has production potential which, if exploited, could lead to excessive clearing and the consequent loss of scenic and conservation values. This is well recognised by several local authorities, and by many in the farming community. In the upper catchments of the Helena and Collie Rivers, clearing controls have been imposed by the PWD on alienated land. Here the need to protect the water resource already supports landscape conservation. This combination of compatible interests could have a valuable application in other areas.

The area is relatively free of dieback disease and contains several important State Forest MPAs for conservation of flora and fauna. These include Russell (C33), Gunapin (C34), Sullivan (C35), Lupton (C41), and Wandering (C44).

Recommendations

- 8 (i) The Government should recognise the unique combination of attractive scenery and water supply potential of the eastern Darling Range, and the need for overall protection and management in the area.
- (ii) Local authorities and water supply authorities should collaborate to develop a plan for the eastern Darling Range, which takes into account the need for conservation of both the landscape and the water resource.
- (iii) In the eastern Darling Range, consideration should be given to the delineation of regional parks and landscape conservation areas, and the classification of the river courses according to the wild and scenic rivers concept.

6.5 Southern Swan Coastal Plain

In some ways, the Swan Coastal Plain south of Perth presents similar planning problems to the northern Darling Range. There is an attractive mixture of forest and farmland, the latter often appearing as parkland, with pasture among the scattered trees. It contains important bodies of open water, including Peel Inlet (C50), Harvey Estuary (C51), and Lakes Preston and Clifton (C54), and valuable and extensive wetlands such as the Harvey River Flats and the Goegrup Lakes (M108). The localities recommended by the System 6 Study include remnants of natural vegetation in otherwise cleared areas, portions of wetlands and surrounding vegetation, and coastal areas.

Irrigated and dryland agriculture has left little uncleared land in the flat areas in the eastern part of the Plain, but the dune systems to the west have extensive natural woodlands held in a variety of tenure. These include freehold land, scattered reserves and national parks, and State Forest, often in the form of long narrow adjoining strips of land. Urban and resort development is proceeding rapidly, particularly in these coastal areas.

The recreational resources of park, woodland, lakes, estuaries and beaches clearly attract use from throughout the south-west. When coupled with pressures for urban and resort development, and intensification of agriculture, a situation is created in which regional planning is clearly required. At present, regional planning of a non-statutory nature is carried out for the Bunbury and Peel-Preston areas. However, statutory planning would go further in protecting the interests of residents and upholding conservation and recreation values. Many of the concepts outlined in Chapter 5 are applicable, and particular areas or features are identified in some of the following sections.

Recommendations

- 9 (i) The Government should recognise the need for regional planning to protect the conservation, recreation and other values of the southern Swan Coastal Plain beyond as well as within the Metropolitan Region.
- (ii) Planning procedures should take account of the potential for the establishment of regional parks on the southern Swan Coastal Plain, and the application of the conservation buffer zone concept for the protection of sensitive areas, particularly wetlands, estuaries and inlets, and the coastal zone.

6.6 Scenic Rivers

With its low relief and gently rolling topography, south-western Australia generally lacks rugged scenery. Exceptional areas are a welcome relief to the eye. Within System 6 the few high points of

the Darling Range such as Mount Dale and Eagle Hill assume a great amenity value, which they share with the gorges and deeply dissected valleys which occur where rivers emerge from the Darling Scarp onto the Swan Coastal Plain. These are shown as 'dissected river valleys' in Figure 2.1, and are mapped in more detail in the Atlas of the Darling System.⁶ They extend from the Brockman-Avon-Wooroloo System in the north to the Blackwood River Valley in the south. There are rocky gorges with steep cliffs, flowing rivers and extensive areas of natural vegetation, and attractive combinations of forest, orchard and pasture land in valleys of rivers such as the Preston or of the tributaries of the Brockman. The valleys are an important resource for such passive forms of recreation as pleasure driving and picnics. Some, especially those of the Swan, Murray, Lower Collie and Blackwood, are important for more active sports such as canoeing, particularly on stretches of wild water, and boating.

The most scenic gorges tend to be the best sites for dam construction, with flooding of upstream sections. All major rivers in System 6 except the Swan, Murray and Blackwood are already dammed. Many groups, in their submissions to the Study, asked for protection of scenic rivers by an Act of Parliament similar to the U.S.A.'s Wild and Scenic Rivers Act.³⁷ Water supply authorities wish to keep their options open for future reservoir construction, especially on rivers close to Perth (see also Chapter 3). However, dam construction can have recreational advantages in that it affords control of flow downstream, as in the case of the Collie River, and irrigation reservoirs are used for sports such as boating. Here is a clear case for collaborative planning by the government agencies and local authorities concerned, in consultation with the public.

The Blackwood River Valley is affected by land use conflicts of a different nature. Upstream areas are largely cleared for agriculture, though substantial areas of forest remain, giving a pleasantly variegated landscape. Downstream from Bridgetown, there are extensive pine plantations on old farmland. While the river is not of great significance as a water supply, due to salinity, it is a most important recreational resource, and consequently needs protection, particularly where it passes through farmland.

Localities which are the subject of recommendations made by the Study fall into several categories. These include extensions to existing national parks, e.g. Avon Valley (M16), Walyunga (M18), and Serpentine (M85), State Forest MPAs for conservation of flora and fauna, or recreation, e.g. Murray Valley (C73), Lennard (C87), and endorsement of MRPA concepts for riverine linear parks along the Upper Swan (M19), Jane Brook (M20), Helena River (M33), and Canning River and Southern River (M75).

Chapter 5 outlines planning approaches to wild and scenic rivers, which are highly relevant in the System 6 area.

6.7 River Foreshores — Linear Parks

River foreshores are environmentally sensitive areas, particularly as water-borne recreation traffic increases. The public is attracted to the water's edge, the foreshores are convenient transport routes and road building authorities make heavy demands on them, and they have also been widely used for sanitary landfill. The alluvial terraces frequently contain clay deposits which are useful in ceramic, brick and other industries. However, licences issued by local authorities prevent excavation closer than 40 m from a water course. Foreshores are also important for conservation of swamp, marsh and wetland ecosystems and as water-bird refuges.

Because industrial, residential, hobby farm, resort and other developments are attracted to foreshores, rivers are often surrounded by built-up areas. Here they have potential as corridors of open space with important conservation and amenity functions. These include provision of avenues for movement of wildlife, pedestrians and cyclists as well as green spaces amongst built-up areas.

The MRPA's submission to this Study put forward the concept of linear parks, which would link open spaces and act as buffer strips. They would take advantage of the natural corridors provided by river systems and foreshores, and could be supplemented by man-made features such as roads and easements for other purposes, thus linking open space in a continuous system. This is essentially a form of regional park and the general planning and management considerations outlined in Chapter 5 are applicable. With the exception of certain portions specifically designated as proposed reserves for the conservation of flora and fauna, the establishment of riverine linear parks should be based on the following objectives:

- to protect the river banks and retain remaining natural vegetation fringing the banks;
- to provide for public access to the rivers and recreation of low impact on the environment;
- to provide a continuous recreation trail for pedestrians, cyclists and equestrians to move through the open space system.

It is important to resolve the conflicts arising between conservation, recreation, transport links, waste disposal and extractive industries. This can be achieved through planning with adequate opportunity for the public to express their preferences. Currently, public preferences appear to be giving greater weight to amenity and conservation values. Several of the Study's specific locality recommendations in Chapters 9 and 10 are relevant.

These are either proposals for conservation reserves, especially portions of the Swan Estuary and tidal flats of the Swan and Canning Rivers (e.g. M60), or endorsement of MRPA proposals for open space enabling recreational access to upper reaches of several rivers in the Metropolitan Region (e.g. M41).

Recommendations

- 10 (i) The Metropolitan Region Planning Authority should proceed through its planning processes, with the identification of linear parks as a type of regional park.
- (ii) Riverine linear parks should extend along at least one bank of all river systems with year round water, in such a way as to provide continual access. The width of the park should be sufficient to allow easy pedestrian access. Bearing in mind vegetation and terrain, this may vary from five metres upwards and should include occasional larger foreshore reserves, suitable for picnics and passive recreation generally.
- (iii) Outside the Metropolitan Region, linear parks should be planned as part of the proposed system of regional parks.
- (iv) In such planning, the responsible authorities should ensure that the views of the communities affected are taken into account.

6.8 Cockburn Sound

Cockburn Sound is the largest sheltered body of water on the coast within System 6. It is bounded to the south by Point Peron and to the west by Garden Island. The sheltered beaches of the mainland shores are an important and increasingly intensively used recreational resource. However, public access to Garden Island is restricted, and the scenic area of Point Peron may be affected by further port and other developments in the future. Industrial development at Kwinana results in restricted beach access, pollution and a significant loss of amenity values.

Following earlier studies on the environmental effects of development, the Government initiated a three-year study of the Sound, at a cost of \$650 000. This was co-ordinated by a Steering Committee convened by DCE. Its objective was to provide the information necessary for managing the Sound for a number of uses, including protection of the environment, fishing for commercial purposes and for sport, both shore and water-based recreation, and port and industrial uses.

The findings of the Cockburn Sound Environmental Study were made public on 18 December 1979.¹³ The report presents results on:

- social and recreational uses
- fish production and potential
- water movements
- industrial discharges
- seagrass condition
- beach movement studies
- development of algal blooms.

This information will be an important input to any future management of the Sound, in which provision for conservation and public recreation must be a major requirement. It is clear, however, that there are already two main effects of development which are likely to be irreversible. The first relates to the seagrass meadows, which are extensively damaged: the denuded areas may become unstable in the future, with long term consequences for the Sound as a recreational resource and as a sheltered harbour. The second effect concerns availability of the Sound's mainland foreshore areas for recreation. Buildings, railways, groynes, effluent outfalls and other structures occupy 12.3 km of the total length of 30.3 km. Of the remainder, only 13.4 km are available and suitable for intensive recreation, so that co-ordinated planning and management assume greater importance. The Study has made recommendations related to Woodman Point (M90), and Garden Island (M96).

Recommendation

- 11 (i) The Environmental Protection Authority should ensure that the need to protect the environment of Cockburn Sound, and the community's recreation requirements there, are given proper recognition in the future management of the Sound and Garden Island.

6.9 Peel Inlet and Harvey Estuary

The Peel-Harvey estuarine system is the largest and most productive in south-western Australia, with an annual fish catch of some 500 tonnes by about sixty professional fishermen, and probably a considerably greater catch of fish, crabs and prawns by large numbers of amateur fishermen. Residential, tourist, and day visitor pressures are increasing rapidly. For example, on the 1978 Australia Day Holiday, nearly five thousand boats were launched onto the estuary. It is obviously attractive for all forms of boating, although the large expanse of open water is misleading because it is all shallower than 2 m and about half the area is not deep enough for navigation by any but the shallowest draught boats. The main tributary is the Murray River, which is navigable for 24 km to Pinjarra. The river is scenically attractive and, together with the inlet channel at Mandurah, provides the only bathing beaches in the system. The whole system is a recreation resource of importance to a large region.

The estuary is eutrophic; an excess of nutrients produces a large amount of green algae which is deposited on the beaches of Peel Inlet and has to be removed mechanically. The causes of this deposit have been under investigation for some time, as part of a study initiated by the EPA. An objective of the work is to provide an understanding of the total estuarine system, including the effects of surrounding land uses. Results will provide important technical information for the future planning and management of the body of water and its catchment area.

The System 6 Study has detailed recommendations for Goegrup Lakes (M108), Channel and Creery Islands, and portions of land to the east of Peel Inlet (C50), and east and south of the Harvey Estuary (C51). The concept of conservation buffer zones is relevant, as discussed in Chapter 5.

Recommendation

- 12 (i) The Environmental Protection Authority should ensure that results of the study of the Peel Inlet and Harvey Estuary are made available to planning and management authorities, and that the implications for conservation and recreation are fully considered.

6.10 Wetlands

Apart from estuaries and marine embayments, System 6 contains a large proportion of the streams, rivers, lakes and swamps of Western Australia. Many have been greatly altered from their natural state since the time of European settlement. Changes that directly affect water quality and levels include clearing of catchments and modification of foreshore vegetation. The wider ranging effects of such activities are shown in the increasing salinity of the Swan-Avon, Murray, Collie and Blackwood River systems.³⁸ Some water bodies which were originally fresh are now saline, polluted or have weed problems resulting from eutrophication. Water quality and levels require monitoring, and controlling where appropriate. A great many wetlands have already been destroyed by landfill or drainage. The predicted expansion of Perth, with the associated demands for water, recreation and places to dispose of urban stormwater runoff, will increase pressures on remaining wetlands. The importance of wetlands is being increasingly recognised. In addition to their functions as recreation and water resources and for the conservation of wetland-dependent species of plants and animals, wetlands provide centres of interest in the landscape. Even considerably disturbed wetlands are important as summer drought refuges for water-birds and as breeding grounds for frogs, turtles and other aquatic animals.

Preservation and regeneration of the fringing vegetation are important means of protecting wetlands, as are fire control, reduction of weed infestation, control of access by people, vehicles and stock, and allowing only recreation activities compatible with conservation objectives. Where appropriate, wetlands could be linked by areas of open space, and pathways could be established for walking, bird-watching and educational purposes.

The Wetlands Advisory Committee, established by the EPA in 1976, recommended in its report³⁹ that the State's remaining wetlands should be protected and conserved, and that careful consideration must be given to the relative priorities of conservation, scenic value and various kinds of recreation when deciding on appropriate vesting and management of wetland resources. The DCE has developed guidelines for their management.⁴⁰

The extraction of peat, minerals (including sand, clay, gypsum, diatomite and salt) and of water itself may conflict with recreation and wildlife conservation in the short term, but is not necessarily always adverse in the long term, if rehabilitation takes place. The deepening of wetlands and a reduction in (but not total elimination of) vegetation, improves their value for water sports and as drought refuges for birds, in some measure counteracting the probable lowering of the water table by the pumping of water from bores for public supplies. Recharging wetlands must be included among the legitimate uses of bore water, despite the urgency of water conservation.

As many wetlands as possible have been recommended for reservation. These include wetlands at

Wanneroo (e.g. M8), Cockburn (M93), Kwinana (M92), the Peel/Harvey area (C50, C51), and others further inland, e.g. Benger Swamp (C65). The recommendations often involve joint vesting in two or more authorities to provide for conservation objectives as well as other uses where necessary, for example, extraction of groundwater (see Chapter 4). Conservation and low-impact recreation are often compatible with the protection of scenic values, and wetlands in landscaped parks can function as refuges for water-birds. If mining takes place, good rehabilitation can provide attractive recreation areas.

The concept of conservation buffer zones (see Chapter 5) has special application to wetlands. While a wetland itself may not be suitable for building sites, clay extraction or grazing by stock, the immediately adjoining areas often attract these uses. They may result in the destruction of fringing vegetation, or alter water table levels. Acquisition of the land is likely to be extremely expensive, as indicated in Chapter 5, whether in urban areas, or in the country where it has summer grazing value. Protection must therefore depend on planning processes, employing some of the concepts already outlined. These may permit not only the protection of the fragile areas, but access ways between them. Informal arrangements should not be neglected, since a management agency may find it possible, through financial inducements such as compensation payments or finance for fencing costs, to persuade owners to restrict harmful activities, such as the movement of stock. The concept of regional parks, as discussed in Chapter 5, is also appropriate, particularly in the case of chains of wetland requiring co-ordinated management and varying degrees of public access.

Recommendations

- 13 (i) The recommendations of the Wetlands Advisory Committee are endorsed, and should receive careful consideration by planning and management agencies.
- (ii) In planning for the use of wetlands in System 6, a high priority should be given to the protection of their conservation value.
- (iii) Wetland conservation areas should contain the water and the fringing vegetation, and should have an appropriate buffer zone around the wetland margin.
- (iv) Wetlands should be used for other purposes such as mining only in such a way as to minimise long term effects on conservation values.

6.11 Coastal Land and Offshore Islands

In its draft guidelines for the coastal zone⁴¹, the EPA defined the coastal zone as extending seaward to the 30 m depth contour line and inland 1 km from highwater mark. The EPA acknowledged that this was an interim definition and in practice would require extension to islands, tidal estuaries, reefs, salt marshes and fragile coastal dune systems. In some cases it may be more convenient to treat these areas as part of the river systems or established reserves.

Parts of the coastal zone have already been drastically altered by urban and industrial development, port installations and recreation facilities. The foreshores are used for a variety of aquatic activities such as fishing, swimming, surfing and boating. The great popularity of these pursuits, and increased use of off-road vehicles, has brought the coastal dunes, which form an important natural protective barrier and wildlife habitat, under heavy pressure. The vulnerability of the dunes in the coastal zone is increased because, like river foreshores, the ratio of perimeter to area is generally high.

Islands off the coast share many of the problems of the mainland coastal zone. However, access and activities on the larger islands can be controlled.

Where mainland predators are absent from the islands, certain marsupials have established significant populations: for example, quokkas on Rottnest Island and tammaros on Garden Island. The islands also support breeding colonies of sea-birds. Sea-lions use Carnac Island and other islands as resting places.

The coast is a most valuable resource and, due to its fragility and vulnerability, it cannot be used without a very high degree of protection and management. Its value stems from its importance as a wildlife habitat, a recreational and commercial asset and, most importantly, as a natural buffer between the sea and the land.

To date, coastal land and offshore islands have been protected by reservation procedures, co-ordinated management by government and local authorities, and the provision of advice and assistance by government departments such as Conservation and Environment, Public Works and Agriculture.

A Coastal Planning and Management Advisor has recently been appointed to the staff of the DCE. His attention, and that of the Coastal Development Committee of the Town Planning Department, should be drawn to our recommendations on recreation planning (Chapter 5), and to those detailed

recommendations in Chapters 9 and 10 which affect the coastal zone. These recommendations refer to Rottnest Island (C45), Garden Island (M96), Carnac Island (C46), the coastal strip within Perth's north-west corridor (M2), and a major portion of the coastline between Mandurah and Bunbury (C54, C66). The Study has also recommended aquatic reserves at Sorrento/Mullaloo (M10), around Cape Peron (M101), and off Rottnest and Carnac Islands.

Recommendation

- 14 (i) Those responsible for coastal lands should prepare and implement detailed management plans for specific areas, defining management procedures for locations which are heavily used and clearly identifying areas to be protected. The overall aim should be to maintain and even enhance the natural character of the coast.

6.12 Conclusion

This Chapter has discussed a number of major landform features in System 6, which are of particular importance as open space. These include the Darling Scarp, steep valleys of the Darling Range, river foreshores, wetlands, and the coastal zone and islands. In addition, several localities with conservation and recreation importance are identified. These are Cockburn Sound, and Peel Inlet and Harvey Estuary. Finally, several portions of the Darling Range and the Swan Coastal Plain, where both landscape and water conservation are important, are highlighted.

Although not intended as a comprehensive coverage of all major features and regions in System 6, this Chapter gives an indication of the ways in which planning and management bodies could approach these, and other similar areas. The recommendations point to the need for co-operation and co-ordination between various authorities, and between authorities and private land owners. The key to the successful implementation of conservation programmes should be by mutual trust and co-operation between the land use planning authority and the land owner. Such a relationship cannot develop under threat of compulsory acquisition of land.

The recommendations also reflect the need to make use of compatibilities between some planning and management objectives, e.g. water and landscape conservation in the northern and eastern Darling Range, and the need for better protection of wetlands, estuarine and marine environments.

Finally, recommendations point to the need for land use planning to give greater consideration to conservation and recreation values. Together, these approaches are based on an increasing awareness of the importance of the open space resources of System 6.

Chapter 7

DISCUSSION

7.1 Effects of the Study's Proposals

The extent of the principal areas of land owned by the State and already set aside for parks and nature reserves in System 6, together with our proposed additions, is shown in Table 7.1.

Table 7.1 Major existing and proposed areas for conservation and recreation in System 6

	km ²	% Area of System 6
State Forest MPAs for conservation and recreation	2063	7.9
Proposed additions to be managed as if MPAs	323	1.2
	<u>2386</u>	<u>9.1</u>
Existing Land Act Reserves for National Parks or Nature Reserves	536	2.1
Additions to or new National Parks, Nature Reserves and Parklands	624	2.4
	<u>1160</u>	<u>4.5</u>
Freehold areas with conservation or amenity value identified as potential additions to Land Act reservation.		
Government owned	54	.2
Privately owned	207	.8
	<u>261</u>	<u>1.0</u>
Total	<u>3807</u>	<u>14.6</u>

The outstanding opportunity for dedicating natural areas to conservation and recreation lies within State Forest, where MPAs already amount to 7.9% of the area of System 6. Apart from proposing some additions the Study recommends ways of establishing their long term security of purpose. Otherwise opportunities are few, and our recommendations add only 2.4% to the existing 2.1% of the area already in Land Act Reserves for these purposes. The proposed additions amount to 624 km², much of it land of extremely high value.

A further 261 km² or 1.0% has been identified as freehold land with a conservation or amenity value, which would merit protection through Land Act reservation if it could be acquired or, failing that, through planning controls. In our opinion such protection through planning would not only be to the advantage of the community generally, but would also benefit the majority of land owners and residents in scenic areas. We have put forward arguments in support of this view in Chapter 5.

If all our recommendations are accepted and implemented, almost 4000 km², involving 14.6% of the land area of System 6, will be dedicated in some way to major parks and nature reserves, with more than half of this land lying in State Forest. If the identified freehold localities are not included, then the proportion falls to 13.6%. This figure compares favourably with the minimum levels of between 5% and 10% recommended by national and international conservation agencies, but should be set against the extreme paucity of reserves in the agricultural areas inland of System 6.

Clearly, then, adequate provision for conservation and recreation in System 6 outside State Forest must depend heavily on land use planning procedures. The State Forest alone cannot provide a fully representative set of reserves, especially for those areas where clearing is extensive, such as the Coastal Plain south of Perth. Consequently, our discussion of planning deficiencies (Chapter 5), particularly beyond the Metropolitan Region, and our recommendations which follow it, assume greater importance.

Whatever the end result, even if the proportion of the land area reserved rises as high as 14.6%, it cannot be seen as excessive for a number of reasons. Firstly, there is a need to compensate for the extremely low proportion of reserved land in the agricultural region which lies immediately to the east of System 6. In fact, much of the area proposed for reserves is in the eastern low rainfall section of forest, near the edge of the wheat belt. This region has a high proportion of endemic plants, that is, plants unique to this area, and supports fauna species such as the tammar and the numbat which have become rare or absent elsewhere. Secondly, the various vegetation types within the System 6 region are unevenly represented in reserves. Representation is barely adequate in the western high rainfall region of the jarrah forest, which is heavily affected by dieback, and is clearly inadequate on the Swan Coastal Plain between Perth and Bunbury (see Figure 2.2). Thirdly, much of the land within the existing and proposed reserves could not be alienated and cleared, as it falls within key catchments for the metropolitan and country water supply systems (see Figure 3.1). As extensive clearing would have disastrous effects on the quality of the water supplies, these reserves fulfil at least a double purpose. Fourthly, a large proportion of the rapidly increasing recreational demand is for outdoor recreation in a natural setting. Finally, there are likely to be increased pressures on conservation reserves from other land uses.

Reservation of land for any purpose implies that other uses may be partially or completely foregone. The effect on mining and extractive industries was a particular concern of the Study, and we have attempted to make an estimate of the area with potential for these industries which may be affected by our proposals. The Darling System Atlas⁶ gives a general indication of the disposition of geological units favourable for certain minerals, and this was the basis of the calculation of areas affected shown in Table 7.2. The figure can only represent the surface extent of the resource in question, which often bears only an incidental relationship to the actual quantity and quality in a particular location. This information is available only for those deposits shown in the 'demonstrated' column, which amount to approximately one tenth of the 'potential' areas.

The figures indicate the degree of conflict between requirements for conservation and reservation and the mining and extractive industries, ameliorated to some extent by the multi-purpose, multiple vesting strategy. However, this conflict has to be seen in perspective, since larger areas have been cleared in the past for agriculture, service corridors, urban and industrial development, and transport links. Unfortunately, data on current rates of clearing of natural vegetation are not readily available. This means that comparisons of the effects of individual land uses cannot easily be made, although such information would be valuable for land use planning. Data could possibly be obtained from satellite imagery.

Recommendation

- 15 (i) A single government agency should be responsible for assembling data on the extent of natural areas, the condition of natural vegetation and the rates of clearing for various purposes.

Table 7.2 Important minerals associated with existing and proposed conservation Reserves in System 6

Mineral Resource	Surface Extent of Mineral Resource Affected by Reservation (a)		Major Landform (b) Units Associated with the Mineral	Main Proposed Multi-Purpose Reserves involved (see Section 4.2)	Major National Parks, Nature Reserves and MPAs involved (see Chapters 9 and 10)
	% of System 6 Area Demonstrated	Potential			
Limestone	15	8	Karrakatta, Cottesloe and Quindalup Dunes	Two Rocks Open Space (M1), Extension to Neerabup National Park (M6)	Yalgorup National Park (C54), Yanchep National Park (M3), Ridges MPA (M4), and Neerabup National Park (M6)
Sand	<1	29	Spearwood and Bassendean Dune Systems	Extension to Moore River National Park (C2), Yeal Nature Reserve (M5)	Moore River National Park (C2), Wabbling MPA (C13), and Melaleuca MPA (M9)
Clay (c)	<1	1½	Swan Coastal Plain and Ridge Hill Shelf	Reserves C20014 and C3307 (C29), Reserve C2457, Mundijong (M83)	Benger Swamp (C65), and land north of Keysbrook (M88)
Aggregate hard rock	<1	14	Darling Scarp	Darling Scarp (M80)	Gooralong MPA (M84)
Coal	<1	13	Collie Basin		Westralia MPA (C88)
Heavy mineral sands	<1	1	Karrakatta, Cottesloe and Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf	Extension to Moore River National Park (C2)	Leschenault Inlet (C66), and Dardanup MPA (C86)
Laterite (the source of bauxite) (d)	4	16	Lateritic Uplands	Extension to Avon Valley National Park (M16), Extension to Walyunga National Park (M18)	Dale (C32), Eagle Hill (C36), Cooke (C38), Windsor (C39), Duncan (C42), Plavins (C74), Samson (C75), Federal (C76), Bell (C77), Surface (C82), Nalyerin (C83), Karnet (M86), and Serpentine (M87) MPAs and Serpentine National Park (M85)

Explanatory Notes

- (a) Information derived from the Atlas of Natural Resources of the Darling System⁶, Geology and Mineral Resources Map.
- (b) Information derived from the Atlas of Natural Resources of the Darling System, Landforms and Soils Map.
- (c) Certain clay deposits may be affected due to proximity to reserves.
- (d) Calculation based on lateritic uplands area of highest interest for bauxite mining as shown in Figure 1 of Alcoa of Australia Limited's report on the Wagerup Alumina Project.⁴²

7.2 Staffing and Management of Reserves

Adoption of our proposals for reservation of additional land for conservation and recreation will necessitate substantial increases in staff for planning and management if they are to be properly implemented. Further, we have recommended that the Government should recognise the need for a State policy on open space management, and that an early study be undertaken with a view to establishing an appropriate co-ordinating organisation with management, advisory and secretariat functions and responsibilities.

The implementation of the proposals which have already been accepted by Government for ten of the twelve systems^{2 26 43} has already placed significant additional responsibilities on management bodies, including the National Parks and Wildlife Authorities, the Forests Department and local authorities. Table 7.3 shows the rapid rate of increase in number and area of National Parks and Nature Reserves during the decade ending 30 June 1979.

Table 7.3 Management of National Parks, Nature Reserves and MPAs for conservation and recreation in Western Australia

Management Body	1969		1974		1979 (30 June)	
	Number of Reserves	Area (km ²)	Number of Reserves	Area (km ²)	Number of Reserves	Area (km ²)
National Parks Authority	47	14194	63	17708	71	45516
Wildlife Authority	127	8184	281	46266	493	82052
Forests Department MPAs	—	—	—	—	78	3973

The gazettal of new areas should be recognised as being only the initial step in the development of an adequate system of reserves. Proper management and maintenance is essential if the value of reserves for their stated purpose is to be maintained. While it may be argued that the conservation and recreation MPAs are and should remain in State Forest under the control of the Forests Department, new objectives for these areas may require that they should be managed differently. New protection techniques may be needed, even though the MPAs and the adjoining forest will be part of a combined protection strategy. The already excessive load on the Forests Department's field staff will be added to by the need to provide recreation facilities, and to control public access to areas likely to suffer direct and indirect damage. A corresponding increase in personnel is essential if these demands are to be adequately met.

Other authorities face similar difficulties, partly stemming from the pressures of increased intensity of recreation use. This problem is experienced in those National Parks close to Perth, for example, Yanchep (M3), Walyunga (M18) and John Forrest (M21), which require additional expertise in recreation and landscape design. The concept of regional parks, and proposals for technical and management advice discussed in Chapter 5, are relevant here.

During the last decade the management of reserves has not kept pace with the rapid growth in their number and area. Increases in staff and resources have been minimal. Many nature reserves are located in agricultural areas and are surrounded by developed agricultural land. Yet, as was pointed out by Burbidge and Evans⁴⁴ in 1976, 'the lack of management of reserves in agricultural areas is placing an undue burden on adjoining landholders and leading to the deterioration of the reserves'.

Because of shortage of staff and resources, the allocation of land for additional National Parks, Nature Reserves and MPAs for conservation and recreation within System 6 will exacerbate staff and funding problems, unless the increased responsibilities are recognised and appropriate measures are taken immediately, or prior to the re-designation of Reserves.

Recommendation

- 16 (i) The Government should recognise the increased responsibilities of the National Parks and Wildlife Authorities, the Forests Department, other government departments and many local authorities, arising from the recommendations, already accepted, for Reserves in other Systems, and the further responsibilities that would be incurred by the creation of new Reserves within System 6.

7.3 The Future

Our terms of reference required us to make recommendations to the EPA on areas to be set aside within System 6 for national parks, nature reserves and major associated recreational resources. We have approached the problem through proposals for reservation under the Land Act, proposals affecting MPAs in State Forest, and proposals for public planning machinery in respect of open space.

In regard to State-owned land dedicated to these purposes by Land Act reservation or by securing MPAs within State Forest, the approach has been to ensure that options for the future are kept open until decisions between alternatives can be made on the basis of adequate information. Security of tenure for conservation MPAs may be established once it is determined that they are properly located, and the value of other potential uses to be foregone is known with some precision. New Land Act Reserves, through the use of the multiple vesting, multiple purpose strategy, may be set aside until decisions on their future can be rationally made. By these means the conservation and recreation values of specific areas would be recognised and protected against inadvertent destruction. However, the way would remain open for decisions made now to be changed in the future, if desired by the community and approved by Parliament.

Our approach to the problem of recreational use of catchments and reservoirs has been a little different. The argument is for investigations to begin now, in order to provide the technical basis for the more intensive management which would be required when and if restrictions were to be eased in the future. Essentially, the approach is a dynamic one, calling for reviews from time to time as circumstances change.

In town and country planning, where provision for recreation is made by setting aside public open space, the need for changes over time should be recognised as populations alter in structure and community attitudes and preferences change.

We believe that the procedures and structure of the System 6 Study are a significant advance compared with those of earlier studies. This arises from the wide diversity of interests represented within the Study, allowing alternative land uses to be considered and appropriate strategies to be developed for reconciling the differences that have inevitably arisen. If our arguments for a dynamic approach to provision for conservation and recreation in the overall land use planning framework are accepted, it follows that a similar review and reconciliation mechanism will be required from time to time in the future.

Recommendations for Specific Localities

Chapter 8

STRATEGIES RELATING TO SPECIFIC LOCALITIES

8.1 General

The general principles outlined in the preceding Chapters have been applied in developing the detailed Recommendations for 209 localities presented in Chapters 9 and 10 of this Report. Of the 209 localities, 101 are in country areas (Chapter 9), and 108 in the Metropolitan Region (Chapter 10). The purpose of this Chapter is to indicate to the reader which of the specific localities are affected by the strategies for conflict resolution outlined in earlier Chapters.

To facilitate this, the strategies are briefly summarised below.

8.2 Land Act Reservation

The strategy of multiple vesting for the multiple purposes of conservation, recreation, and water supply and mining has been proposed in certain cases. These include vacant Crown land recommended for reservation, and some existing Reserves at present dedicated to other purposes. The localities affected are listed in Table 8.1.

The intention of the joint vesting strategy, as explained in Chapter 4, is to reserve areas of land in such a way that the competing uses, conservation (or recreation) and water supply and/or mining, are all allowed for until such time as decisions between the uses can be rationally made by the Government. The strategy calls for joint vesting of land in the appropriate Ministers and for an early evaluation of the mineral, earth and water resources.

Table 8.1 Proposed multiple purpose-multiple vested Reserves

Locality	Description	Area (ha)	Purpose Vesting
C2	Vacant Crown land adjoining the Moore River National Park	4844	■
C28	Reserves C4623, C11619, C14275, C14276 and C25796 and vacant Crown land near Wundowie	2719	■
C29	Reserves C3307 and C20014 near Clackline	136	□
C49	Reserve C21038 near North Dandalup	61	●
M5	Reserve C33784 and vacant Crown land comprising part of the proposed Yeal Nature Reserve	11074	■
M14	Reserve C1654, Bullsbrook	120	□
M16	Vacant Crown land adjoining the Avon Valley National Park	3060	□
M18	Reserves C26864 and C26865 and freehold land adjacent to Walyunga National Park	759	□
M34	Catchment area of the small pumpback dam within the Helena Valley	2105	●
M83	Reserve C2457, Mundijong	75	□
M97	Reserve C36110, Wandí	31	■
		24984	
Purpose Vesting	■ Conservation of Flora and Fauna, Water and Mining Ministers for Fisheries and Wildlife, Water Resources, and Mines		
Purpose Vesting	□ Conservation of Flora and Fauna, and Mining Ministers for Fisheries and Wildlife (or Conservation and Environment), and Mines		
Purpose Vesting	● Conservation of Flora and Fauna, and Water Ministers for Fisheries and Wildlife (or Conservation and Environment), and Water Resources		

8.3 Water as a Purpose of Reserves

A number of Reserves require only the inclusion of water as a purpose, either now or in the future, to satisfy objections raised to proposals that they should be dedicated as nature reserves or recreation areas. The Reserves and localities affected are listed in Tables 8.2 and 8.3.

Table 8.2 Existing Reserves proposed for conservation and/or recreation with 'water' as an additional purpose

Locality	Description
C2	C18352 adjacent to the Moore River National Park
C6	C9676, Yurine Swamp
C7	C22223, Beermullah Lake
C8	C1224, Bartletts Well
C9	C25954
C14	C20366 and C25431, Lake Muckenburra
C49	C21038, North Dandalup
C71	A23000, C28825 and C28836, Dalyellup
M7	A31048, Lake Joondalup
M34	Helena Valley
M35	A21406, Star Swamp
M42	C27766, Jackadder Lake
M76	Mary Carroll Park, Gosnells
M78*	C10601, Carmel
M82	C5704, Wungong
M93	Cockburn Wetlands — Eastern Chain
M98	C31874, Casuarina
M99	A25886, west of Byford
M100	C28167, south-west of Byford
M108	Goegrup Lakes

*'Water' is the proposed sole purpose

Table 8.3 Proposed new Land Act Reserves with 'water' as a purpose

Locality	Description
C4	Quins Hill
C12	Crown land adjoining Caraban Management Priority Area
C69	Big Swamp, South Bunbury
M7	Lakes Joondalup and Goollelal
M13	Whiteman Park (Mussel Pool)
M19	Swan River — Guildford to Walyunga National Park
M21	John Forrest National Park
M34	Helena Valley
M39	Lake Gwelup
M47	Bold Park, City Beach
M48	Lake Claremont
M69	Kenwick Swamp (subject to purchase)
M93	Cockburn Wetlands — Eastern Chain
M103	Lakes Cooloongup and Walyungup

8.4 Planning Controls and Procedures

A number of localities identified are recommended to be set aside for conservation and/or recreation, but we have not thought it advisable to specify exactly how this should be done, for a number of reasons. One of the more important is that many of them include privately owned freehold land which it would be extremely costly to purchase, particularly in the Metropolitan Region. The task of determining ways and means is more properly that of planning authorities at various levels, partly through existing provisions, and perhaps partly through the important new planning proposals put forward in Chapter 5. These may, of course, result in the application of the multiple vesting-multiple purpose strategy if the land is acquired by the State and reserved at a later stage. Some of the more important localities to which that strategy may be applied by planning authorities are listed in Table 8.4.

A significant number of localities where the new planning concepts in Chapter 5 may aid the planning process are listed in Table 8.5.

Table 8.4 Localities suitable for multiple vesting-multiple purpose Reserves if acquired by the State

Locality	Description	Area (ha)
M1	Two Rocks Open Space	At least 1500
M6	Freehold land next to Neerabup National Park, not including part of lots 2 and 17 of Location 1370	451
M8	Freehold land comprising Lakes Badgerup, Little Badgerup and Little Maringiniup, part of Lakes Gngangara, Jandabup and Maringiniup, and wetlands near Lenzo Road	500
M38	Careniup Swamp	30
M104	Reserves C31102 and C33581, vacant Crown land and Kwinana lot S33, freehold land	346
		2827

*Herdsmen Lake (M43), 309 ha, has already been 'reserved' for Parks and Recreation under the Metropolitan Region Scheme, and has also been identified in the Study as having significant potential for minerals and water.

Table 8.5 Application of planning concepts to particular localities**Existing National Parks suitable as regional parks**

M3	Yanchep (at least part)
M16	Avon Valley (part)
M18	Walyunga
M21	John Forrest
M34	Kalamunda (Helena Valley)
M85	Serpentine

Existing National Parks with proposed extensions, suitable as regional parks

M34	Kalamunda (Helena Valley)
M85	Serpentine (excluding portions within water supply catchments)

Other localities suitable as regional parks

C21	Julimar Management Priority Area
C51	Harvey Estuary (part)
C66	Leschenault Inlet
C73	Murray Valley Management Priority Area
C87	Lennard Management Priority Area
M6	Neerabup National Park
M7	Lakes Joondalup and Goollellal
M8	Wanneroo Wetlands — Eastern Chain
M13	Whiteman Park (Mussel Pool)
M24 & M25	{ Reserves north-west of Chidlow
	{ Lake Leschenaultia
M47	Bold Park, City Beach
M80	Darling Scarp
M90	The Quarantine Station and Explosives Magazine Reserve, Woodman Point
M92	Cockburn Wetlands — Western Chain
M93	Cockburn Wetlands — Eastern Chain
M95	Forrestdale Lake
M103	Lakes Cooloongup and Walyungup
M105	Lowlands Property, west of Serpentine
M106	Port Kennedy

River valleys suitable for classification as 'wild', 'scenic' or 'recreational'

C72	Teesdale Management Priority Area
C73	Murray Valley Management Priority Area
C74	Plavins Management Priority Area
C87	Lennard Management Priority Area
M16	Avon Valley National Park
M18	Walyunga National Park
M34	Helena Valley
M85	Serpentine National Park

Localities suitable as riverine linear parks

C67	Brunswick, Collie and Wellesley Rivers
M19	Swan River — Guildford to Walyunga National Park
M20	Jane Brook
M33	Helena River — Guildford to Darlington
M41	Bennett Brook
M75	Upper Canning and Southern Rivers

Some localities for pathway systems

C67	Brunswick, Collie and Wellesley Rivers
M6	Neerabup National Park
M19	Swan River — Guildford to Walyunga National Park
M20	Jane Brook
M23	Reserves along disused railways — Midland to Chidlow
M33	Helena River — Guildford to Darlington
M41	Bennett Brook
M75	Upper Canning and Southern Rivers

Localities for conservation buffer zones

C7	Beermullah Lake
C9	Gingin and Boonanarring Brooks
C15	Reserves C24257 and C26756, Gingin
C17	Lake Chandala, Muchea
C25	Mound Springs, Muchea
C27	Beelaring and Goonaring Springs
C52	Lakes McLarty and Mealup
C63	Myalup Swamp and Mialla Lagoon
M3	Yanchep National Park (in respect of Mindarie Lake and Coogee Spring)
M6	Neerabup National Park (in respect of Lakes Carabooda and Neerabup)
M8	Wanneroo Wetlands — Eastern Chain
M17	Ellen Brook and Twin Swamps Wildlife Sanctuaries, Upper Swan
M19	Swan River — Guildford to Walyunga National Park
M20	Jane Brook
M33	Helena River — Guildford to Darlington
M41	Bennett Brook
M45	Hazelmere Lakes
M74	Bull Creek
M75	Upper Canning and Southern Rivers
M88	Land north of Keysbrook
M92	Cockburn Wetlands — Western Chain
M93	Cockburn Wetlands — Eastern Chain
M108	Goegrup Lakes

8.5 Management Priority Areas in State Forest

The importance of MPAs for conservation and/or recreation is highlighted in Chapter 4, in which Recommendations are advanced to strengthen their security of purpose. An area of 206 279 ha comprising 7.9 per cent of System 6, and 20 per cent of the State Forest within it, has been set aside as forty-one MPAs for conservation of flora and fauna, or for recreation, following government approval of the Forests Department's Working Plan 86 of 1977.

In addition, another five MPAs, i.e. Bennelaking (C94), Dalgarp (C100), Lupton (C41), Muja (C93) and Wandering (C44), covering 16 150 ha and situated in Systems adjacent to System 6, are described in this Report. Appendix 5 lists the forty-six MPAs and summarises some of their important characteristics.

Other Recommendations, given in Chapters 9 and 10, propose that additional land totalling 32 300 ha and involving existing Reserves and land owned by the Crown, should be acquired and managed by the Forests Department as if part of an MPA. The MPAs affected are listed in Table 8.6

Table 8.6 Management Priority Areas proposed for enlargement

C12	Caraban	C88	Westralia
C13	Wabling	C91	Noggerup
C21	Julimar	C92	Goonac
C38	Cooke	C97	St. John Brook
C42	Duncan	M84	Gooralong
C56	McLarty	M86	Karnet
C72	Teesdale	M87	Serpentine
C84	Trees	C41	Lupton (System 4)
C86	Dardanup	C94	Bennelaking (System 4)
C87	Lennard		

In addition, there are MPAs adjacent to privately owned freehold land which may become subject to planning controls or acquisition in the future, if Recommendations are adopted. The eleven MPAs are listed in Table 8.7.

Table 8.7 Management Priority Areas affected by planning proposals

C21	Julimar	C97	St. John Brook
C72	Teesdale	M9	Melaleuca
C73	Murray Valley	M84	Gooralong
C82	Surface	M86	Karnet
C88	Westralia	M87	Serpentine
C95	Mullalyup		

8.6 Management and Monitoring

The main thrust of the Recommendations in this Report is towards the identification of areas of land which could be set aside as National Parks or nature reserves or could provide for public recreation in natural surroundings. Clearly, management is required if the areas are to be protected. In addition, monitoring of the effects of other land uses, such as extraction or pollution of groundwater, will be essential. Many planning and management agencies will not have the technical and financial resources for these purposes, though they may receive advice and assistance if the secretariat proposed in Chapter 5 is established. As an interim measure however, we recommend the following:

Recommendations

- 17 (i) Management and monitoring programmes should be developed in consultation with one or more of the Departments of Conservation and Environment, Fisheries and Wildlife, Public Works, and the Metropolitan Water Board, as appropriate.
- (ii) Where proposed works affect natural areas, the matter should be referred to the Department of Conservation and Environment.

Chapter 9

COUNTRY LOCALITIES

As indicated in Chapter 8, detailed recommendations have been developed for 101 country localities.

Figure 1 is an index map for Figures 2 and 3, which show the distribution of the localities.

Each locality is listed below, described in the following text and indicated by a stippled boundary on Figures 5 to 72 inclusive. A common legend for the detailed maps is shown on Figure 4.

Locality Number	Figure
C1 Reserve C21164, Cowalla Bridge	5
C2 Moore River National Park	5
C3 Reserves C15816 and C25591, Moore River	6
C4 Quins Hill	6
C5 Reserve A3345, Moore River	7
C6 Reserve C9676, Yurine Swamp	8
C7 Beermullah Lake	8
C8 Reserve C1224, Bartletts Well	8
C9 Gingin and Boonanarring Brooks	9
C10 Lake Wannamal	10
C11 Reserves C965 and C27028, Udumung Brook	10
C12 Caraban Management Priority Area (MPA 15.4*)	11
C13 Wabbling Management Priority Area (MPA 15.3)	12
C14 Reserves C20366 and C25431, Lake Muckenburra	13
C15 Reserves C24257 and C26756, Gingin	14
C16 Geological Sites, Gingin	15
C17 Lake Chandala, Muchea	16
C18 Reserve C42, Burroloo Well	17
C19 Needonga and Chittering Lakes	17
C20 Reserve C 32807, Mt. Byroomanning	17
C21 Julimar Management Priority Area (MPA 2.1)	18
C22 Reserve C3156, Bindoon Spring	18
C23 Reserve C22096, Culham	18
C24 Reserve C19904, West Toodyay	18
C25 Mound Springs, Muchea	19
C26 Reserve C4070, North of Bullsbrook	20
C27 Beelaring and Goonaring Springs	21
C28 Reserves near Wundowie	22
C29 Reserves north-west of Clackline	23
C30 Reserve C30363, Inkpen Road	24
C31 Reserves C25860 and C30393, Berry Brow Road	24
C32 Dale Management Priority Area (MPA 2.6)	25
C33 Russell Management Priority Area (MPA 2.5)	26
C34 Gunapin Management Priority Area (MPA 2.3)	27
C35 Sullivan Management Priority Area (MPA 2.4)	27
C36 Eagle Hill Management Priority Area (MPA 8.1)	28
C37 Brookton and Albany Highways	29
C38 Cooke Management Priority Area (MPA 8.2)	30
C39 Windsor Management Priority Area (MPA 8.6)	30
C40 Boyagarring Management Priority Area (MPA 8.5)	31
C41 Lupton Management Priority Area (MPA 8.8)	31
C42 Duncan Management Priority Area (MPA 3.5)	32
C43 Gyngoorda Management Priority Area (MPA 3.4)	32
C44 Wandering Management Priority Area (MPA 3.10)	33
C45 Rottnest Island	34
C46 Carnac Island	35
C47 Reserve C14629, North Dandalup	36
C48 Reserve C19413, North Dandalup	36
C49 Reserve C21038, North Dandalup	36
C50 Peel Inlet	37
C51 Harvey Estuary	38

C52	Lakes McLarty and Mealup	38
C53	Coolup Reserves	39
C54	Yalgorup National Park	40A & B
C55	Clifton Management Priority Area (MPA 10.1)	40A
C56	McLarty Management Priority Area (MPA 10.11)	40B
C57	Myalup Management Priority Area (MPA 10.2)	40B
C58	Reserve A23172, Harvey River	41
C59	Reserve C22199, Wagerup	41
C60	Reserves C12049 and C12632, Harvey	42
C61	Reserve C24472, Lake Preston	43
C62	Reserve C2547, Harvey	43
C63	Myalup Swamp and Mialla Lagoon	44
C64	Reserve C2517, Harvey	44
C65	Benger Swamp	45
C66	Leschenault Inlet	46
C67	Brunswick, Collie and Wellesley Rivers	46
C68	Anglesea Island	47
C69	Big Swamp, South Bunbury	48
C70	South Bunbury coastal land	49
C71	Reserves near Dalyellup	50
C72	Teesdale Management Priority Area (MPA 3.7)	51
C73	Murray Valley Management Priority Area (MPA 3.3)	52
C74	Plavins Management Priority Area (MPA 3.6)	53
C75	Samson Management Priority Area (MPA 10.5)	54
C76	Federal Management Priority Area (MPA 10.4)	54
C77	Bell Management Priority Area (MPA 10.3)	55
C78	Reserve C22977, Harvey	56
C79	Reserve C15515, Harvey	56
C80	Reserves east of Harvey	57
C81	Reserve C25727, Harvey	57
C82	Surface Management Priority Area (MPA 10.6)	58
C83	Nalyerin Management Priority Area (MPA 10.7)	58
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* Forests Department Reference Number

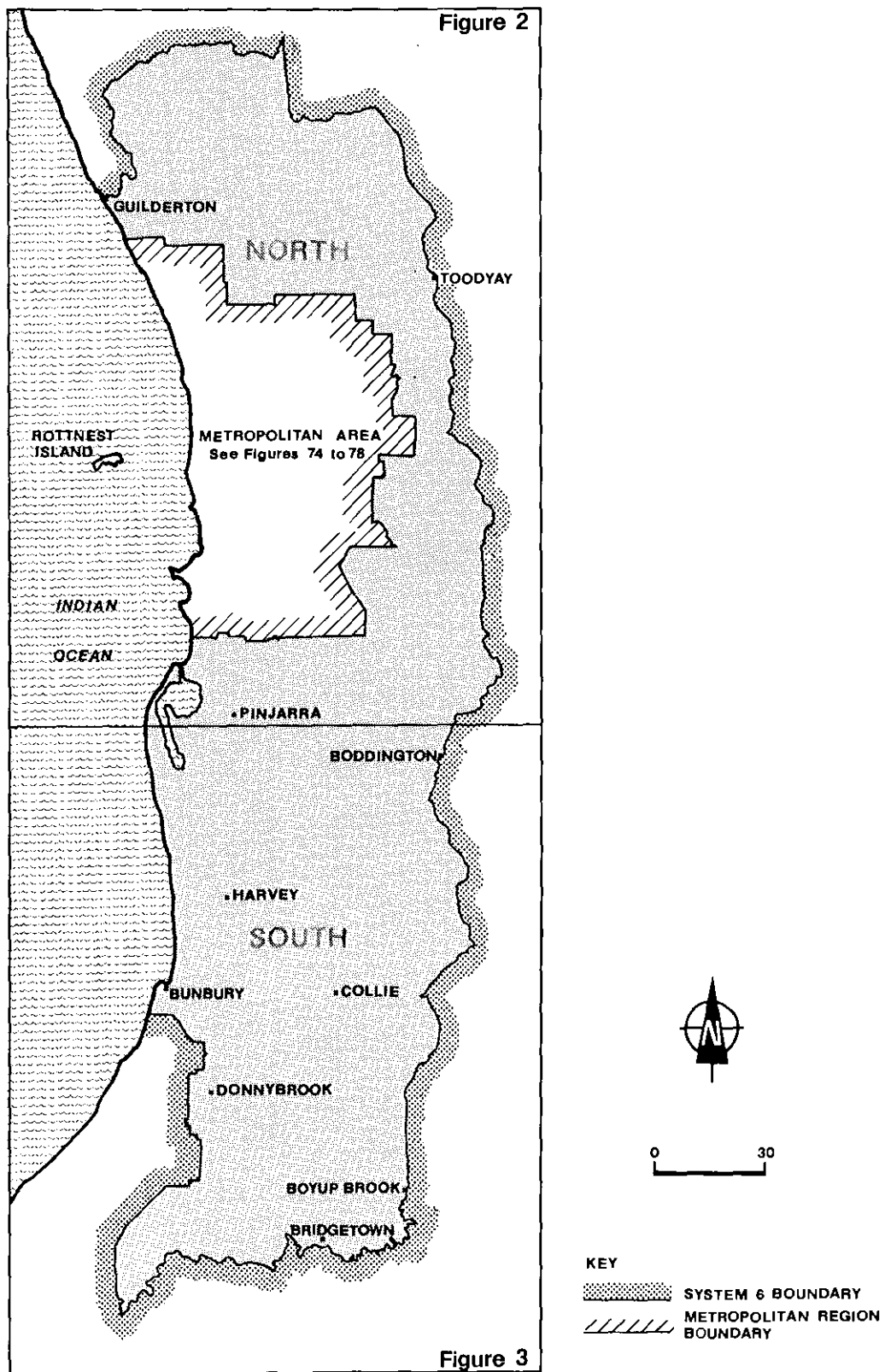


Figure 1 Index to country locality figures

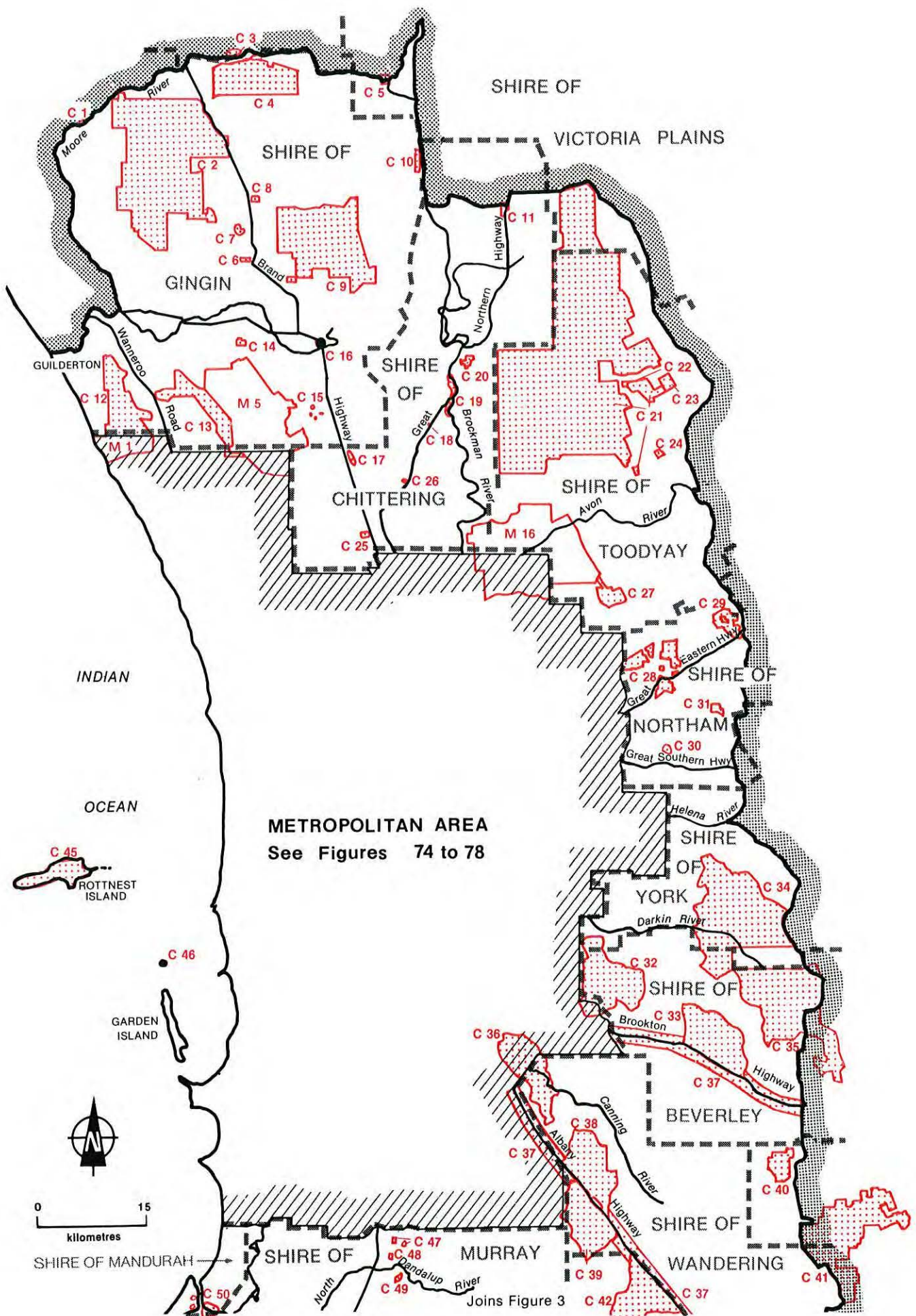


Figure 2 Country localities—north

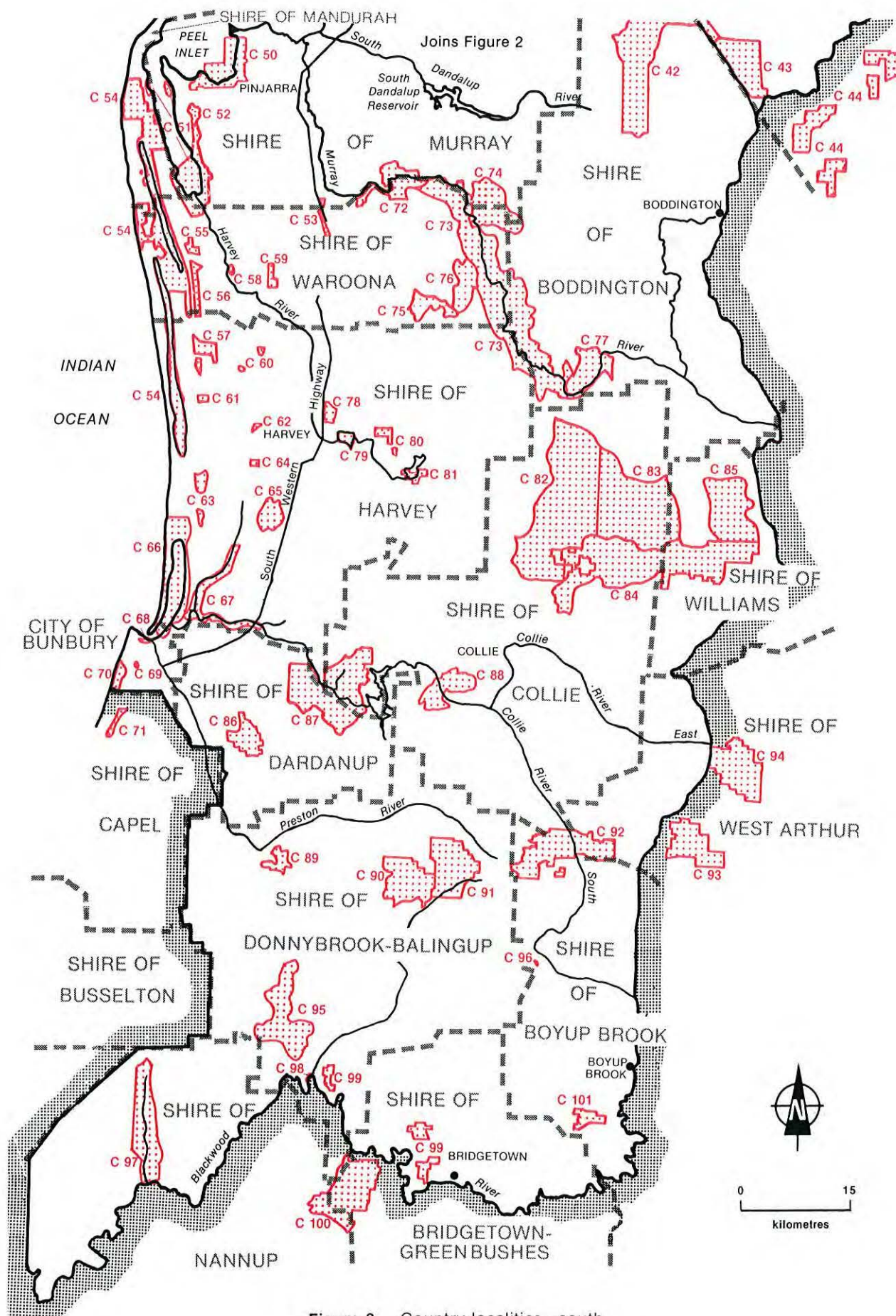


Figure 3 Country localities—south

LEGEND

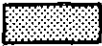
	AREA BOUNDARY
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	METROPOLITAN REGION SCHEME (M.R.S.) PARKS AND RECREATION RESERVE BOUNDARY
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	UNSURVEYED BOUNDARY
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2624	SUBDIVIDED LOCATIONS, TOWN OR SUBURBAN LOTS
128	AGRICULTURAL AREA, ESTATE AND SUBDIVISIONAL LOTS
	RESERVE SYMBOL
	TRIG. STATION or STANDARD SURVEY MARK

Figure 4 Legend for boundaries and symbols shown on locality figures

C1 RESERVE C21164, COWALLA BRIDGE

Reserve C21164, for Stock Route, vested in the Shire of Gingin, is located on the Moore River at Cowalla Bridge, about 20 km from the coast (Figure 5).

Reserve C21164 straddles the Moore River. The northern portion is largely cleared and is apparently being grazed, but some flooded gum and swamp paperbark remain. South of the river there is low open-forest of acorn banksia associated with spearwood. Other species present are pricklybark, flooded gum, slender banksia, Menzies' banksia, holly-leaf banksia, blackboy and Christmas tree.

Despite its small size the Reserve is valuable. It differs from other reserves between Gingin and the Moore River in that its vegetation is largely single storey, consisting of a dense layer 2 to 6 m tall, with little or no ground cover.

Recommendations

- C1.1 Subject to the agreement of the controlling body, the purpose of Reserve C21164 should be amended to Conservation of Flora and Fauna, and Parkland, and the Reserve should be vested in the W.A. Wildlife Authority.
- C1.2 The W.A. Wildlife Authority should prepare a management programme, giving consideration to:
 - (a) refencing of the Reserve so as to exclude cattle;
 - (b) consulting with the Gingin Shire Council on the provision of a picnic area, to be located on the Reserve.

C2 MOORE RIVER NATIONAL PARK

The area comprises Reserves A28462, for National Park, vested in the National Parks Authority; C15928, for Water, vested in the Shire of Gingin; C18352, for Government Requirements, and C33032, for Stopping Place for Travellers and Stock, both not vested; and vacant Crown land. It is situated just south of the Moore River about 90 km north of Perth (Figure 5).

The National Park carries a wide range of vegetation. The most common, on pale grey sands, comprises a low woodland of banksia, pricklybark and Christmas tree, with a rich understorey which includes *Scholtzia involucreata*. In the central northern section there is a high, undulating area of dry dunes where the vegetation is a low open-woodland of banksia with an understorey of species including blueboy. Running north-south there are two low-lying strips called Nine-Mile Swamp and Six-Mile Swamp which carry low woodland and low open-woodland of banksia, and, in seasonally flooded areas, swamp banksia and Moonah paperbark. To the south of Nine-Mile Swamp there are a few areas of marri with some flooded gum, and with an understorey containing rose banksia, morrison and blackboy. Rose banksia is practically restricted to this National Park. The wet sands and peat of the more permanent swamps grow paperbark and flooded gum, with heath and scrub and, in wetter areas, sedges. On the extreme eastern side of the Park there are pale grey sands with a low open-woodland of banksia. Wildflowers of popular appeal, such as golden kangaroo paw and winter bell, are plentiful in the Park.

The vacant Crown land to the south contains 7 small semi-permanent lakes, which are of better quality than the swamp lakes in the Park. The land is characterised by a pattern of low dunes of yellow sand with intervening lakes which are well defined, rounded and permanent. The vegetation of the drier areas consists of low woodland of banksia, pricklybark and Christmas tree. The lakes contain open water. Their fringes are vegetated with closed-sedgeland of jointed twig rush, surrounding which are some patches of low closed-forest of swamp paperbark and low woodlands of paperbark and banksia, principally swamp banksia and holly-leaf banksia. Where holly-leaf banksia dominates, the understorey contains rose banksia, white myrtle and hovea. Near some of the lakes there are also woodlands of marri.

The vacant Crown land would be a valuable addition to the Park since it would preserve the Caladenia complex, which is not represented in other Crown land, and would provide the Park with greater diversity of vegetation. Not only are the yellow and pale yellow sands of this land, and their associated flora, different from those of the Park but also the wetlands are different from the ill-defined, swampy areas that occur in the Park. Moreover, semi-permanent lakes, such as those contained in the vacant Crown land, are important as summer refuges for water-birds.

Although Reserve C33032, to the east of the Gingin Scarp, is adjacent to the Park, much of it is of a distinct character and its addition would increase the biological diversity of the Park. Furthermore it occupies higher ground and provides fine views over the Coastal Plain. Towards the southern end of the Reserve there is a woodland of wandoo, growing in gravelly soil. Nearby is an area of yellow sand, which supports scattered trees of pricklybark, marri and slender banksia, with some couch

honeypot and blackboy in the understorey. White sands in the Reserve are associated with closed-heath and scattered, emergent Christmas trees and with low woodland of banksia and pricklybark with a varied understorey.

Reserves C15928 and C18352, situated at the south-eastern corner of the National Park, contain interesting vegetation. Reserve C15928 has low woodland of holly-leaf banksia, with a shrub layer which includes woollybush, blueboy and buttercup, and a swamp surrounded by stands of swamp paperbark. Reserve C18352 includes a low, swampy area of sand, with a tall shrubland of Christmas tree, banksia, silky bloodflower, snakebush, paperbark and blackboy. An occurrence of swamp cypress is especially noteworthy.

The western grey kangaroo is plentiful.

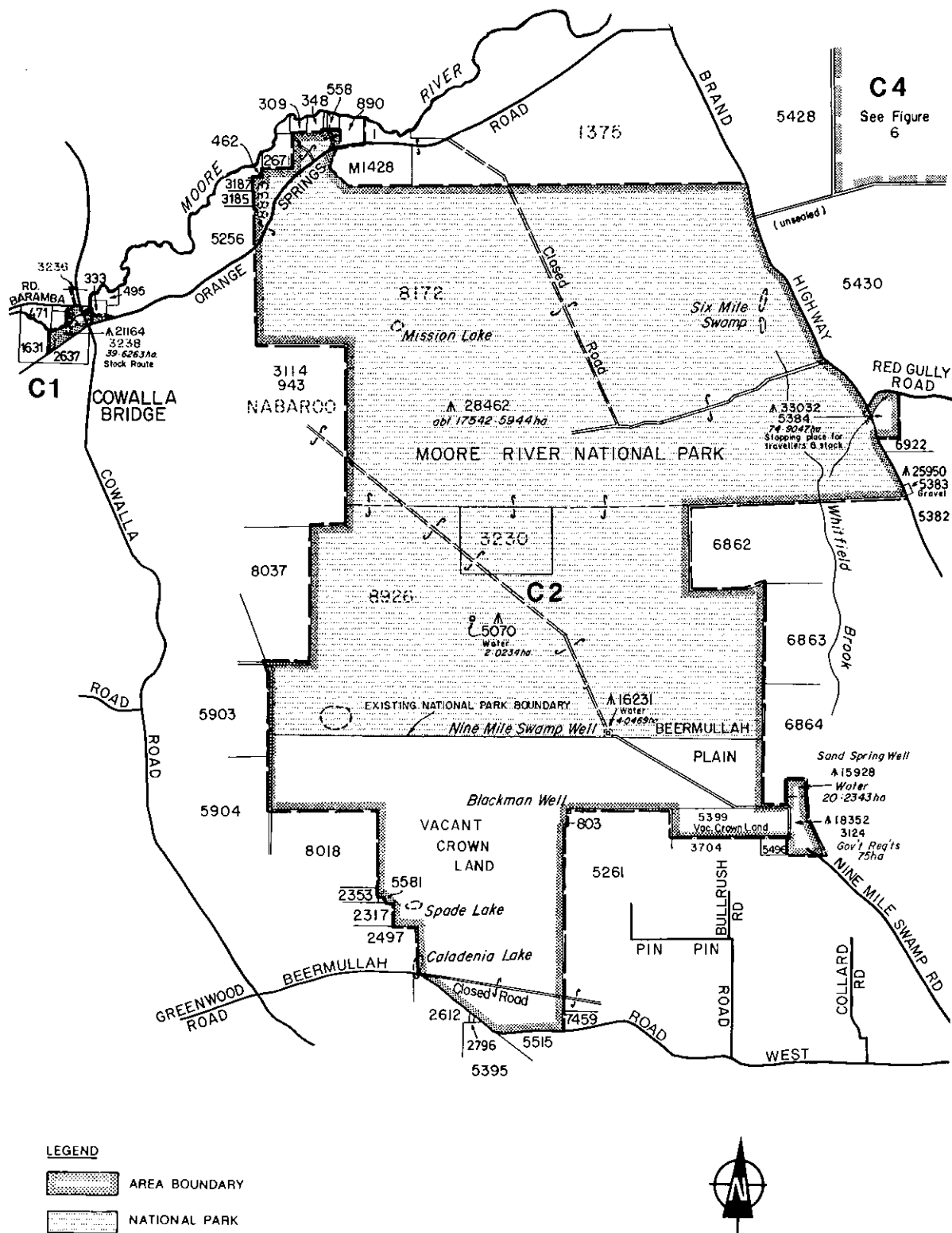
The area is within the Gingin Groundwater Control Area. Any future groundwater extraction could affect vegetation.

SEC lines run along the north-east boundary of the Park and adjacent lines are proposed. There is a possibility that the Brand Highway may be widened. The vacant Crown land, which has potential for diatomite and heavy mineral sands is not affected by mining claims but is subject to petroleum claims. Part of Reserve C33032 is used as a road metal dump and campsite for the MRD. There is a registered apiary in the wandoo woodland.

Moore River National Park has very high conservation value. Recreational use of the area is likely to increase, but should not be allowed to interfere with water catchment.

Recommendations

- C2.1 Reserve C33032 should be cancelled and its area added to Reserve A28462.
- C2.2 The vacant Crown land should be declared a Class C Reserve, for Conservation of Flora and Fauna, Water, and Mining, and the Reserve should be vested jointly in the Ministers for Fisheries and Wildlife, Water Resources and Mines.
- C2.3 Subject to the agreement of the controlling body, the purpose of Reserve C15928 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the W.A. Wildlife Authority.
- C2.4 Reserve C18352 should be cancelled and its area added to Reserve C15928.
- C2.5 The Geological Survey of Western Australia should give a high priority to the early evaluation of the mineral potential of the vacant Crown land.



LANDS DEPARTMENT PUBLIC PLAN N°
 Bidaminna SE, SW, NW, NE.
 DCE Ref. No A1, A2,

Figure 5

C3 RESERVES C15816 AND C25591, MOORE RIVER

Reserves C15816, for Water, vested in the Shire of Gingin, and C25591, for Public Utility and Water, not vested, border the Moore River to the north of Quins Hill (Figure 6).

The area is important since it is of a type poorly represented in conservation reserves elsewhere in System 6.

In Reserve C15816, woodland of flooded gum and paperbark fringes the Moore River. There is a steep sandy rise carrying woodland of marri, with an understorey of banksia and pricklybark. The uplands carry closed-heath including scrub sheoak, blackboy, common smokebush, telegraph and semaphore sedge. Reserve C25591, which contains a wetland, is comparatively inaccessible. The area has potential for groundwater extraction.

Recommendations

- C3.1 The Department of Fisheries and Wildlife should investigate the conservation and the Public Works Department the water supply potential of Reserves C15816 and C25591 and report their findings to the Environmental Protection Authority.
- C3.2 Water should remain as a purpose for the Reserves.

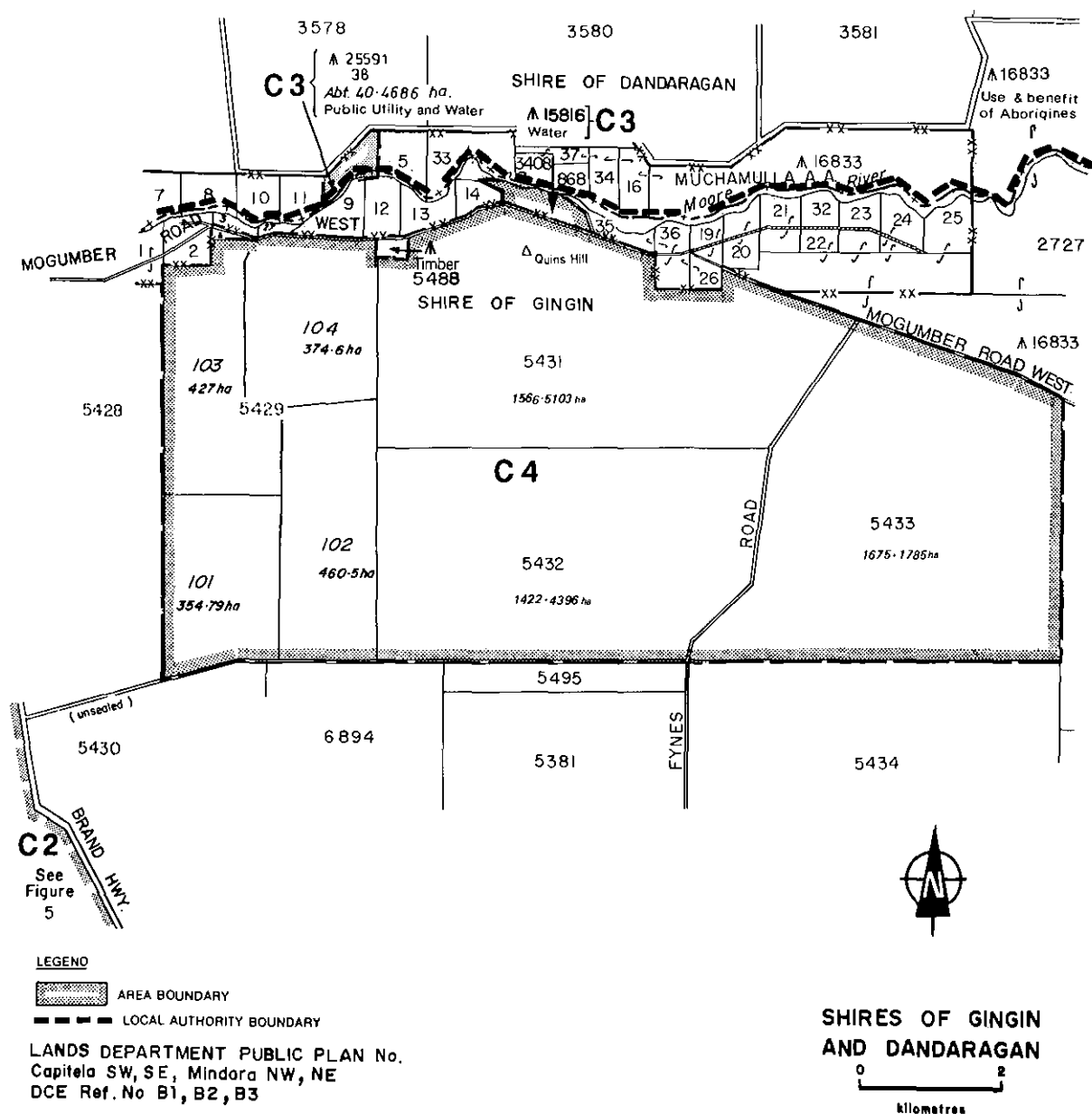


Figure 6

C4 QUINS HILL

The area comprises Swan Locations 5431, 5432, 5433 and lots 101 to 104 of Location 5429, privately owned freehold land. It is situated near the Moore River, about 90 km north of Perth (Figure 6).

Soil composition within the area varies greatly, from laterite on hill tops to deep sand in valleys. The vegetation is dominated by closed- and open-heaths which are remarkably rich in plant species and are the closest to Perth of the northern heathlands. There are many species of banksia, including three which are unnamed. Dryandra is common, especially on the lateritic soils, and the great variety of heath species, several of which are rare, includes smokebush, myrtle, pea plant, wattle, kangaroo paw, sundew, boronia, snakebush, banjine, leschenaultia and trigger plant. In every season there are wildflowers in bloom, and the area is consequently popular with tourists.

In the sandy valleys there is low open-woodland of pricklybark with some taller marri in places. Banksia is usually associated with this formation. Quins Hill itself is a lateritic hill with both low open-woodland of wandoo and tall shrubland in which Morrison's cypress and broombush honeymyrtle are prominent.

The area has a very high conservation value and is important both scientifically and aesthetically. Swan Location 5433 is substantially uncleared, while the other Locations are partially cleared.

The area has minor potential for groundwater extraction.

Recommendations

C4.1 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Priority for any acquisition should be given to Swan Location 5433.

C4.2 Any future Land Act Reserves should include Water as a purpose.

C5 RESERVE A3345, MOORE RIVER

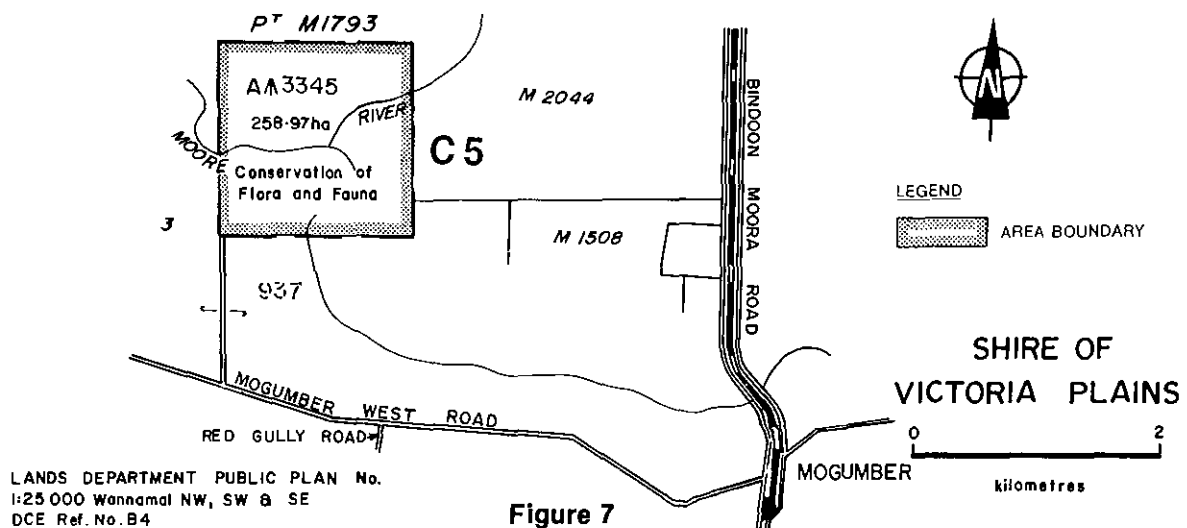
Reserve A3345, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated in the north-east corner of System 6, about 4 km north-west of Mogumber (Figure 7).

The Reserve lies at the junction of the east branch and main stream of the Moore River. The river runs in a valley, some 15 to 20 m deep, the sides of which support woodland of wandoo, marri and flooded gum. The remainder of the Reserve consists of low sand dunes covered mainly by low open-forest of banksia and pricklybark, with some Christmas tree. There is also some open-woodland of marri, with a well defined understorey of pricklybark and banksia. On the deeper sand the understorey includes blueboy, silky bloodflower and scrub sheoak.

The Reserve offers a good variety of habitats for wildlife, especially passerine birds. It is important as a type which elsewhere has been mostly developed for agriculture.

The area has limited potential for water supply, but the PWD wishes to retain right of access to the water courses.

The Study endorses the present purpose and vesting of Reserve A3345.



C6 RESERVE C9676, YURINE SWAMP

Reserve C9676, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated about 16 km north-west of Gingin (Figure 8).

A bitumen road divides the Reserve into an eastern portion, which contains Yurine Swamp, and a larger western portion. The swamp is surrounded by a tall stand of swamp paperbark, and the eastern portion also carries flooded gum, swamp banksia and woollybush. The western portion carries mixed stands of marri, pricklybark and banksia. The understorey species include blackboy, blueboy, one-sided bottlebrush, stinkwood, common hovea and prickly moses.

Yurine Swamp has been popular with duck shooters, and the Reserve is classified as a shooting and hunting area during an open season.

The Reserve is within the Gingin Brook Catchment and the Gingin Groundwater Area. Groundwater extraction in the future could affect vegetation.

Recommendation

- C6.1 Subject to the agreement of the controlling body the purpose of Reserve C9676 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be classified as Class A and vested in the W.A. Wildlife Authority.

C7 BEERMULLAH LAKE

The area comprises Reserve C22223, for Recreation, vested in the Shire of Gingin; and Location 829, and part of Locations 830 and 2591, privately owned freehold land. It is situated about 20 km north-west of Gingin (Figure 8).

Beermullah Lake is permanent and thus important as a summer drought refuge for water-fowl. It is used all year by a wide variety of birds. Its fish include hardyhead, Swan River goby and the introduced mosquito fish. During summer, algal growth in the lake is a problem. It is believed to be caused by nutrients which enter the lake from a stream and also from surrounding agricultural land.

The lake's foreshore has been revegetated, with resulting erosion and build up of dunes on the western side. The lake, which is used for water skiing, should be protected both as a recreation area and as a habitat for water-fowl.

The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

The Reserve is within the Gingin Brook Catchment and the Gingin Groundwater Area. Groundwater extraction in the future could affect vegetation.

Recommendations

- C7.1 Subject to the agreement of the controlling body, the purpose of Reserve C22223 should be amended to Conservation of Flora and Fauna, Parkland, and Water, and the Reserve should be vested jointly in the Shire of Gingin and the W.A. Wildlife Authority.
- C7.2 The Gingin Shire Council and the W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

Consideration should be given to:

- (a) revegetating the lake's shores;
- (b) preventing algal growth;
- (c) zoning of water skiing in the lake;
- (d) fencing to restrict stock access.

C8 RESERVE C1224, BARTLETTS WELL

Reserve C1224, for Camping, vested in the Shire of Gingin, is situated about 25 km north-west of Gingin (Figure 8).

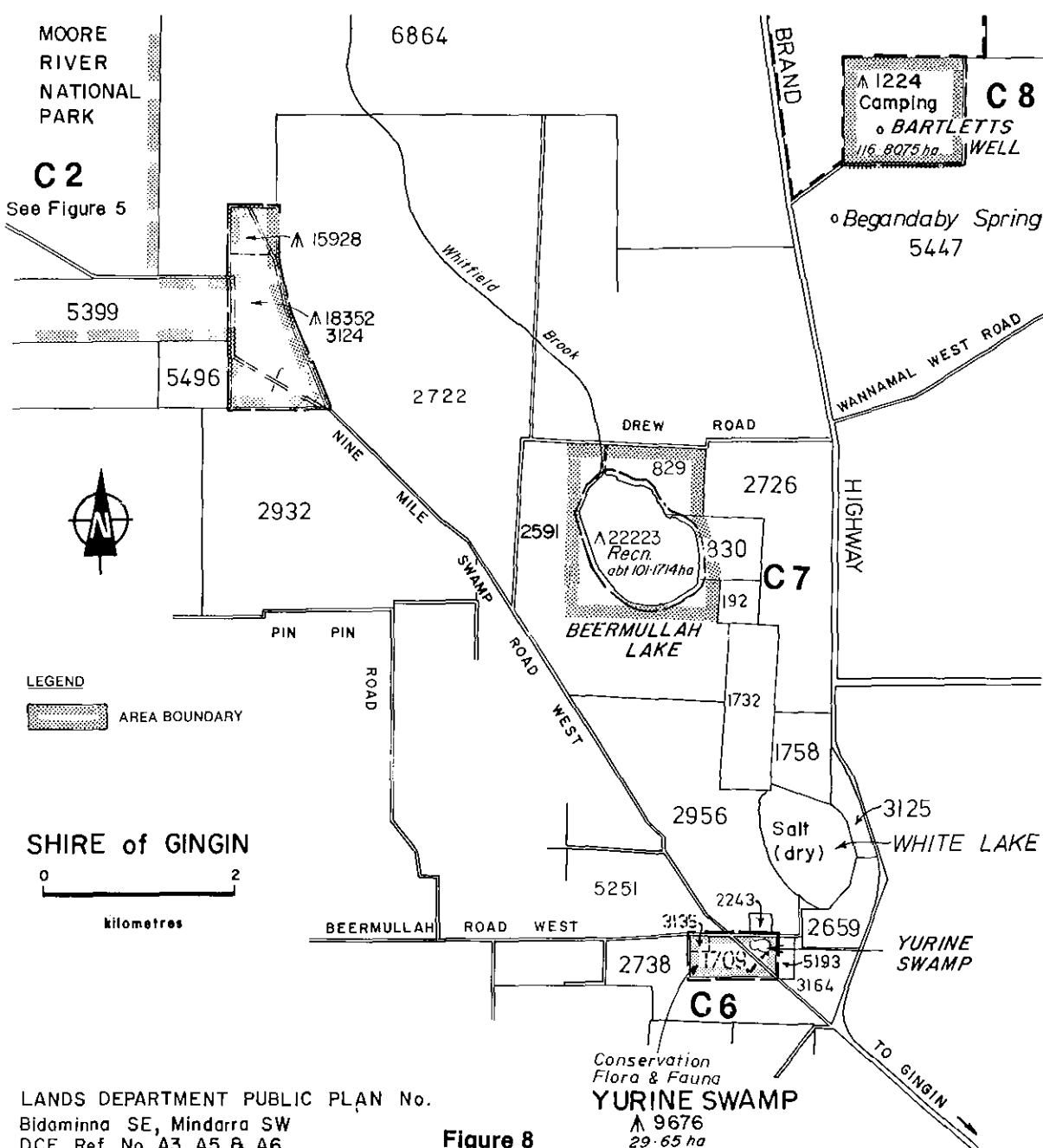
For its size the Reserve has a very varied vegetation. The south-western section has a woodland of marri with a diverse understorey. On the western side the ground slopes uphill to the north and the soil of orange to red sand supports a low woodland of pricklybark and banksia with a few sheoak. Blackboy and zamia occur in the understorey. The higher ground of the northern section contains gravelly soils and supports a woodland of wandoo and jarrah.

The western grey kangaroo and numerous bird species have been recorded in the Reserve.

The Reserve is within the Gingin Brook Catchment and the Gingin Groundwater Area. Groundwater extraction in the future could affect vegetation.

Recommendation

C8.1 Subject to the agreement of the controlling body, the purpose of Reserve C1224 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the W.A. Wildlife Authority.



C9 GINGIN AND BOONANARRING BROOKS

The area comprises Reserves C539, for Water and Stopping Place, vested in the Shire of Gingin; C22602, for Water, C24559, for Water Catchment Purposes, and C25954, for Gravel, all not vested; vacant Crown land, and parts of lots 5 and M784 of Swan Location 1373, privately owned freehold land. It is situated about 10 km north of Gingin (Figure 9).

The vacant Crown land is undulating, with a few deeper valleys. Open-forest of jarrah and marri with an understorey of bull banksia occurs on the lateritic uplands. Small areas of wandoo also occur. On sandier soils there is low woodland and low open-woodland of slender banksia and Menzies' banksia with some jarrah, marri, pricklybark and Christmas tree. There are several small pockets of flooded gum where the water table is close to the surface. An uncommon species is *Lysinema elegans*, a heath otherwise known only in the Jandakot area.

Gingin Brook is a perennial fresh stream. Every day it gains several million litres of water from springs in peat banks, a unique occurrence in Western Australia, and one which has a very marked effect upon the vegetation. The low woodland on the sandy slopes changes within a few metres to dense swamp thicket. The trees are typical swamp species such as flooded gum and paperbark but the tall shrub storey includes tea-tree, which is otherwise known only on the south coast, and boronia, which is also usually a southern species. The uncommon twining bladderwort occurs in the wetter areas together with a helmet orchid and a tropical fern, which are otherwise only found in the extreme south-west and the north of the State respectively. Aquatic species including water starwort, water button and water ribbon occur in the brook. The woodland on the surrounding hills is dominated by marri and banksia. A small legume which occurs here is unknown in any other locality. The Gingin Brook area as a whole has five rare species, and is unusual both botanically and geologically. Its preservation will provide protection for both Gingin Brook and its catchment.

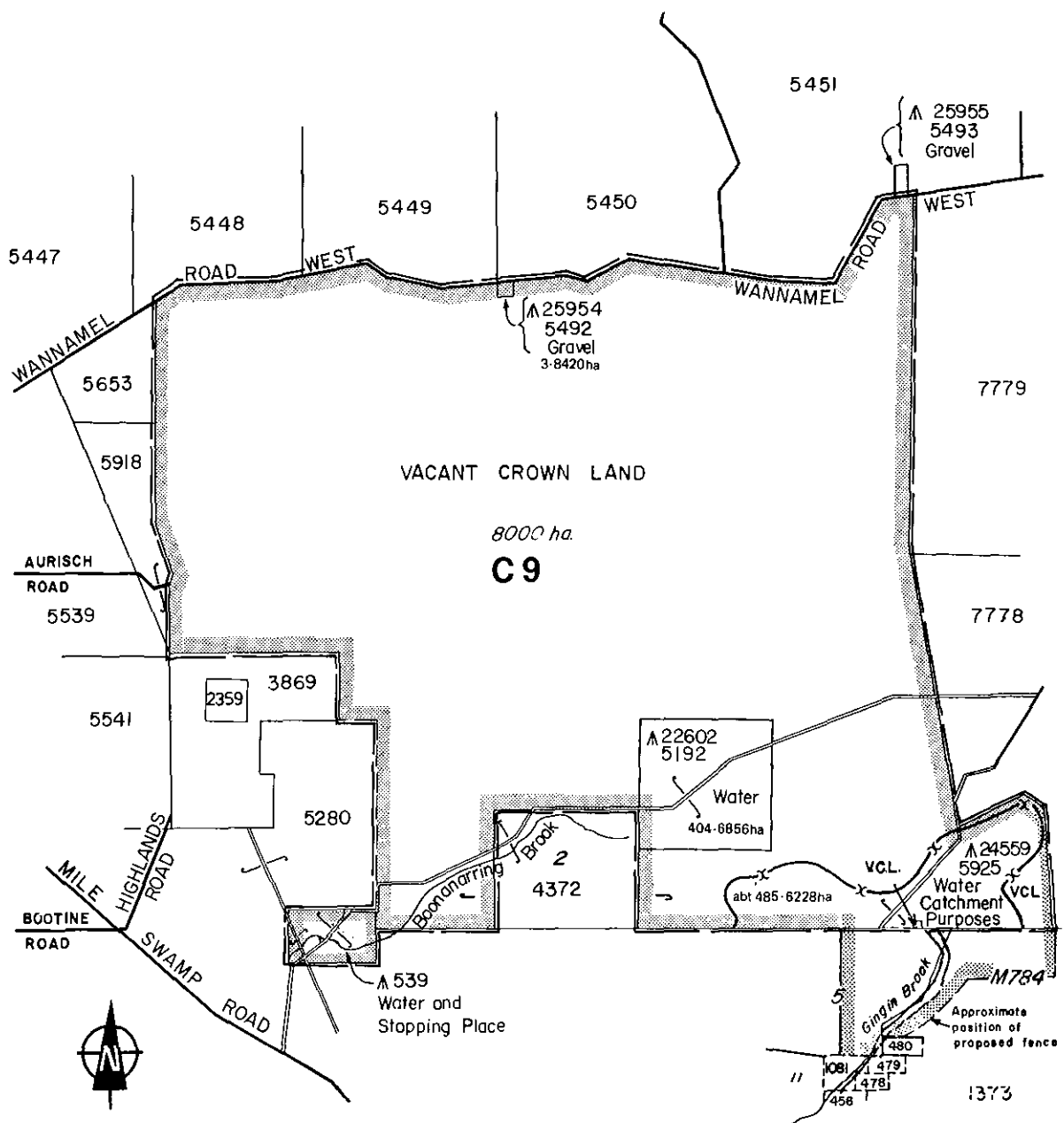
Reserve C539, which has high conservation value, has three distinct soil-landforms. In the north-eastern portion there is a sandplain which carries a closed-heath with a large number of species, including scrub sheoak, one-sided bottlebrush, couch honeypot, buttercup, sundew and blackboy. Christmas tree is the only tree, apart from some banksia woodland round the margins. The creek valley supports fairly dense patches of Moonah paperbark and marri, flooded gum and Menzies' banksia. Near the edge of the stream there is some bull banksia. On the orange sand in the southern portion there is a woodland of slender banksia and pricklybark, with an understorey of smokebush, scrub sheoak, blackboy and honeybush. In the north-west there is a large gravel pit which contains a woodland of marri, with an understorey of hakea, blackboy and black gin.

The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

The area has considerable agricultural potential but it has not been evaluated. Reserve C539 and the southern portion of the vacant Crown land is within the Gingin Brook Catchment, a possible future source of water supply, and the Gingin Groundwater Area. MWB groundwater extraction may affect water levels and public access may be restricted to some extent by Catchment Zone regulations. The area may be affected by a pipehead dam which could be built on Gingin Brook near its confluence with the Moore River. There are existing SEC lines; the area may be affected by future SEC lines, a gas pipeline and requirements for materials for roads.

Recommendations

- C9.1 Subject to the agreement of the controlling body, the purpose of Reserve C539 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the W.A. Wildlife Authority.
- C9.2 The purpose of Reserve C22602 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the W.A. Wildlife Authority.
- C9.3 Reserves C24559 and C25954 should be cancelled and their respective areas added to Reserve C22602.
- C9.4 The vacant Crown land should be added to Reserve C22602.
- C9.5 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) preventing stock from grazing on the banks of Gingin Brook;
 - (b) rehabilitating the eastern bank of Gingin Brook.



LEGEND

AREA BOUNDARY

LANDS DEPARTMENT PUBLIC PLAN No.
Gingin NW & NE (1:25 000)
Mindarra SE & SW
DCE Ref. No B7, B8 & B9

SHIRE OF GINGIN

0 3
kilometres

Figure 9

C10 LAKE WANNAMAL

The area comprises Reserve A9838, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; and part of Location 2150, privately owned freehold land. It is situated about 90 km north of Perth (Figure 10).

The northern portion of the Reserve supports low open-forest and low closed-forest of york gum, marri, swamp sheoak and swamp paperbark, with a dense understorey which includes jam, prickly moses, harsh hakea, couch honeypot, dryandra and stinkwood. In the southern portion the vegetation includes flooded gum and paperbark but is generally sparse.

The lake is semi-permanent and provides a summer refuge for water-birds. Forty-four species have been recorded, including grey teal, mountain duck, black swan and freckled duck, the last named being one of Australia's rarest water-fowl. The dense vegetation in the northern end of the lake and extending northwards along a string of swamps in private land, provides a refuge for water-fowl.

The lake, classified under the Wildlife Conservation Act as a shooting and hunting area, is popular with duck shooters.

The Reserve is within the Brockman River Catchment. A storage dam is planned for a site downstream and consequently public access may be restricted to some extent by Catchment Zone regulations.

Recommendation

- C10.1 The Department of Fisheries and Wildlife, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

C11 RESERVES C965 AND C27028, UDUMUNG BROOK

The area comprises Reserves C965, for Recreation, vested in the Shire of Chittering; and C27028, for Gravel, vested in the Commissioner for Main Roads. It is situated about 90 km north of Perth (Figure 10).

Udumung Brook passes through the northern portion of the area. The soil there is red loam, but this changes to gravelly loam and then laterite as the land rises gently to the south.

The vegetation is woodland, of wandoo in the northern portion and of marri and powderbark in the southern portion. A highlight of the understorey is the representation of *Dryandra* species, including two which are undescribed. There is a good stand of hooded smokebush, a relatively uncommon species. The black kangaroo paw, common in heaths north of the Moore River but rare on the Darling Plateau, also occurs. The tiled trigger plant, otherwise known only from the south coast, is also to be found.

The Reserves are generally in good condition. Some gravel has been extracted from both, but there has been little weed infestation and with management the disturbed areas will probably regenerate. Because of the important species present, the Reserves have high conservation value.

The Reserves are within the Brockman River Catchment, which the MWB may utilise after the year 2000. Public access may be restricted to some extent by Catchment Zone regulations and the area may be affected by future widening of the Great Northern Highway.

Recommendations

- C11.1 Subject to the agreement of the controlling body, the purpose of Reserve C965 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested in the W.A. Wildlife Authority.
- C11.2 Subject to the agreement of the controlling body, Reserve C27028 should be cancelled and its area added to Reserve C965.

C12 CARABAN MANAGEMENT PRIORITY AREA (MPA 15.4)

The area comprises part of State Forest No. 65, managed by the Forests Department for conservation of flora and fauna; and Swan Location 9757, being Crown land under the control of the Department of Lands and Surveys. It is situated about 60 km north of Perth (Figure 11).

The MPA's purpose is to conserve coastal vegetation types associated with the Spearwood Dune System. It also contains a small area of Quindalup Dunes.

Most of the area consists of limestone ridges interspersed with sandy depressions. The upperstorey vegetation includes tuart and banksia and the understorey is rich in species. Chenille honeymyrtle, spider-net grevillea and parrot bush occur near limestone outcrops while deeper soils carry tree smokebush, one-sided bottlebrush and *Melaleuca acerosa*. Downslope there are areas with a well developed tree stratum, which includes limestone marlock, sheoak, Menzies' banksia and bull banksia. Deep yellow sands carry telegraph sedge, synaphea, silky bloodflower and rough honeymyrtle. In deeper, more leached sands blackboy, blueboy, eremaea and Albany synaphea occur. There has been virtually no disturbance to the area, and it is so far free from dieback infection, limestone mining and recreation pressure.

The MPA is within the Gnangara Water Reserve, a potential source of water supply. There are existing SEC lines in the area which may be affected by future gas and SEC lines, and road construction if an industrial area is developed at Wilbinga. The area has potential for limestone and silica sand and there are existing mineral claims.

Recommendation

- C12.1 Subject to the agreement of the controlling body, Swan Location 9757 should be declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the Conservator of Forests and managed as if part of Caraban Management Priority Area.

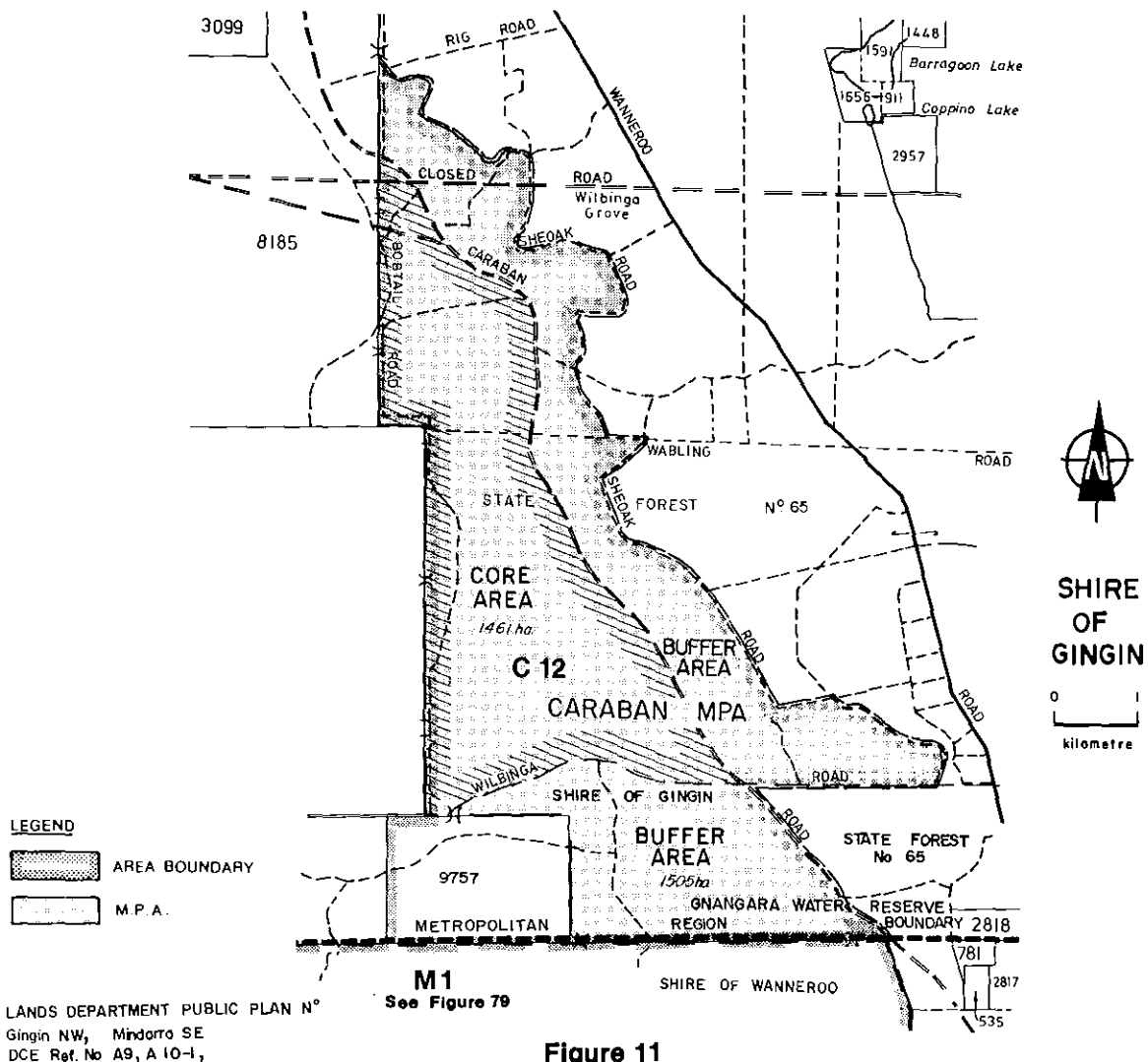


Figure 11

C13 WABLING MANAGEMENT PRIORITY AREA (MPA 15.2)

The area comprises Wabling MPA, managed by the Forests Department for conservation of flora and fauna; and Reserve A24436, for Protection of Flora, vested in the National Parks Authority. It is situated about 60 km north of Perth (Figure 12).

The MPA's purpose is to preserve the steep environmental and floral gradient between the limestone outcrops of Wabling Hill and the leached dunes near Yeal Swamp, as well as a corridor of undisturbed vegetation between the Bassendean and Spearwood Dune Systems.

The area has a wide range of soils and vegetation. It carries varying combinations of Moonah paperbark, tuart, sheoak and banksia, with white myrtle, blackboy, silky bloodflower and *Beaufortia elegans* in the understorey.

Parts of the MPA have been lightly logged. There is no known occurrence of dieback. Recreational pressure is so far insignificant, but could develop at Wabling Hill, in the north-western section.

The eastern portion of Reserve A24436 contains a low sand dune with a low woodland of banksia and pricklybark. The proximity of the limestone outcrops of Wabling Hill may account for the presence in the western portion of other species including tree smokebush and *Jacksonia hakeoides*. A good variety of trees and shrubs grows in the greater part of the Reserve. The extent to which the species intermix is interesting, for some of them are characteristic of wet and moist soils and others of dry soils.

The National Parks Authority harvests foliage of the flooded gum from the Reserve as food for koalas at Yanchep National Park.

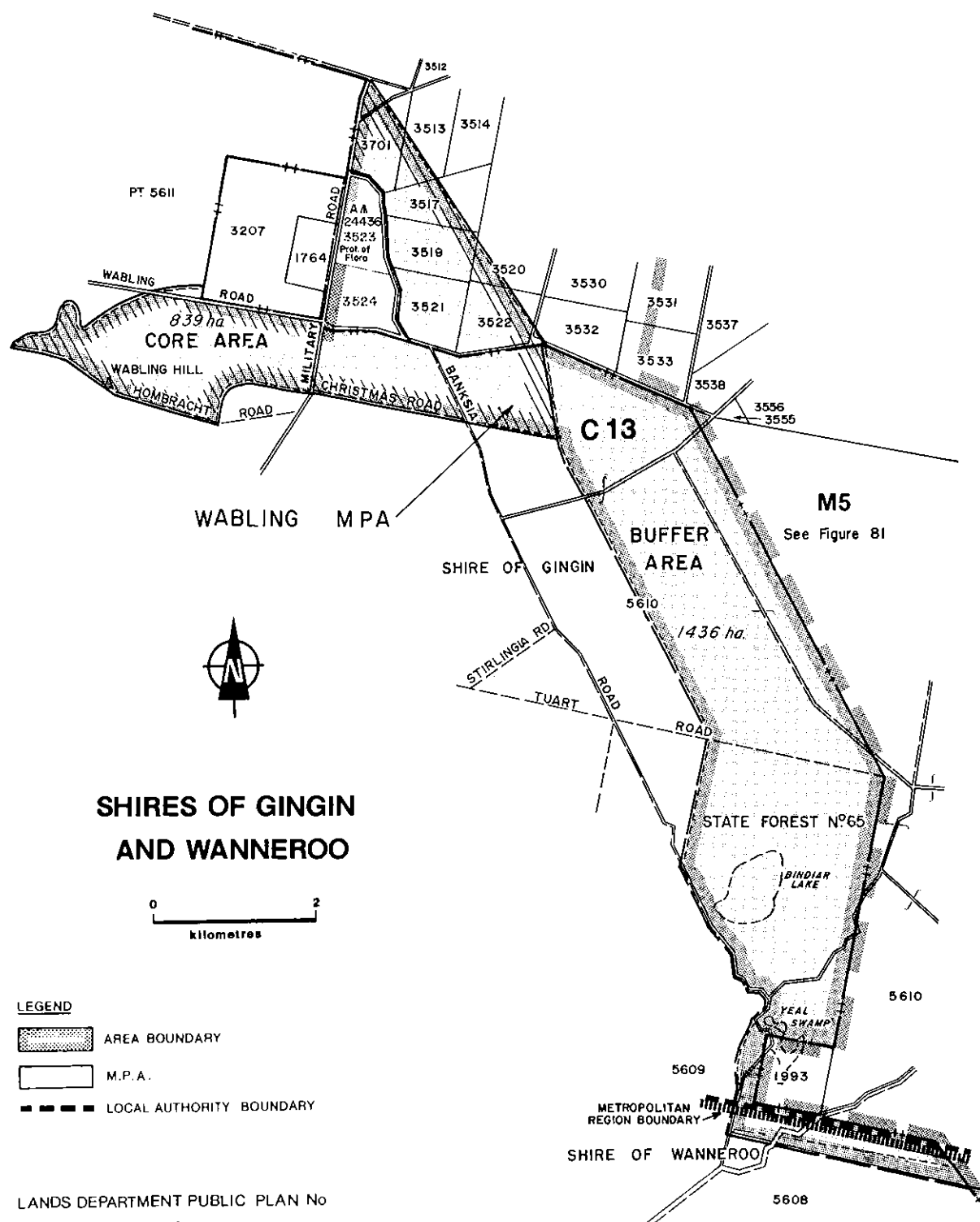
The area is within the Gngangara Water Reserve, a source of water supply. Groundwater extraction is likely to lower water levels and affect vegetation, particularly if the MWB's proposed Barragoon groundwater extraction scheme is developed.

There is a need for monitoring and research on groundwater extraction in order that utilisation may be modified if necessary. The Forests Department, which is monitoring changes in the vegetation, has been consulted over this. The area appears to have undergone a major hydrological change in geologically recent times, and as yet has not reached stability. The dynamic state of the vegetation is of scientific interest and the Forests Department's study is important in understanding the effects of groundwater extraction.

The area has potential for diatomaceous earth, heavy mineral sand and limestone, and is affected by existing mineral claims and by MRD limestone requirements for road construction purposes. Road, rail and other services may need to be given access through the MPA if the industrial area proposed for Wilbinga is developed.

Recommendations

- C13.1 Subject to the agreement of the controlling body, the purpose of Reserve A24436 should be amended to Conservation of Flora and Fauna, and Landscape, and the Reserve should be vested in the Conservator of Forests and managed as if part of Wabling Management Priority Area, provided that the National Parks Authority continues to be allowed to obtain koala food from the area of the Reserve.
- C13.2 The extraction of limestone within Wabling Management Priority Area should be restricted to places where it has already commenced.
- C13.3 Recreation should not be excluded from Wabling Management Priority Area, but vehicular access should be confined to all-weather roads such as Wabling and Military Roads.



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Figure 12

C14 RESERVES C20366 AND C25431, LAKE MUCKENBURRA

The area comprises Reserves C20366, for Recreation, vested in the Shire of Gingin; and C25431, for Public Utility, not vested. It is located about 12 km west of Gingin (Figure 13).

Wetlands are an important resource on the Coastal Plain, and Lake Muckenburra should be protected. Much of the area carries banksia and pricklybark. There are some groups of marri, and in places blackboy and zamia.

South of the lake there is a low, swampy area with tall shrublands of *Melaleuca viminea* and *Regelia ciliata*, and low open-woodlands of swamp banksia, paperbark and Christmas tree. The lake is bordered by white sand dunes, which are covered by open-scrub, with a few flooded gum and swamp paperbark trees. The tops of the dunes carry zamia, and near the lake there is a dense stand of jointed twig rush.

A wide variety of birds has been recorded, including the yellow-tailed thornbill, the grey fantail and the singing honeyeater. A nest of the long-necked tortoise has also been found.

The area is within the Gingin Brook Catchment as well as the Public Water Supply and Underground Water Pollution Control Areas proposed by the MWB. Groundwater extraction in the future will probably have adverse effects upon the water table unless groundwater development is restricted to the western portion of the proposed Areas. Public access may be restricted by Catchment Zone regulations.

Recommendations

- C14.1 Subject to the agreement of the controlling body, the purpose of Reserve C20366 should be amended to Conservation of Flora and Fauna, Water, and Parkland, and the Reserve should be vested jointly in the W.A. Wildlife Authority and the Shire of Gingin.
- C14.2 Reserve C25431 should be cancelled and its area added to Reserve C20366.
- C14.3 The W.A. Wildlife Authority and the Gingin Shire Council should prepare a management programme, giving consideration to:
- (a) confining active recreation to the waters of the lake, in order to minimise disturbance of the Reserve's vegetation;
 - (b) providing suitable recreation facilities and imposing restrictions, so as to prevent damage to the lake's foreshores and pollution of the lake.
- C14.4 The Minister for Water Resources should restrict groundwater extraction to the western portion of the proposed Public Water Supply and Underground Water Pollution Control Areas.

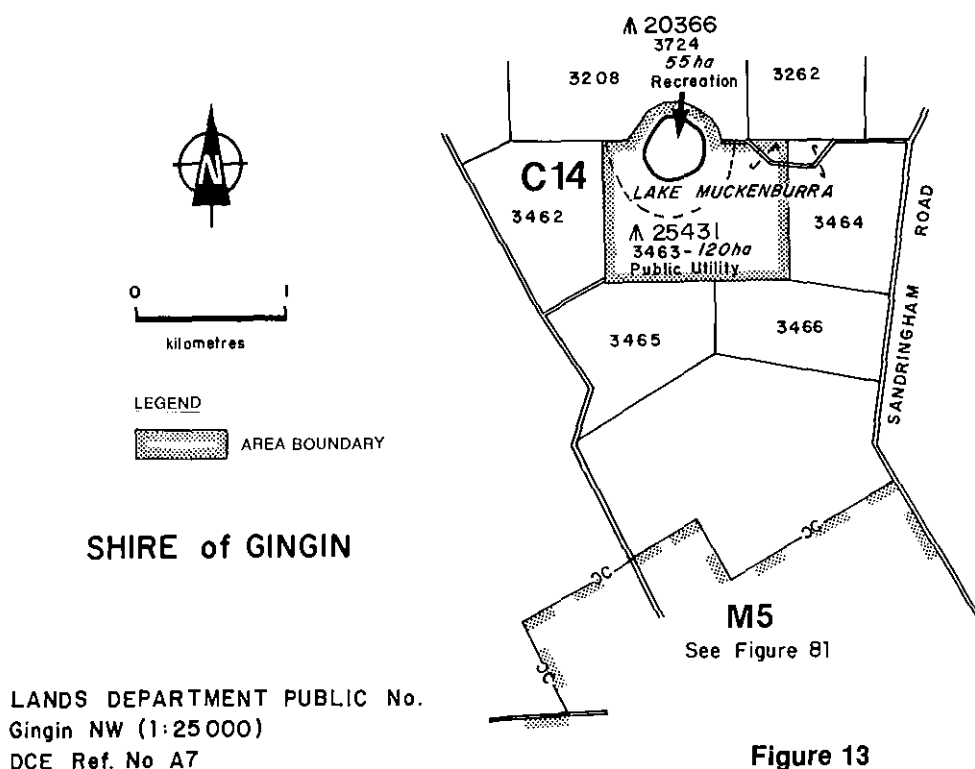


Figure 13

C15 RESERVES C24257 AND C26756, GINGIN

The area comprises Reserves C24257, for Conservation of Fauna, not vested; and C26756, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority. It is situated about 10 km south of Gingin (Figure 14).

Reserve C24257 contains Lakes Bambun, Nambung and Mungala. Lake Bambun is a large, deep, permanent lake which has a surrounding vegetation of flooded gum and paperbark. Fish which inhabit Lake Bambun include the Swan River goby, nightfish, western minnow and the introduced mosquito fish. Hundreds of ducks and a number of waders have been recorded in the lake area. Lakes Nambung and Mungala are shallower, semi-permanent wetlands which are particularly rich in aquatic life and serve as a food source for many water-birds.

There is insufficient reserved land to form a buffer zone around the three lakes to protect them from eutrophication. Stock are damaging the vegetation at the lakes' edges, and preventing regeneration.

Wallering Swamp was an important nesting site for the straw-necked ibis until a fire destroyed its vegetation in 1963. Subsequent grazing prevented regrowth.

Due to these problems the concept of a 'conservation buffer zone', as discussed in Chapter 5, is relevant.

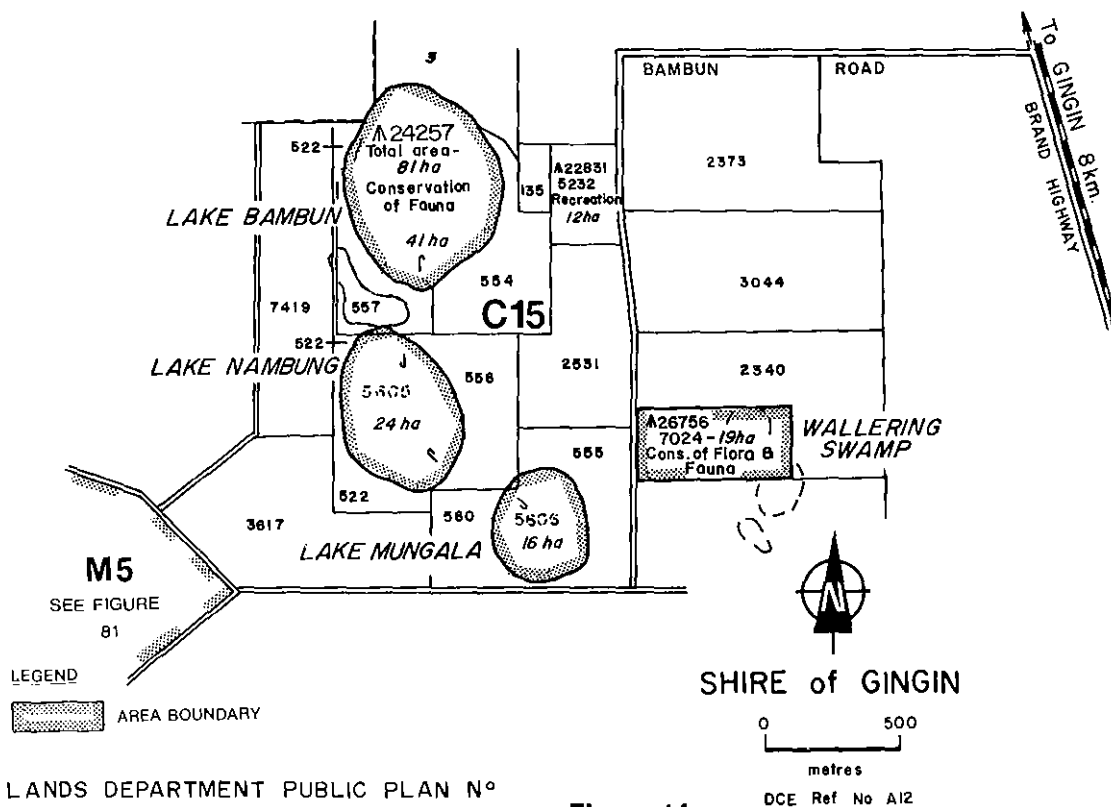
The area is within the Ellen Brook Catchment, a potential source of water supply. MWB groundwater extraction may affect water levels, and public access may be restricted by Catchment Zone regulations.

Recommendations

C15.1 Reserve C26756 should be classified as Class A.

C15.2 Reserve C24257 should be cancelled and its area added to Reserve C26756.

C15.3 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of adjacent freehold land. Consideration should be given to fencing of the wetlands.



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Gingin SE

Figure 14

C16 GEOLOGICAL SITES, GINGIN

The area comprises parts of Locations 103, 128, 149, 398 and 3108, privately owned freehold land near Gingin (Figure 15).

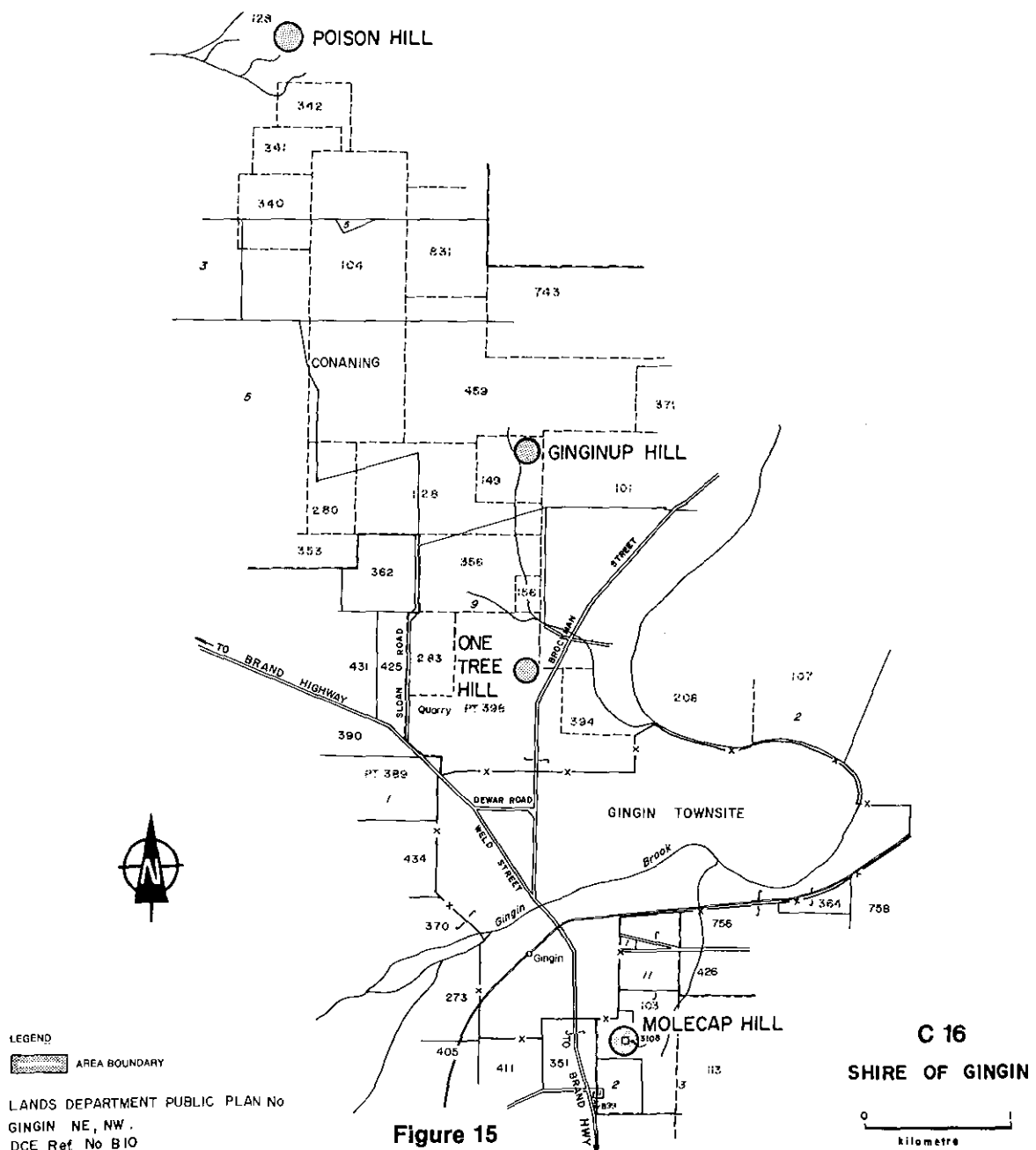
The hills that surround Gingin contain exposures of early Cretaceous chalk and greensand, which virtually replicate the classic successions of Western Europe. They are of great scientific and educational interest. All the important, well-exposed geological sections are on private land.

The area is within the Gingin Brook, Lennard Brook and Ellen Brook Catchments, potential sources of water supply. Public access may be restricted to some extent by Catchment Zone regulations. There are SEC lines in the area.

The Gingin Shire Council has, on behalf of the National Estate, proposed several more sites of geological and historical importance.

Recommendation

C16.1 The Geological Sites Committee, in consultation with the Gingin Shire Council, local land owners, and interested scientific and teaching institutions, should prepare a management programme for the geological sites.



C17 LAKE CHANDALA, MUCHEA

The area comprises parts of lots 2 and 3 of Location 1371 and parts of lots M1306, M1378, M1939 and Location 2115, land purchased by the Government for a proposed Class A Reserve. It is situated about 7 km north of Muchea (Figure 16).

Lake Chandala, also known as Lake Mandowin or Reedhead Swamp, is a seasonal, circular-shaped wetland, portion of which is owned by the Department of Fisheries and Wildlife. The vegetation consists of low closed-forest of swamp paperbark and flooded gum, surrounded by closed-scrub of melaleuca and small areas of samphire.

Lake Chandala supports a nesting colony of straw-necked ibis, the largest of only three known nesting colonies in Western Australia and believed to contain more than 90 per cent of the State's breeding population.

Water from Chandala Brook and various drains flows through Lake Chandala in winter and spring, providing a diversity of habitats for fish.

The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

The area is within the Ellen Brook Catchment, a potential source of water supply. MWB groundwater extraction may affect water levels and public access may be restricted by Catchment Zone regulations.

Recommendation

C17.1 The proposed Class A Reserve should be for Conservation of Flora and Fauna, and the Reserve should be vested in the W.A. Wildlife Authority.

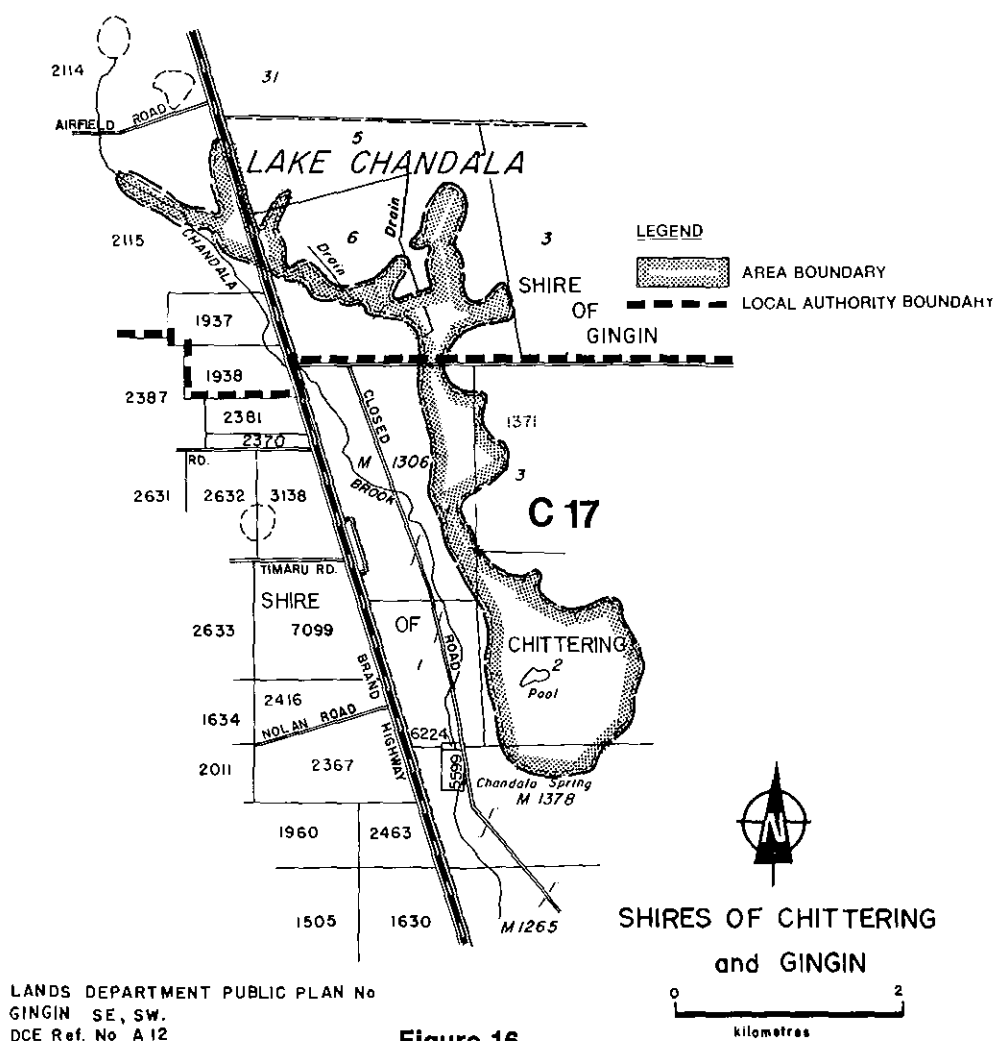


Figure 16

C18 RESERVE C42, BURROLOO WELL

Reserve C42, for Resting Place for Stock, not vested, is situated about 2 km south of the Great Northern Highway-Chittering Road junction (Figure 17).

The Reserve mainly contains brown sandy loam covered by open-woodland of marri, with a few wandoo and jarrah, and a varied understorey which includes couch honeypot and blue leschenaultia. Gravelly clay soils near the creek carry a shrub layer which includes white myrtle and fuschia grevillea. There are thickets of stinkwood and wattle in the centre of the Reserve and a dense stand of swishbush at the southern end. There are a number of perennial and ephemeral herbs, including pincushion, flannel flower and woodbridge poison, and a wide variety of other species including scrub sheoak, common verreauxia and bright podolepsis. The vegetation is in good condition, with little invasion of weeds. The surrounding land has been mainly cleared for agriculture, and the Reserve should therefore be maintained to provide an example of the flora of the district.

The area is within the Brockman River Catchment, a potential source of water supply. It may be affected by a proposed pipehead dam on the Brockman River near its confluence with the Avon River. Public access would be restricted to some extent by Catchment Zone regulations. The Reserve may be affected by reconstruction of the Great Northern Highway.

Recommendation

C18.1 The purpose of Reserve C42 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

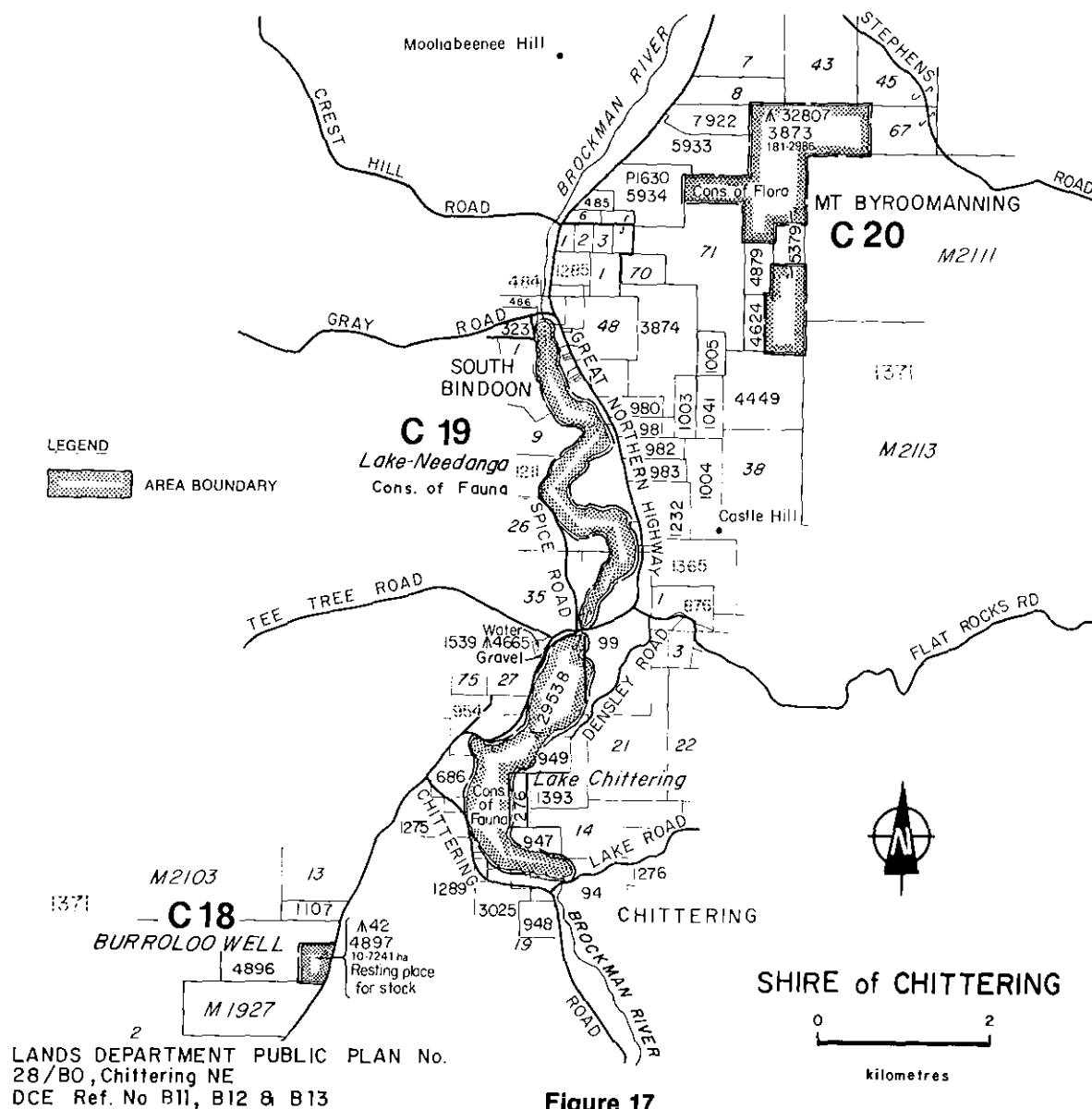


Figure 17

C19 NEEDONGA AND CHITTERING LAKES

Reserve C29538, for Conservation of Fauna, vested in the W.A. Wildlife Authority, is situated about 15 km east-south-east of Gingin (Figure 17).

Needonga and Chittering Lakes are on the water course of the Brockman River. They are bordered by low closed-forest of swamp paperbark. Wetland vegetation has been affected by grazing. Before 1975, the numbers of water-birds using the area had been steadily diminishing due to the lakes becoming shallower, through siltation and drainage, and drying up mid-summer. In September 1975 the Department of Fisheries and Wildlife constructed a sand-bag weir at the outlet to Lake Chittering and the weir retained a large area of water throughout the following summer. A permanent structure was subsequently erected to retain water in the lakes during summer. The lakes now support colonies of egret, white egret, black duck, grey teal, wood duck, mountain duck, musk duck, brown bittern, straw-necked ibis, stilt and swan. Nineteen species of water-bird have been recorded on the lakes.

The area is within the Brockman River Catchment, a potential source of water supply. It may be affected by a proposed pipehead dam on the Brockman River near its confluence with the Avon River. Public access would be restricted to some extent by Catchment Zone regulations. The Reserve may be affected by reconstruction of the Great Northern Highway.

Recommendation

C19.1 Reserve C29538 should be classified as Class A.

C20 RESERVE C32807, MT. BYROOMANNING

Reserve C32807, for Conservation of Flora, not vested, is situated on the eastern side of the Brockman Valley near Bindoon (Figure 17).

The Reserve is on a rocky lateritic ridge, the vegetation being open-woodland with a mixture of wandoo and york gum. The understorey includes jam and manna wattle. This association of species is not otherwise adequately represented in conservation reserves.

The Reserve is within the Brockman River Catchment, a potential source of water supply. It may be affected by a proposed pipehead dam on the Brockman River near its confluence with the Avon River. Public access would be restricted to some extent by Catchment Zone regulations. The Reserve may be affected by reconstruction of the Great Northern Highway.

Recommendation

C20.1 The purpose of Reserve C32807 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

C21 JULIMAR MANAGEMENT PRIORITY AREA (MPA 2.1)

The area comprises State Forest No. 61, managed by the Forests Department for conservation of flora and fauna; Reserves A27595, for Conservation of Flora and Fauna, C13971, for Water, C20210, for Water, C22097, for Government Requirements, and C29100, for Buffer Strip, all not vested; Avon Location 28184, owned by the Commonwealth of Australia; and Locations 7790, 14703, 22299, 24025, 24651, 24652 and 26883, privately owned freehold land. It is situated about 25 km north-west of Toodyay and 80 km north-east of Perth (Figure 18).

The area consists of lateritic uplands and dissected lateritic slopes, with moderately incised valleys. The uplands support open-forest of jarrah and marri and the valleys open-woodland of wandoo. The area includes extensive stands of *Dryandra polycephala*, *Dryandra drummondii*, *Conospermum polycephalum* and species of *Synaphea*, none of which is well represented in the areas to the south.

Julimar MPA has a range of vegetation associations, the major types being open-forest of jarrah and marri, and wandoo woodland, with some jarrah and powderbark. Two minor types of vegetation occur. One is restricted to granite outcrops and the other to swampy areas. Several species of mammals, including the tammar (a rare marsupial), western grey kangaroo, brush wallaby, brush possum, pigmy possum, honey possum, bats and possibly the numbat, occur. About fifty species of birds have been recorded in the MPA, which has a large population of some birds that are becoming rarer in the South-West, examples being the rufous tree creeper, black-capped sittella and splendid wren.

The area has been logged, mainly between 1950 and 1970. Commercial activities in the area include beekeeping, based mainly on wandoo, and harvesting of *Dryandra polycephala* for dried floral arrangements. There are sporadic occurrences of dieback in the MPA.

Due to its accessibility to Perth, and the capacity of open-woodland of wandoo to support recreation activity, the concept of a 'regional park', as discussed in Chapter 5, is relevant.

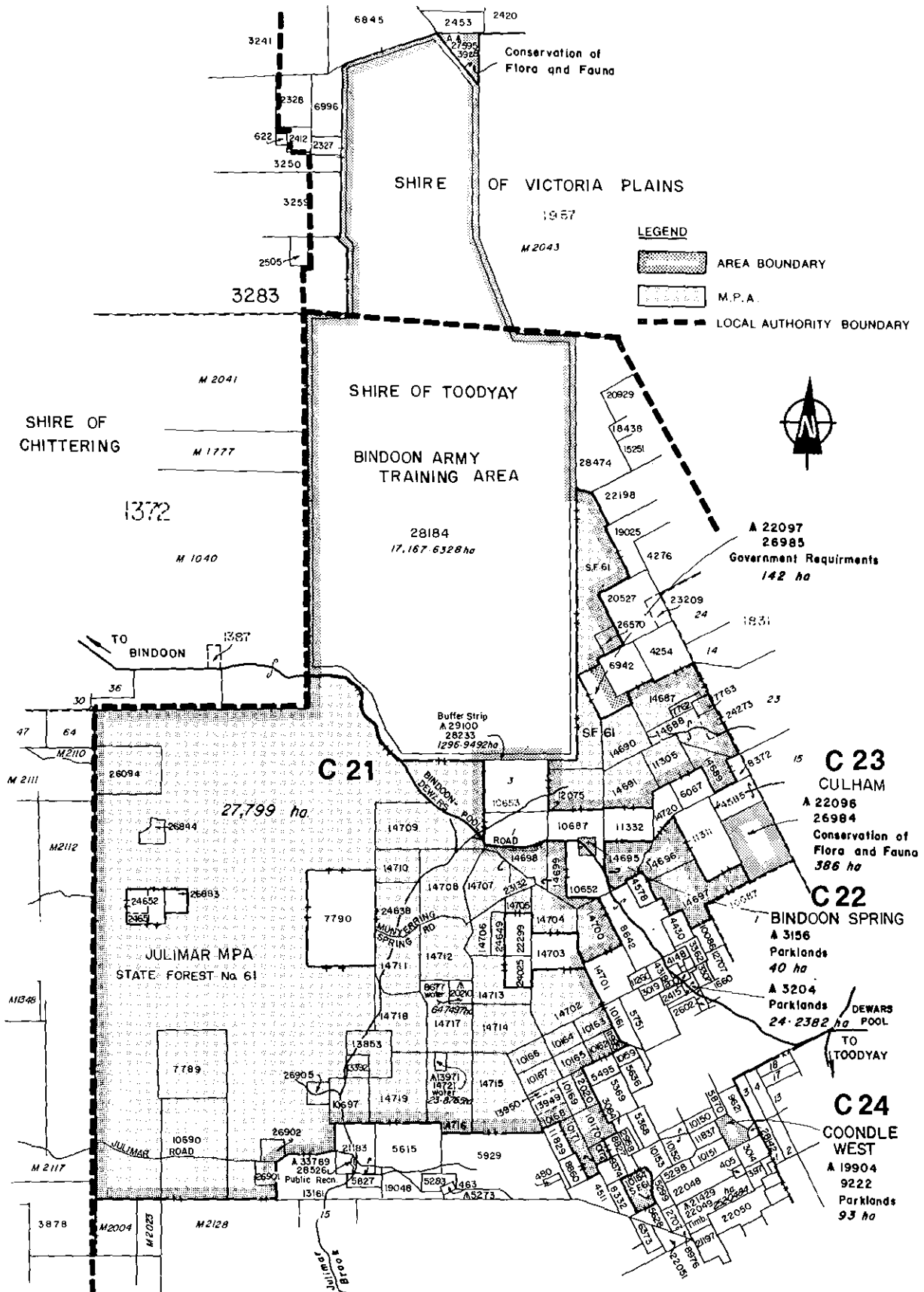
Although Julimar MPA is relatively close to Perth, it has not been developed much for recreation, which is at present limited to bushwalking and scenic drives. This situation is, however, expected to change in the near future. Trail-bikes are being increasingly used in sections of the forest.

The area is within the Brockman River and Julimar Brook Catchments, which the MWB may use after the year 2000. A storage dam may be built on the Brockman River near its confluence with the Avon River, and another dam on the Julimar Brook near its confluence with the Avon River. Consequently the MWB would wish to restrict public access. However these Catchments are extensively populated and farmed, so Catchment Zone regulations would not be very restrictive. Part of the area contains materials suitable for road building.

The area is within the Pacminex and Alcoa Mining Leases, but has low long term priority for bauxite mining. The northern part of the Army Training Area could be affected to some extent by the future planned route of the Great Northern Highway.

Recommendations

- C21.1 Reserves A27595, C13971, C20210, C22097, and C29100 should be vested in the Conservator of Forests and managed as if part of Julimar Management Priority Area.
- C21.2 Subject to the agreement of the controlling body, Avon Location 28184 should be purchased and its area added to Reserve A27595.
- C21.3 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- C21.4 The Forests Department should consider the allocation of an area of State Forest No. 61, to be clearly defined and supervised, for the use of trail-bike riders, subject to:
 - (a) the demand for this activity being substantiated;
 - (b) on-site staff or regular patrols being available to ensure that off-road vehicles do not enter adjoining areas.



C22 RESERVE C3156, BINDOON SPRING

Reserve C3156, for Parklands, vested in the Shire of Toodyay, is situated about 20 km north-west of Toodyay (Figure 18).

The Reserve is unusual in that it has sandy soil, in contrast to the predominant heavy soils of the district. The vegetation is mostly low woodland of slender banksia, bull banksia and Christmas tree. Species present include *Conostylis candicans*, *Lechenaultia floribunda*, spearwood and wattle.

A sand pit has been opened in the south-west of the Reserve. Although still used it has been partly revegetated. Apart from weed infestation along the boundary, the Reserve is in good condition. It is an unusual inland area of vegetation containing species typical of the Coastal Plain.

Should the purpose of the Reserve be altered to Conservation of Flora and Fauna, provision could still be made in its management for limited use by visitors. Extraction of sand from the Reserve should cease.

Recommendation

C22.1 Subject to the agreement of the controlling body, the purpose of Reserve C3156 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested in the W.A. Wildlife Authority.

C23 RESERVE C22096, CULHAM

Reserve C22096, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated about 20 km north-west of Toodyay (Figure 18).

The area is undulating and dissected by steep-sided gullies. The soil is gravel and yellow-brown sand with large lateritic boulders in the gullies. The vegetation is predominantly open-woodland of wandoo and marri with a dense understorey. Some Christmas tree, snottygobble and bull banksia are present and common species include *Acacia celastrifolia*, *Adenanthos drummondii*, *Calothamnus sanguineus* and *Petrophile serruriae*. The Reserve is undisturbed.

The Forests Department believes that the conservation objectives of Reserve C22096 would be better served if it were to be managed as if part of Julimar MPA.

Recommendation

C23.1 Subject to the agreement of the controlling body, Reserve C22096 should be vested in the Conservator of Forests and managed as if part of Julimar Management Priority Area.

C24 RESERVE C19904, WEST TOODYAY

Reserve C19904, for Parklands, vested in the Shire of Toodyay, is situated about 10 km north-west of Toodyay (Figure 18).

The Reserve is undulating. The upper slopes support woodland of marri and bull banksia and lower down the trees are powderbark and wandoo. Blackboy is common and there are thickets of parrot bush, as well as occurrences of york gum with jam and manna wattle. This type of vegetation has been mostly cleared elsewhere in the region. Although somewhat disturbed by the felling of timber and the opening of gravel pits, the Reserve still contains a substantial amount of vegetation.

Recommendation

C24.1 Subject to the agreement of the controlling body, the purpose of Reserve C19904 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

C25 MOUND SPRINGS, MUCHEA

The area comprises Reserves C24724, for Recreation, vested in the Shire of Chittering; C17680, for Gravel, and part of Reserve C2336, for Townsite, both not vested; vacant Crown land; Swan Locations 1518 (part of Commonwealth Government Lease 37L/776) and 2667 and 2929, privately owned freehold land. It is situated just west of Muchea (Figure 19).

Mound Springs provides a habitat for certain species of plants which are rare in System 6, including sundew, bog clubmoss and an unusual liverwort. Location 2929 contains a plant population of a newly discovered species of *Darwinia*. The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

The area is within the Gnangara Water Reserve and the Ellen Brook Catchment. MWB groundwater extraction may affect water levels and public access may be restricted to some extent by Catchment Zone regulations. There are SEC lines in the area.

Recommendation

C25.1 The W.A. Herbarium should survey the area, hold discussions with local land owners, and prepare a report on the conservation of the flora for the Environmental Protection Authority and the W.A. Wildlife Authority.

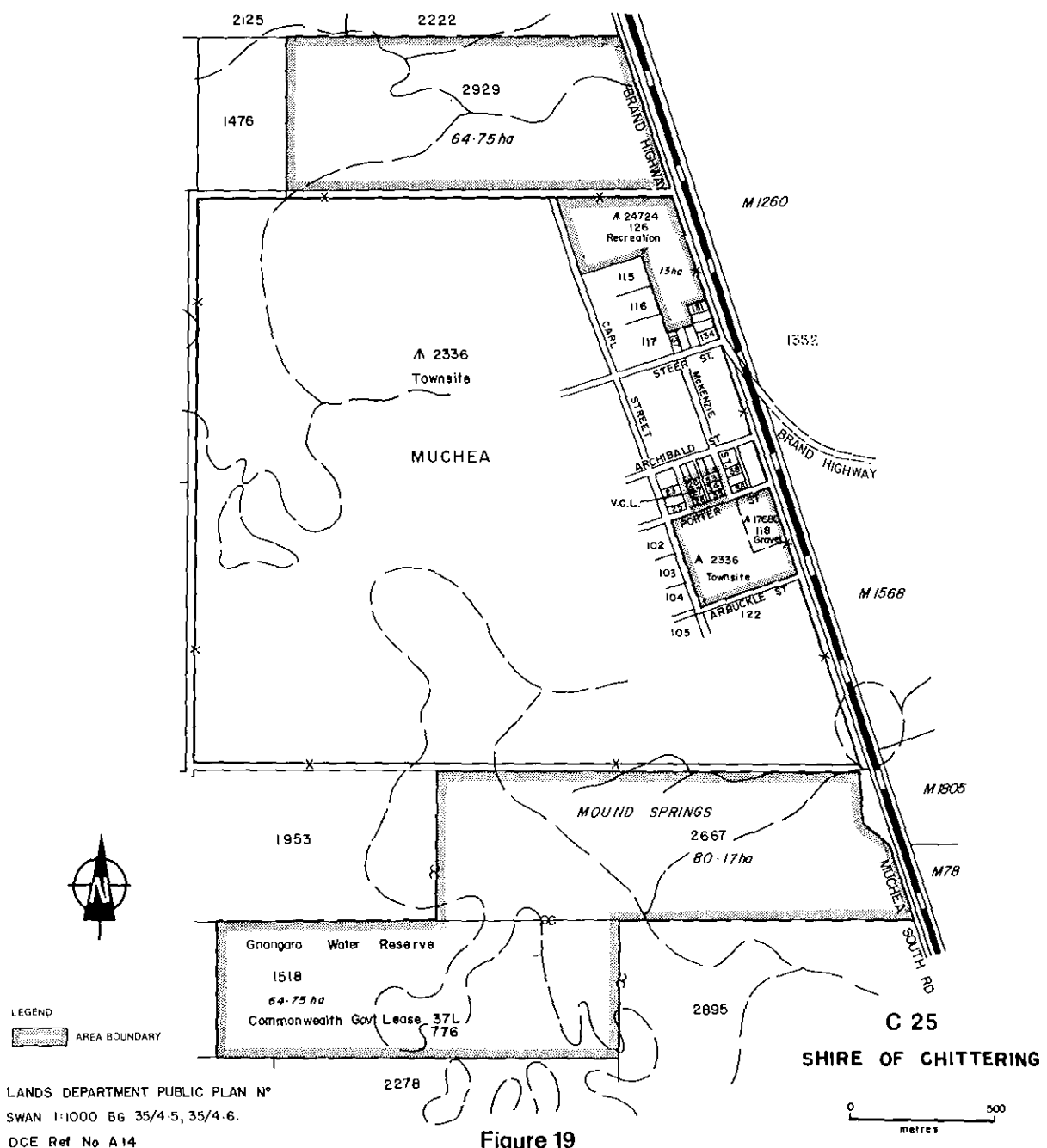


Figure 19

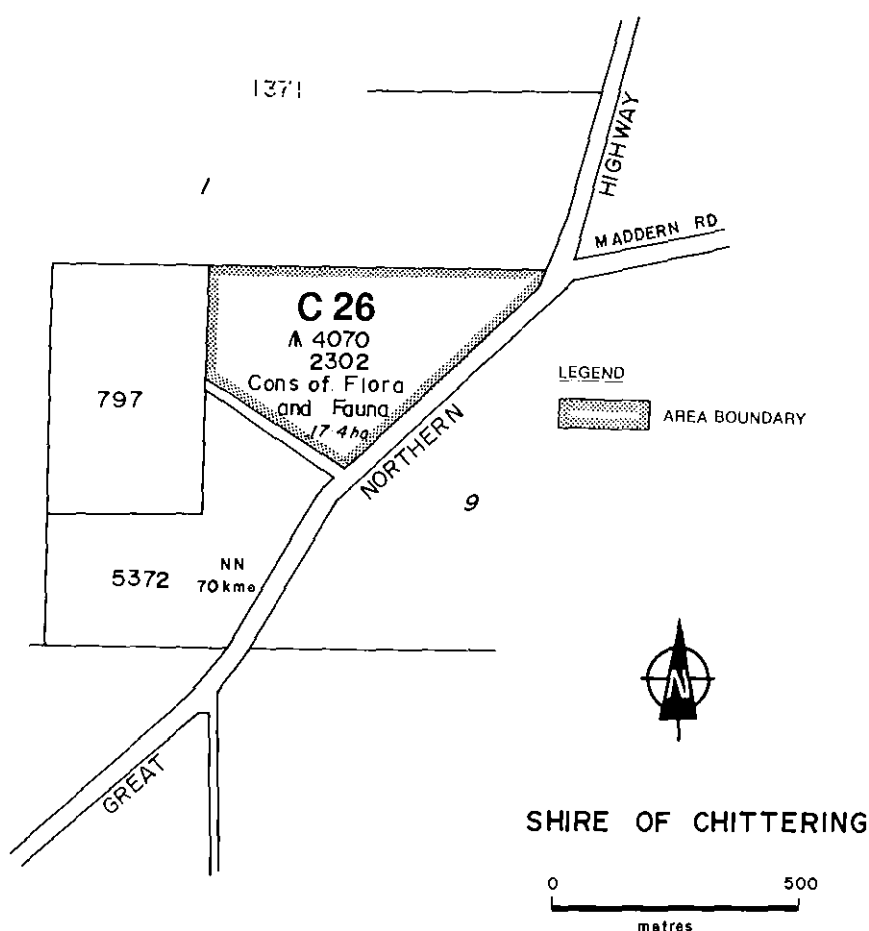
C26 RESERVE C4070, NORTH OF BULLSBROOK

Reserve C4070, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated on the Great Northern Highway about 20 km north of Bullsbrook (Figure 20).

Open-woodland of marri, Christmas tree, bull banksia and some wandoo occurs on an open sandy loam and clay flat. The flat is low-lying and becomes wet in winter. The shrub layer includes many species and a wide variety of herbs. The western portion of the Reserve is slightly higher and has a sandy rise with low woodland of slender banksia, Menzies' banksia and pricklybark. Typical shrubs are woollybush, scrub sheoak and pixie mops. There is no other Reserve in the district with the same association of species and richness of flora.

The Reserve is within the Ellen Brook Catchment, a potential source of water supply. It may be affected by a proposed pipehead dam on Ellen Brook near its confluence with the Swan River. Public access would be restricted to some extent by Catchment Zone regulations. The Reserve may be affected by reconstruction of the Great Northern Highway.

The Study endorses the present purpose and vesting of Reserve C4070.



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Figure 20

C27 BEELARING AND GOONARING SPRINGS

The area comprises Reserves C529 and C659, for Conservation of Flora and Fauna, both vested in the W.A. Wildlife Authority; part of lots M2050 and M2137 (Location 1953) and Location 28292 privately owned freehold land. The area is situated about 50 km north-east of Perth (Figure 21).

The vegetation of both Reserves is diverse, and also unusual in this region. The soil of Reserve C529 is red loam with some gravel and the Reserve carries woodland of jarrah and marri, with a dense understorey including *Adenanthos drummondii* and prickly poison, and possibly species of lambstail, rare in System 6.

There are two distinct soil associations on Reserve C659, which is sloping, the lower slopes having a yellow-red loam with some gravel and the higher slopes being more gravelly. Consequently, the Reserve has two distinct plant associations. Open-forest of jarrah, marri and Moonah paperbark, with an understorey of tall shrubs including wattle and swishbush, occurs on the lower slopes. Open-woodland of jarrah and marri with an open understorey occurs on the higher slopes. The Reserve is relatively undisturbed.

Up to eighty bird species have been recorded in the area, and the streams contain a crustacean of the Koonac group. The area as a whole has significant conservation value, largely because Beelaring and Goonaring Springs provide fresh water for most of the year. The catchments for Beelaring and Goonaring Springs, which include parts of lots M2050 and M2137, privately owned, must be protected. The EPA has negotiated an agreement whereby this freehold land will be acquired by the Crown. Such acquisition will provide a link with Reserve 30193 and the Avon Valley National Park.

The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

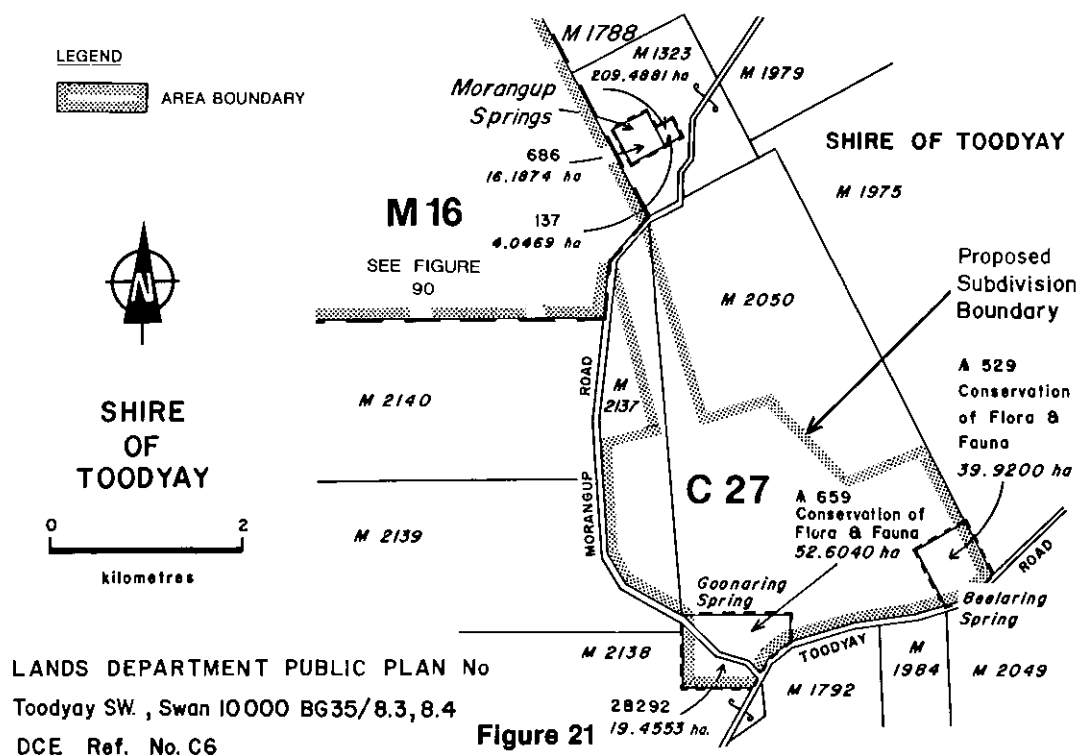
The area is within the Red Swamp Brook Catchment, a potential source of water supply, which may be affected by a proposed dam on the Brook near its confluence with the Avon River. Public access would be restricted to some extent by Catchment Zone regulations. The area may be affected by the proposed Midland - Goomalling Road.

Recommendations

C27.1 Reserve C529 should be cancelled and its area added to Reserve C659.

C27.2 Reserve C659 should be classified as Class A.

C27.3 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



C28 RESERVES NEAR WUNDOWIE

The area comprises Reserves C4623, C14275 and C14276, for Timber, all not vested; C11619, for Recreation, vested in the Shire of Northam; and C25796, for Rubbish Depot, vested in the Shire of Northam; and vacant Crown land. It is situated around Wundowie Townsite about 60 km north-east of Perth (Figure 22).

Reserve C4623 is undulating and has a woodland of jarrah and wandoo on gravel and gravelly loam. Blackboy and zamia are common. The rare fringed lily, *Thysanotus anceps*, known only from a few other localities north-east of Perth, occurs in the Reserve. The eastern section is in good condition but the western section is disturbed, containing a gravel pit and many vehicle tracks.

Reserve C11619 (Coates Reserve) is on the upper slopes of a rise which slopes to the north-west. The gravelly loam supports woodland of jarrah and wandoo with the latter predominating in the eastern section of the Reserve. The understorey is quite diverse, and the vegetation is undisturbed.

Reserve C14275 is in two sections separated by freehold land. The western section, next to Wundowie townsite, is relatively flat and supports woodland of jarrah and bull banksia with an admixture of wandoo in some places. *Thysanotus anceps* also occurs here. There has been tree-felling in parts of this section, as well as extraction of gravel and sand. The eastern section of the Reserve is undisturbed and rises gently towards the south. It has woodland of jarrah, bull banksia and wandoo, with some marri, as well as dense stands of acacia and dryandra.

Reserve C14276 is gently undulating and contains gravelly and sandy soils and granite outcrops. The vegetation is woodland of jarrah, marri, wandoo and bull banksia with a low heath understorey. It contains powderbark and stands of rock sheoak, and blackboy and zamia are common. The section to the west of Inkpen Road has been burnt regularly and has consequently degenerated.

Most of the area is within the Wooroloo Brook Catchment, a potential source of water supply. A storage dam may be built on the Wooroloo Brook near its confluence with the Avon River. Public access would be restricted to some extent by Catchment Zone regulations. There are SEC lines in the area, which may be affected by realignments of the Great Eastern Highway and Inkpen Road. The area has potential for iron ore, bauxite, clay, silica sand, quartz, titaniferrous magnetite, vanadium, gravel and Toodyay stone and is subject to various mineral claims. The eastern section of Reserve C14275 (east of Location 10275) is affected by the Coates Vanadium Project. The area is partly within both the Alcoa Mining Lease and the Pacminex Agreement Area. However, the potential for bauxite is low and Pacminex has no plans for mining. The southern section of Reserve C14276 could be affected by a small industrial site, which may be built near the intersection of Inkpen and Douglas Roads.

The Northam Shire Council has proposed that Reserve 14275 should be extended by the inclusion of Railway Reserve 23746, and Avon Locations 3586, 332, 3754, 117, 4960.

Recommendations

- C28.1 The purpose of Reserve C14275 should be amended to Conservation of Flora and Fauna, Water, and Mining, and the Reserve should be vested jointly in the Ministers for Fisheries and Wildlife, Water Resources, and Mines.
- C28.2 Subject to the agreement of the controlling body, Reserves C11619 and C25796 should be cancelled and their respective areas added to Reserve C14275.
- C28.3 Reserves C4623 and C14276 should be cancelled and their respective areas added to Reserve C14275.
- C28.4 The vacant Crown land should be added to Reserve C14275.
- C28.5 The Geological Survey of Western Australia should give a high priority to an early evaluation of the mineral potential of the area.
- C28.6 The Ministers for Fisheries and Wildlife, Water Resources, and Mines, and Coates Vanadium should prepare a management programme for that section of Reserve C14275 affected by the Coates Vanadium Project, giving consideration to:
 - (a) ensuring adequate buffer zones and disposal techniques;
 - (b) rehabilitating mined areas.
- C28.7 The Northam Shire Council should prepare a management programme for Reserve C11619 (Coates Reserve), giving consideration to prohibiting vehicular access.

C29 RESERVES NORTH-WEST OF CLACKLINE

The area comprises Reserves C32400, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; C20014 for Timber, not vested; C3307, for Water, not vested; C1494, for Railway Purposes, vested in the Commissioner of Railways; and C8518, for Railway Purposes, not vested; and vacant Crown land. It is situated just north of Bakers Hill and Clackline (Figure 23).

The western portion is gently undulating but towards the eastern end the land is dissected into steep-sided valleys and ridges. The soils include yellow-brown and white sands, gravels and clays. There are also granite outcrops. The vegetation is chiefly woodland with the trees varying according to soil type. The main tree types include jarrah, marri, wandoo, powderbark, rock sheoak, Christmas tree and bull banksia. There is an occurrence of brown mallet, which is otherwise found in the Great Southern. A rare species of orchid, *Caladenia triangularis*, not known from any other conservation reserve, has been found in Reserve C32400.

The vacant Crown land and the adjoining Reserves C1494 and C8518 contain a portion of Clackline Brook, which is bordered by flooded gum with an understorey of introduced grasses. Springs provide the river bed with permanent pools which are an important source of water for the animals that inhabit the Reserves and vacant Crown land to the north-west.

Schools, from nearby and also from Perth, use the area for ecological studies.

The area may be affected to some extent along its southern boundary by realignment of the Great Eastern Highway. There are existing mineral claims for the extraction of iron ore, silica sand, clay, quartz and Toodyay Stone. Some of the vacant Crown land around Reserve C32400 is used by Clackline Refractory Limited for the production of refractory clay. The land is within the Pacminex Agreement Area but Pacminex has no plans for bauxite mining.

The Northam Shire Council has proposed an extension of the area to include Avon Locations 12315, 15435, 16016, 19370 and 21189.

Recommendations

- C29.1 Subject to the agreement of the controlling body, Reserve C1494 should be cancelled and its area added to Reserve C32400.
- C29.2 Reserve C8518 should be cancelled and its area added to Reserve C32400.
- C29.3 The vacant Crown land should be added to Reserve C32400.
- C29.4 The purpose of Reserves C3307 and C20014 should be amended to Conservation of Flora and Fauna, and Mining, and the Reserves should be vested jointly in the Ministers for Fisheries and Wildlife, and Mines.
- C29.5 The Geological Survey of Western Australia should give a high priority to an early evaluation of the mineral potential of Reserves C3307 and C20014.
- C29.6 The W.A. Wildlife Authority should prepare a management programme for Reserve C32400, giving consideration to:
 - (a) fire protection and controlled burning;
 - (b) directing school use.

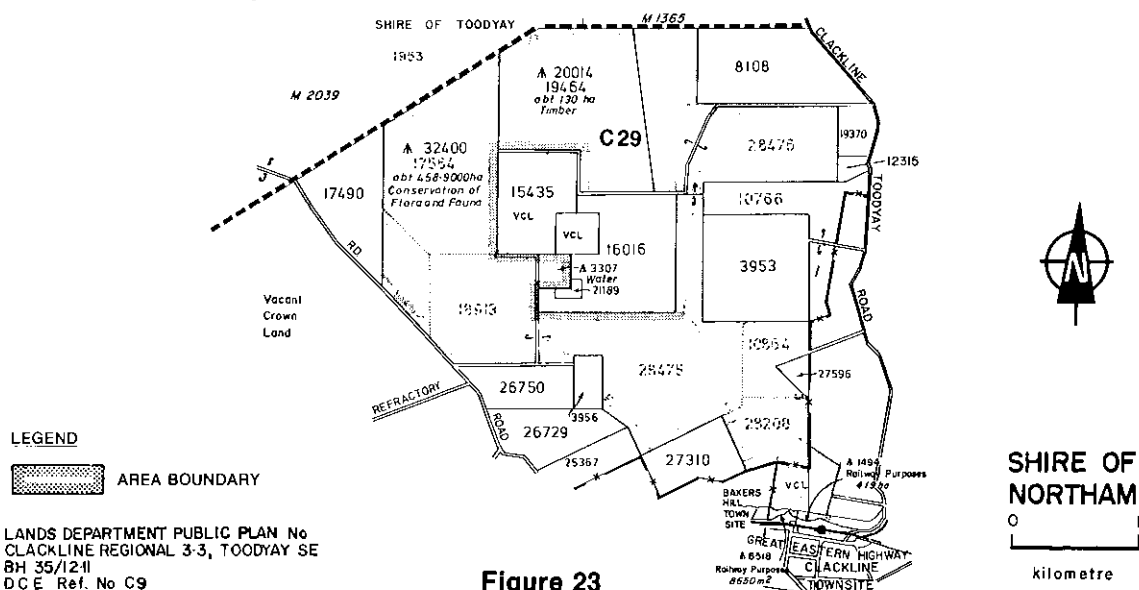


Figure 23

C30 RESERVE C30363, INKPEN ROAD

Reserve C30363, for Government Requirements, not vested, is situated to the north of the Great Southern Highway, about 15 km east of Chidlow and 50 km east of Perth (Figure 24).

The area is gravelly and undulating, with a low-lying central belt of sandy soil. It supports woodland of jarrah and marri with the latter predominating in the sandy soil.

The area is within the Wooroloo Brook Catchment, a potential source of water supply. It may be affected by a proposed storage dam on the Wooroloo Brook, near its confluence with the Swan River. Public access would be restricted to some extent by Catchment Zone regulations.

Recommendation

C30.1 The purpose of Reserve C30363 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

C31 RESERVES C25860 AND C30393, BERRY BROW ROAD

The area comprises Reserves C25860, for Public Utility, and C30393, for Government Requirements, both not vested. It is situated about 25 km south-west of Northam (Figure 24).

The Reserves occupy undulating country and contain some attractive granite outcrops. The higher parts are lateritic and are covered by low open-woodland of wandoo, jarrah, marri and powderbark. *Zamia* and silky bloodflower occur on the lateritic breakaway, and downslope vegetation consists of a mixture of york gum and jam with rock sheoak on some areas of granitic soil.

The area has potential as a site for an open range zoo. A picturesque winding creek in the northern part of Reserve C30393, and a gravel quarry (on high ground which affords excellent views) require a minimum of landscaping to make the area very attractive to potential zoo visitors. An adequate water supply could be maintained with slight modifications to the catchments, possibly involving the construction of a series of small dams in the creeks. The open-woodland and a network of tracks allows a fair degree of movement throughout the area. Access roads and powerlines run adjacent to Reserve C30393.

The metropolitan zoo in South Perth occupies an area of 18 ha, which is insufficient to cater for the breeding and maintenance of stocks of many animal species. There is an increasing recreational demand for an open range zoo within a day-visit distance from the Perth metropolitan area. Open range zoos have been operating in other parts of Australia and throughout the world for some years. An open range zoo near to Perth would offer considerable advantages to metropolitan residents and the tourist industry, and would provide significant recreational and educational benefits.

The area is partly within both the Alcoa Mining Lease and the Pacminex Agreement Area. However, the potential for bauxite is low and Pacminex has no plans for mining.

Recommendations

C31.1 Reserve C25860 should be cancelled and its area added to Reserve C30393.

C31.2 The purpose of Reserve C30393 should be amended to Zoological Gardens and the Reserve should be vested in the Zoological Gardens Board.

C32 DALE MANAGEMENT PRIORITY AREA (MPA 2.6)

The area comprises Dale MPA, managed by the Forests Department for the conservation of flora and fauna, and part of Location 10383, freehold land, held in the name of the Conservator of Forests. It is situated about 50 km south-east of Perth (Figure 25).

The MPA's purpose is to support a wide range of landscape features and vegetation types.

The area contains an extremely broad range of landscape components, including a granitic monadnock, lateritic uplands, dissected lateritic slopes, gently sloping valleys and steeply sloping valleys. The lateritic uplands support open-forest of jarrah and marri with an understorey of sheoak. Open-woodland of jarrah, shrubland, herbland and a lithic complex occur on shallower soils and on granite outcrops. The valleys carry open-forest of jarrah and marri, and woodlands of wandoo and flooded gum. Open-woodland of wandoo with an admixture of yarri occurs on loamy soils which have elsewhere been cleared for agriculture. Much of the area has been heavily logged. Several of the vegetation types represented in Dale MPA have been severely affected by dieback elsewhere in State Forest. Dieback is presently restricted to a few peripheral gullies. Most of the MPA, which has very high significance for conservation, is under quarantine.

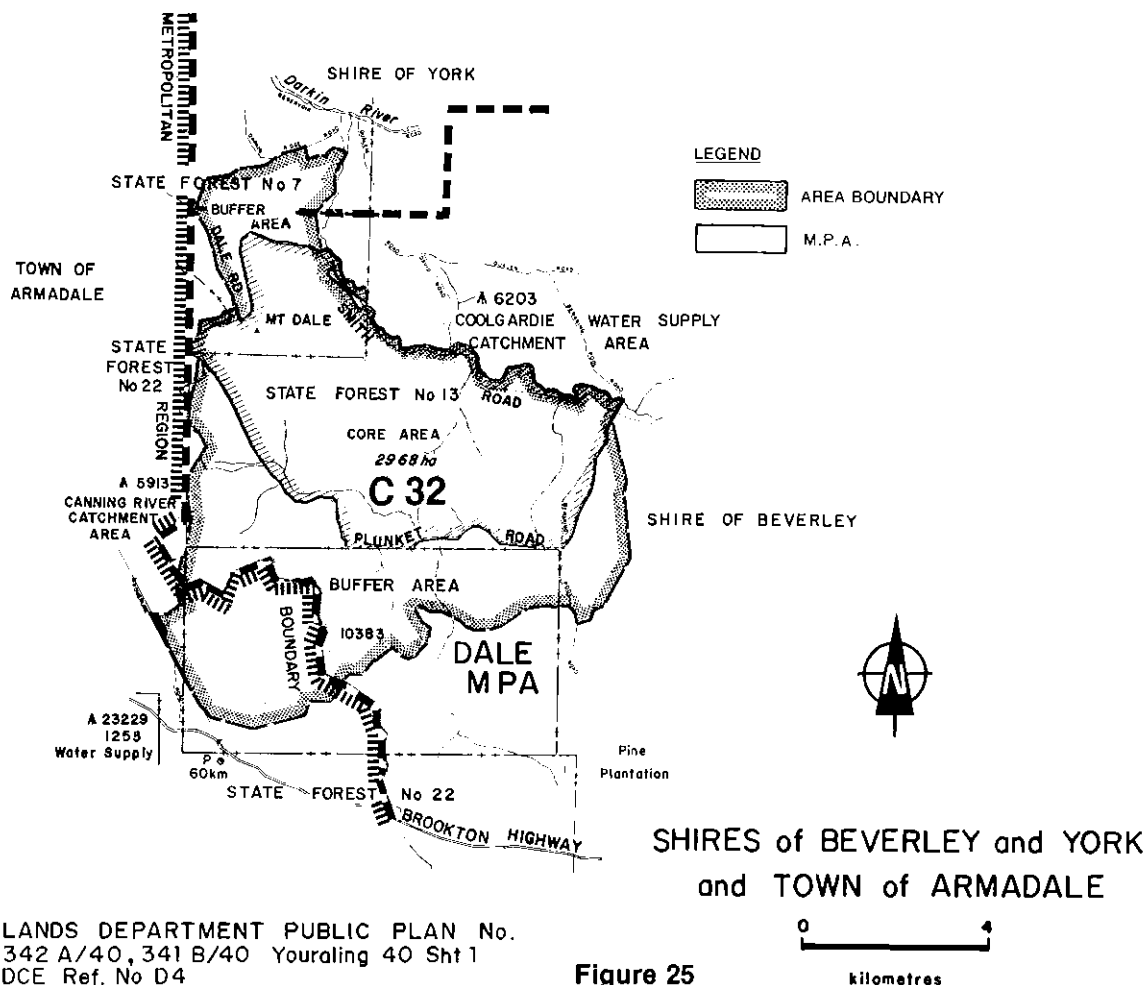
Mt. Dale is popular for walks and picnics. Recreation should be carefully monitored and access restricted, other than to walkers.

The area is within the Mundaring and Canning River Catchments, sources of water supply. Public access is restricted by Catchment Zone regulations. The MPA is within the Alcoa Mining Lease and the southern portion has long term potential for bauxite mining.

Recommendation

C32.1 The Forests Department, in consultation with the Public Works Department and the Department for Youth, Sport and Recreation, should prepare a management programme giving consideration to:

- (a) recreation activities;
- (b) protection of the springs along the south-western perimeter of the area.



C33 RUSSELL MANAGEMENT PRIORITY AREA (MPA 2.5)

Russell MPA, managed by the Forests Department for conservation of flora and fauna, is situated about 65 km south-east of Perth (Figure 26).

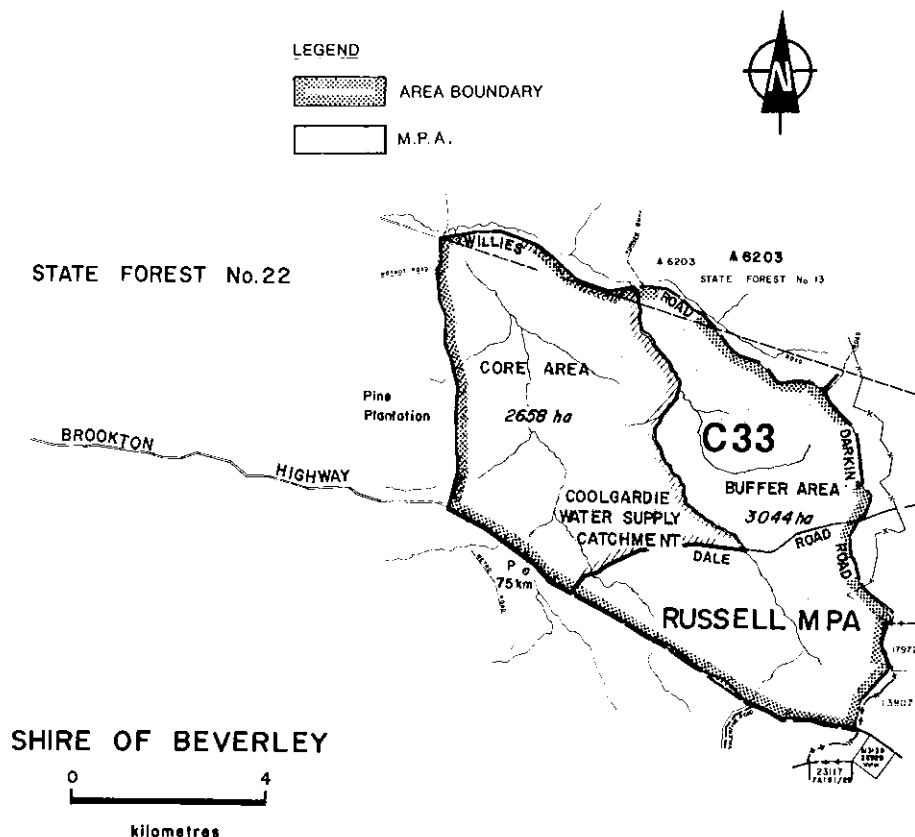
The MPA's purpose is the preservation of the largest remaining area of virgin wandoo woodland in System 6.

Russell MPA includes lateritic uplands which support a range of vegetation from open-forest of jarrah and marri to open-woodland of wandoo. There are significant areas of shallow lateritic soils and granite outcrops associated with open-woodland of jarrah, low open-forest of rock sheoak, and shrubland. The MPA contains the largest remaining woodland of uncut wandoo. Only parts have been logged and dieback is restricted to a few peripheral gullies and depressions. The area is under forest quarantine and is highly significant for conservation. Recreational use will increase in the future because the MPA is near the Brookton Highway. Facilities could be located in buffer areas along the Highway.

The MPA is within the Beraking Brook Catchment, a source of water supply. Public access is restricted by Catchment Zone regulations. The area may be affected by widening and/or re-alignment of the Armadale - Ravensthorpe Road and may also be affected by the Dale - Mawson Road. It has potential for bauxite and is within the Alwest Agreement Area but has been excluded from current long term bauxite mining plans.

Recommendation

- C33.1 The Forests Department, in consultation with the Public Works Department and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.



LANDS DEPARTMENT PUBLIC PLAN No.
342 A/40, 341 B/40
DCE Ref. No D3

Figure 26

C34 GUNAPIN MANAGEMENT PRIORITY AREA (MPA 2.3)

Gunapin MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 70 km east of Perth on the eastern boundary of the State Forest (Figure 27).

The MPA's purpose is the conservation of a range of swamp vegetation types and associated fauna, and of banksia woodlands on deep sandy soils.

Gunapin MPA has an outstanding range of soils, landforms and vegetation representative of the drier areas on the eastern fringes of State Forest in System 6. It has lateritic uplands and deep sandy deposits surrounding swampy valley floors and contains the largest area of swamps in State Forest. These swamps support numerous animals and an extremely wide range of flora. The swamp vegetation includes low closed-forest and open-woodland of paperbark, open-woodland of swamp banksia and swamp sheoak, and closed-shrubland of melaleuca and sedgelands.

Open-woodland of wandoo occurs along the margins of the swamps, and merges with a mixed woodland of wandoo and jarrah. Stands of rock sheoak, lichens, herblands and shrublands are associated with granite outcrops. The MPA has an outstanding range of vegetation types and species in undisturbed or mildly disturbed conditions and is of very high significance for conservation. There is no record of dieback in the area, although some of the vegetation has proved susceptible to the disease elsewhere. Sections have been logged. Recreation should be limited to the southern fringe and to walking.

The MPA is within the Darkin River Catchment and public access is restricted by Catchment Zone regulations. It has potential for bauxite, and is within the Pacminex and Alwest Agreement Areas. As yet, Pacminex has no plans for bauxite mining, and the area has been excluded from current long term mining plans.

Recommendation

- C34.1 The Forests Department, in consultation with the Public Works Department and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.

C35 SULLIVAN MANAGEMENT PRIORITY AREA (MPA 2.4)

The area comprises Sullivan MPA, managed by the Forests Department for the conservation of flora and fauna; Reserves C33188 and C34442, for the Conservation of Flora and Fauna, both vested in the W.A. Wildlife Authority; and vacant Crown land. It is situated about 10 km north of Boyagarring on the eastern boundary of State Forest No.13 (Figure 27).

The MPA's purpose is to conserve Dobaderry and Goonaping Swamps, which support a variety of swamp vegetation, and the associated fauna.

The core of the MPA and Dobaderry Swamp, in Reserve C34442, are situated on swampy valley floors. The most outstanding feature of the area is the lowland vegetation, which includes low open-woodland of slender banksia and Menzies' banksia, low open-forest of Moonah paperbark and swamp banksia, and sedgelands. There is a significant occurrence of swamp cypress and *Casuarina acuturba*. The lateritic uplands mostly support open-woodland of wandoo, with jarrah and marri on the more undulating areas, and powderbark on the dissected slopes.

The vacant Crown land, if added to Reserve C34442, would incorporate in the Reserve the immediate catchment of Dobaderry Swamp and also provide a link with Reserve C33188. The MPA is highly significant for conservation. Recreation should be limited to bushwalking. Stricter controls should be imposed on kangaroo shooters.

The northern section is within the Helena (Mundaring Weir) Reservoir Catchment and public access is restricted by Catchment Zone regulations. The southern section may be slightly affected by the Dale - Mawson Road. The area has some potential for bauxite and is within the Alwest Agreement Area but has been excluded from current long term bauxite mining plans.

Recommendations

- C35.1 Reserves C33188 and C34442 should be classified as Class A.
- C35.2 The vacant Crown land should be added to Reserve C34442.
- C35.3 The Forests Department, in consultation with the Public Works Department, the Department for Youth, Sport and Recreation, and the W.A. Wildlife Authority should prepare a management programme giving consideration to:
- (a) recreation activities;
 - (b) the imposition of strict controls on kangaroo shooters.

C36 EAGLE HILL MANAGEMENT PRIORITY AREA (MPA 8.1)

Eagle Hill MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 50 km south-east of Perth (Figure 28).

The MPA's purpose is to conserve the upland jarrah, the high quality yarri in the valleys, the monadnocks and the rare butter gum.

Eagle Hill MPA includes a wide range of landforms and vegetation. Open-forest of jarrah and marri dominates the lateritic uplands. Portions of this forest are uncut. The shallower soils and granite rocks support a lithic complex and stands of rare butter gum. The valley vegetation is open-forest of jarrah and marri with some yarri on the lower slopes. The main features of the MPA are the uncut and relatively undisturbed stands of yarri along the Canning River, the stands of butter gum, some extensive stands of black gin and a wide range of plant species associated with the Mt. Cooke to Mt. Randall chain of monadnocks.

There are localised areas of dieback, the MPA being under forest quarantine. It is highly significant for conservation. Recreation will increase, but vehicle access should be restricted to Gleneagle picnic spot.

Most of the area is within the Canning River Catchment, a source of water supply. Public access is restricted by Catchment Zone regulations. There are several sweet water springs along the Canning River side of Eagle Hill Ridge and they are extremely important to the MWB. The MWB may require access in the area for construction of the proposed South Canning Dam, even though the dam will not inundate any of the MPA. The area may be affected by future requirements for the Albany Highway. It is within the Alcoa Mining Lease and has considerable medium term significance for bauxite mining.

Recommendation

C36.1 The Forests Department, in consultation with the Metropolitan Water Board and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.

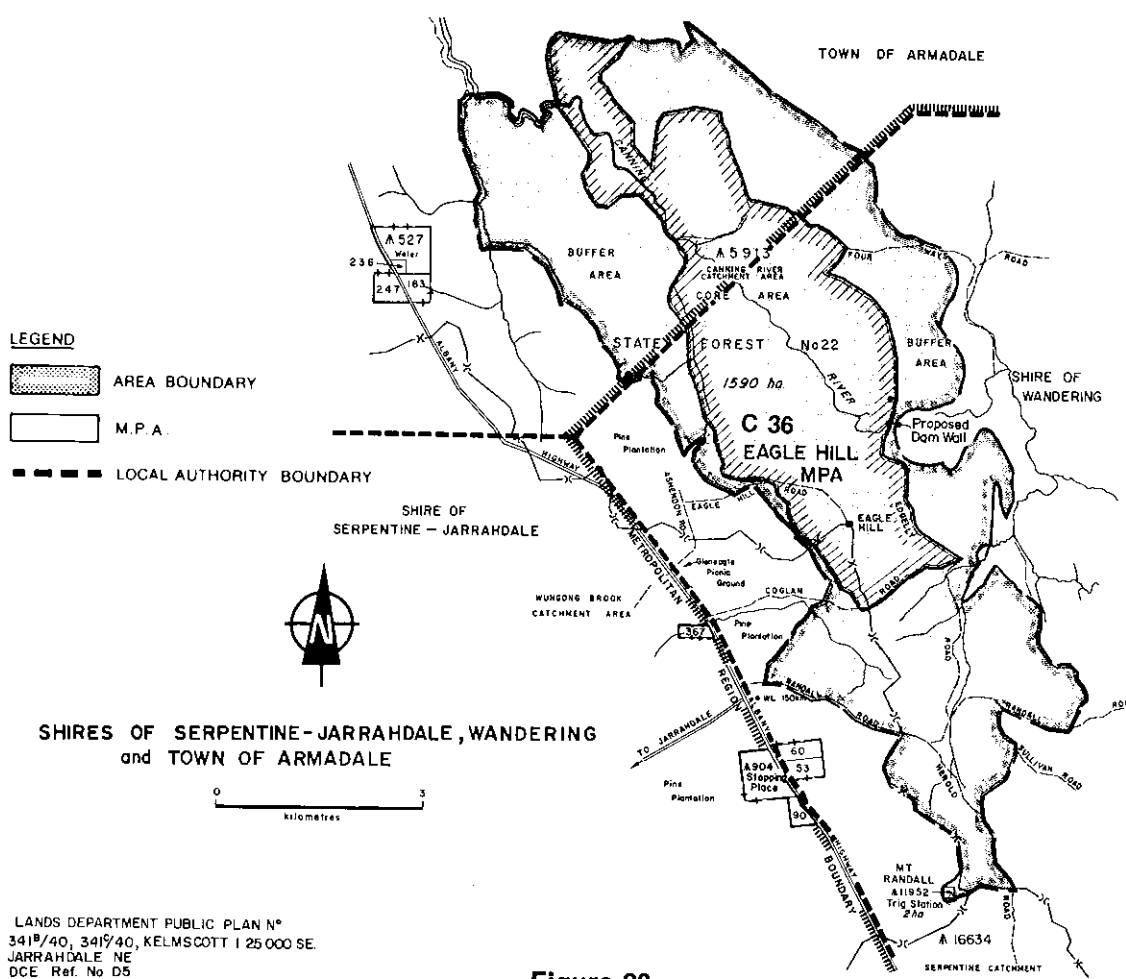


Figure 28

C37 BROOKTON AND ALBANY HIGHWAYS

The Brookton and Albany Highways pass through an extensive area of State Forest between the Darling Scarp and the agricultural areas to the east (Figure 29).

For many travellers the Highways provide the best opportunity to see the natural vegetation of the Darling Range and especially the forest of jarrah, marri and wandoo in extensive areas. On the Great Northern and Great Eastern Highways and the Toodyay Road the forests are already decimated by clearing, and the highways further south pass through forests of different plant associations.

Although there has been some replacement of natural vegetation with introduced eucalyptus and pine, the forests of the Brookton and Albany Highways remain relatively intact over long distances. There are many wildflowers to be seen in the understoreys, their composition changing with different soil types and with rainfall. It is important that the natural vegetation be retained both for its appeal to visitors and for scientific study. Some of the plants are rare.

The several sandy areas traversed are of special interest in supporting outlying populations of species found otherwise on the Coastal Plain, for example, Menzies' banksia, summer starflower and blueboy.

Recommendations

C37.1 The Forests Department should designate a strip 1 km wide on each side of the Brookton and Albany Highways where they pass through State Forest.

C37.2 These strips should be managed primarily for the conservation and display of their flora and for scientific study.

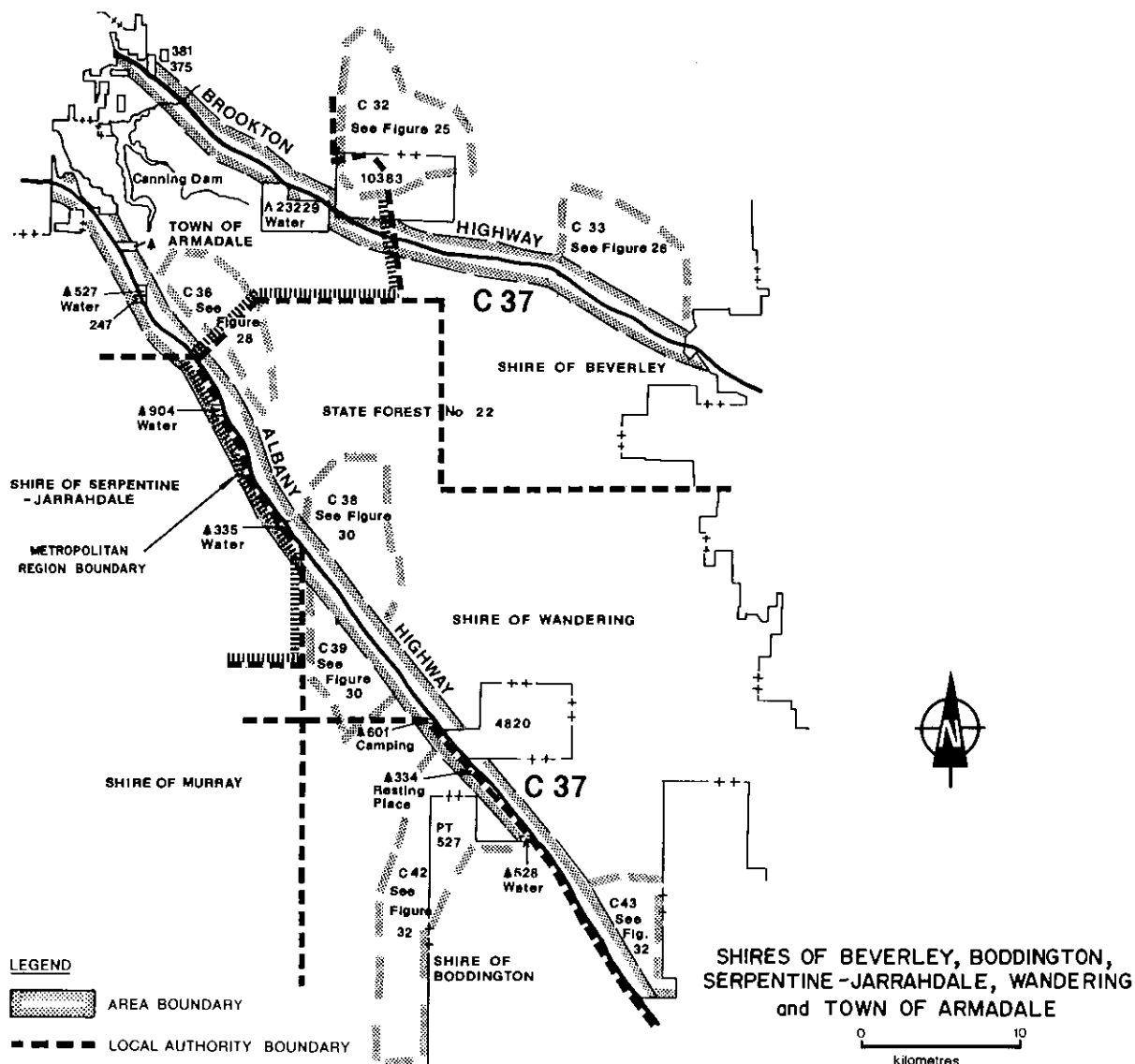


Figure 29

C38 COOKE MANAGEMENT PRIORITY AREA (MPA 8.2)

The area comprises Cooke MPA, managed by the Forests Department for the conservation of flora and fauna, and part of Reserve C335, for Watering and Stopping Place for Teams, under the control of the Shire of Wandering. It is situated about 70 km south-east of Perth (Figure 30).

The MPA's purpose is to conserve the upland virgin jarrah and the monadnocks with outstanding stands of butter gum.

The MPA contains part of a chain of monadnocks, including Mt. Cooke. Other landforms are lateritic uplands, poorly drained valleys and swampy valley floors. There is a wide range of vegetation. The main type is open-forest of jarrah mixed with marri, which covers most of the slopes and uplands and some of the valleys. The valleys also carry open-woodland of wandoo and their floors are dominated by melaleuca and other typical swamp plants. There are localised patches of low open-woodland of the rare butter gum, with lichens, herbfields and thickets of grevillea and hakea, on granite outcrops. Gravelly soils on the slopes carry a variety of species including hairy jugflower, zamia and honeybush.

The peripheries of Mt. Cooke, parts of which have been selectively cut, have been badly affected by dieback, as have gullies and lower valley slopes. The area, which is under forest quarantine, is highly significant for conservation. Bushwalking and rock climbing are popular, with magnificent views from Mt. Cooke. Access by vehicles and provision of picnic areas should be restricted to the outer perimeter of the MPA.

The area is within the Canning River Catchment, a source of water supply. Springs occur along the western boundary. Public access is restricted by Catchment Zone regulations. There are SEC lines and more are proposed. The area may be affected by future requirements for the Albany Highway. The area is within the Alcoa Mining Lease, and has long term significance for bauxite mining.

Recommendations

- C38.1 Subject to the agreement of the controlling body, the eastern section of Reserve C335 should be excised, vested in the Conservator of Forests and managed as if part of Cooke Management Priority Area.
- C38.2 The Forests Department, in consultation with the Metropolitan Water Board and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.

C39 WINDSOR MANAGEMENT PRIORITY AREA (MPA 8.6)

Windsor MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 70 km south-east of Perth (Figure 30).

The MPA's purpose is to conserve the swamp vegetation and the range of vegetation types associated with the granite outcrops and gullies.

The dominant landforms of the MPA are the granitic outcrops, associated with the Mt. Cooke to Mt. Randall chain of monadnocks, and lateritic uplands. These support a variety of vegetation including open-forest of jarrah, open-woodland of wandoo and a lithic complex on the granite rocks.

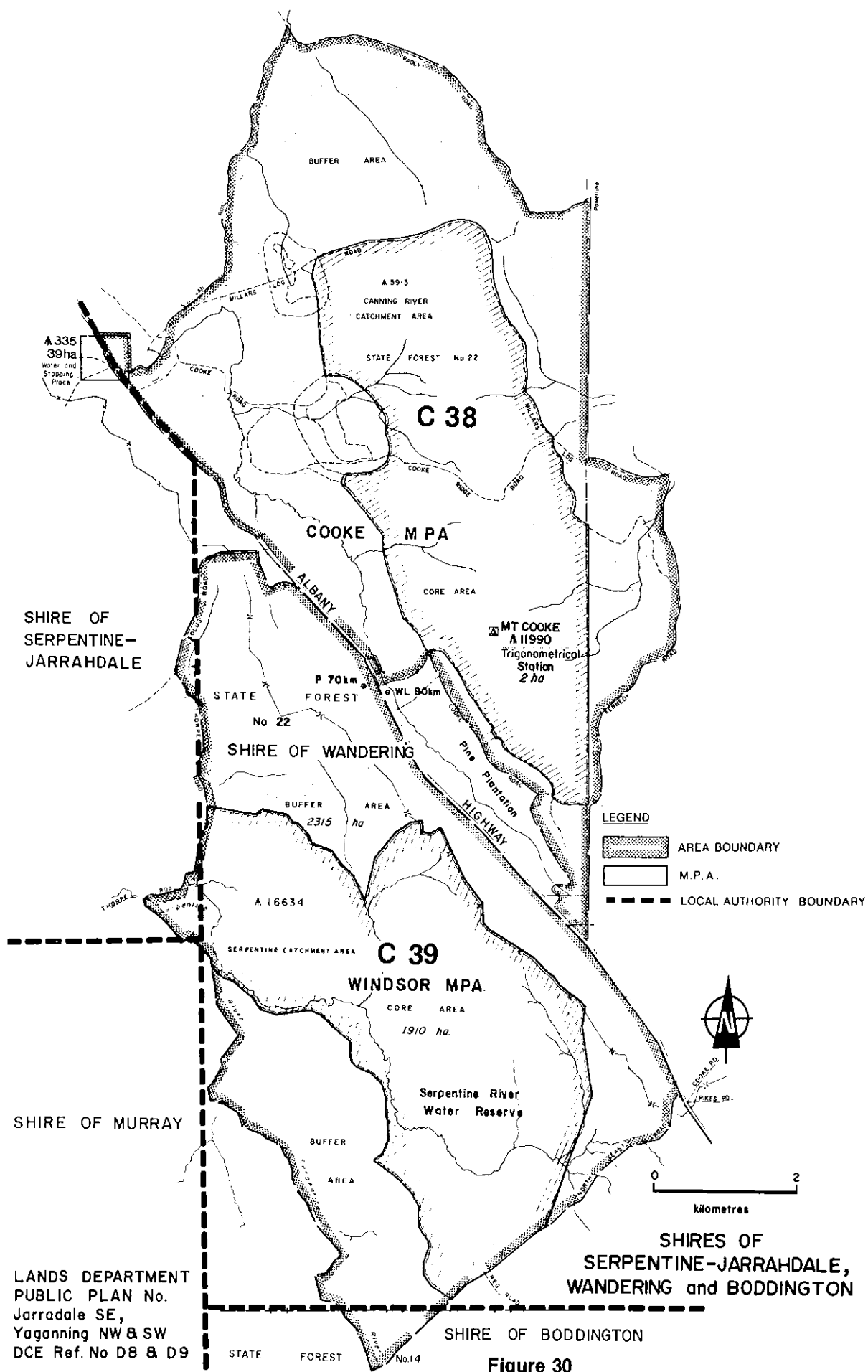
The broad, gently sloping valleys and the associated swampy valley floors support open-woodland of wandoo, mixed stands of jarrah, marri and yarri, and species such as melaleuca which are characteristic of swampy areas. The latter are important because they provide shelter for various native animals. Several peripheral valleys have been affected by dieback, and the area is under forest quarantine. It is highly significant for conservation, despite having been logged prior to 1960.

Recreational use may increase in the future because the area is surrounded by three main roads, including the Albany Highway. Recreation should not be encouraged in the Serpentine River Catchment. In the Canning River Catchment, vehicle access should be limited to the Albany Highway.

The area is within the Serpentine River and the Canning River Water Reserves, sources of water supply. Numerous springs occur along the ridge dividing the two catchments. Public access is restricted by Catchment Zone regulations. There are SEC lines and more are proposed. The area may be affected by future requirements for the Albany Highway. The area is within the Alcoa Mining Lease and has long term significance for bauxite mining.

Recommendation

- C39.1 The Forests Department, in consultation with the Metropolitan Water Board and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.



C40 BOYAGARRING MANAGEMENT PRIORITY AREA (MPA 8.5)

The area comprises Boyagarring MPA, managed by the Forests Department for the conservation of flora and fauna. It consists of vacant Crown land and is located about 80 km south-east of Perth on the eastern fringes of System 6 (Figure 31).

The MPA's purpose is to conserve the extensive woodlands of wandoo and powderbark and associated fauna.

Boyagarring MPA contains a large range of soils, landforms and vegetation. It consists mainly of undulating uplands with dissected lateritic slopes and rocky slopes. These uplands support extensive woodlands of wandoo and powderbark, a significant occurrence. Low woodland of rock sheoak occurs on the periphery of granitic outcrops. No dieback has been recorded in the MPA, which has been lightly cut for timber. There has been some invasion of exotic plant species from the privately owned agricultural land which surrounds the MPA.

There are SEC lines and more are proposed. The area is within the Alwest Agreement Area, but has been excluded from current long term bauxite mining plans.

Recommendation

- C40.1 The vacant Crown land should be declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and the Reserve should be vested in the Conservator of Forests and managed as Boyagarring Management Priority Area.

C41 LUPTON MANAGEMENT PRIORITY AREA (MPA 8.8)

The area comprises Lupton MPA, managed by the Forests Department for the conservation of flora and fauna; the southern section of Reserve C26666 for Timber, not vested; and vacant Crown land. It is situated within System 4, about 100 km south-east of Perth, adjacent to System 6 (Figure 31).

The MPA's purpose is to conserve the eastern extension of the State Forest with the extensive stands of wandoo and powderbark.

The lateritic uplands support extensive open-woodland of wandoo, with powderbark on the ridges and jarrah on the more undulating areas. The valleys support woodland of wandoo with stands of jam, rock sheoak and manna wattle. No dieback has been recorded. This is due to drier conditions and infrequent use by people.

The section of Reserve C26666 and the vacant Crown land carry valuable water supplies and they should be associated with the MPA for management reasons.

The area is within the Alwest Agreement Area but has been excluded from current long term bauxite mining plans. Deposition of rubbish on the eastern section of the MPA should be stopped.

Recommendations

- C41.1 Reserve C26666 should be vested in the Conservator of Forests and managed as if part of Lupton Management Priority Area.
- C41.2 The vacant Crown land should be declared a Class C Reserve for the purpose of Conservation of Flora and Fauna and the Reserve should be vested in the Conservator of Forests.

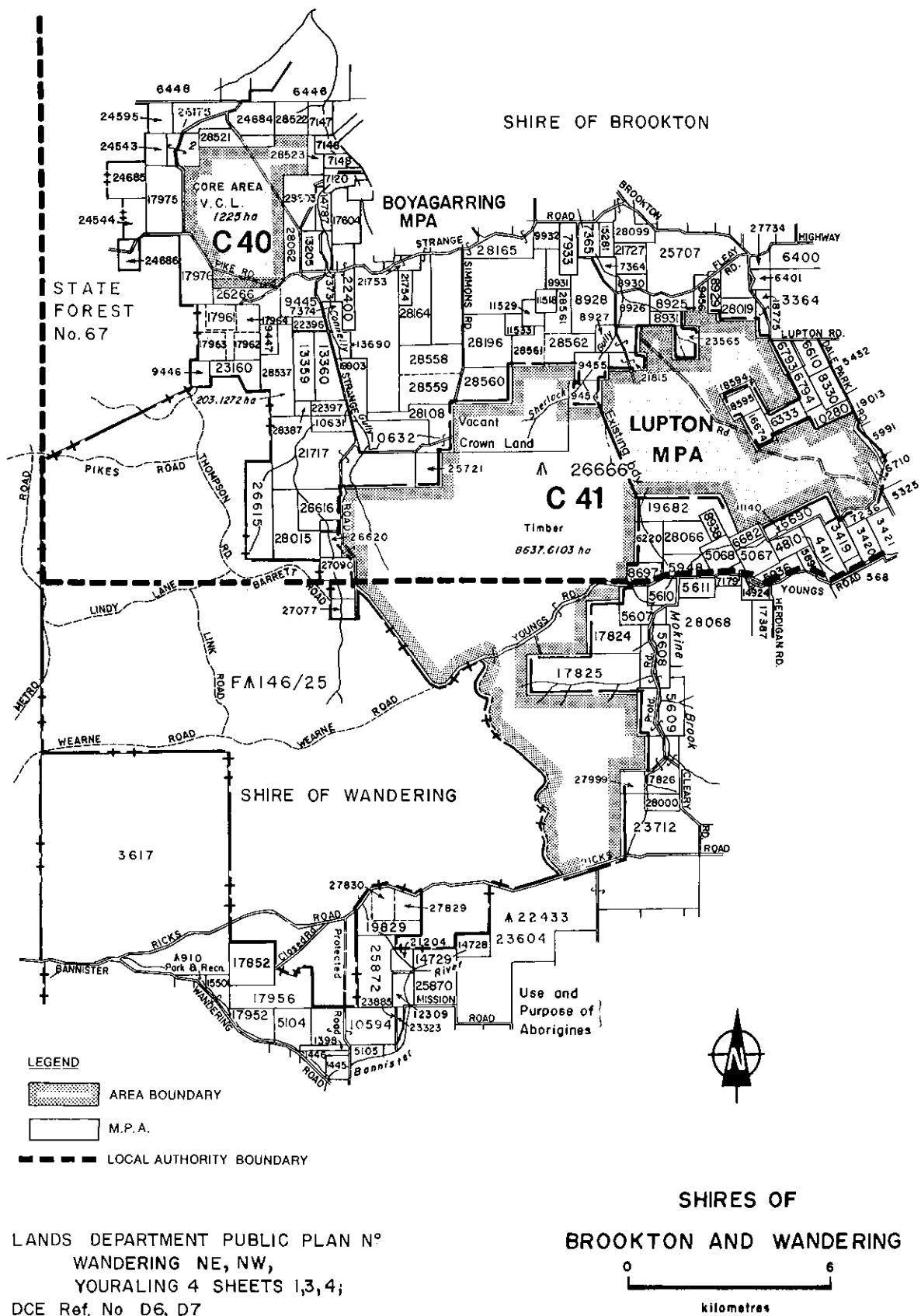


Figure 31

C42 DUNCAN MANAGEMENT PRIORITY AREA (MPA 3.5)

The area comprises Duncan MPA, managed by the Forests Department for the conservation of flora and fauna; Reserve C528, for Water, not vested; Reserve C334, for Watering and Stopping Place for Teams, and part of Reserve C601, for Stopping Place for Teams, both under the control of the Shire of Wandering; Location 527, the northern part of which is held by the PWD, the middle part by the MWB and the southern part being vacant Crown land; and part of Location 526, held by the PWD. It is situated about 100 km south-east of Perth (Figure 32).

The MPA's purpose is to conserve the virgin wandoo in the gullies, dieback-free areas within the jarrah forest, the extensive stand of Drummond's gum, and the vegetation associated with the granitic outcrops.

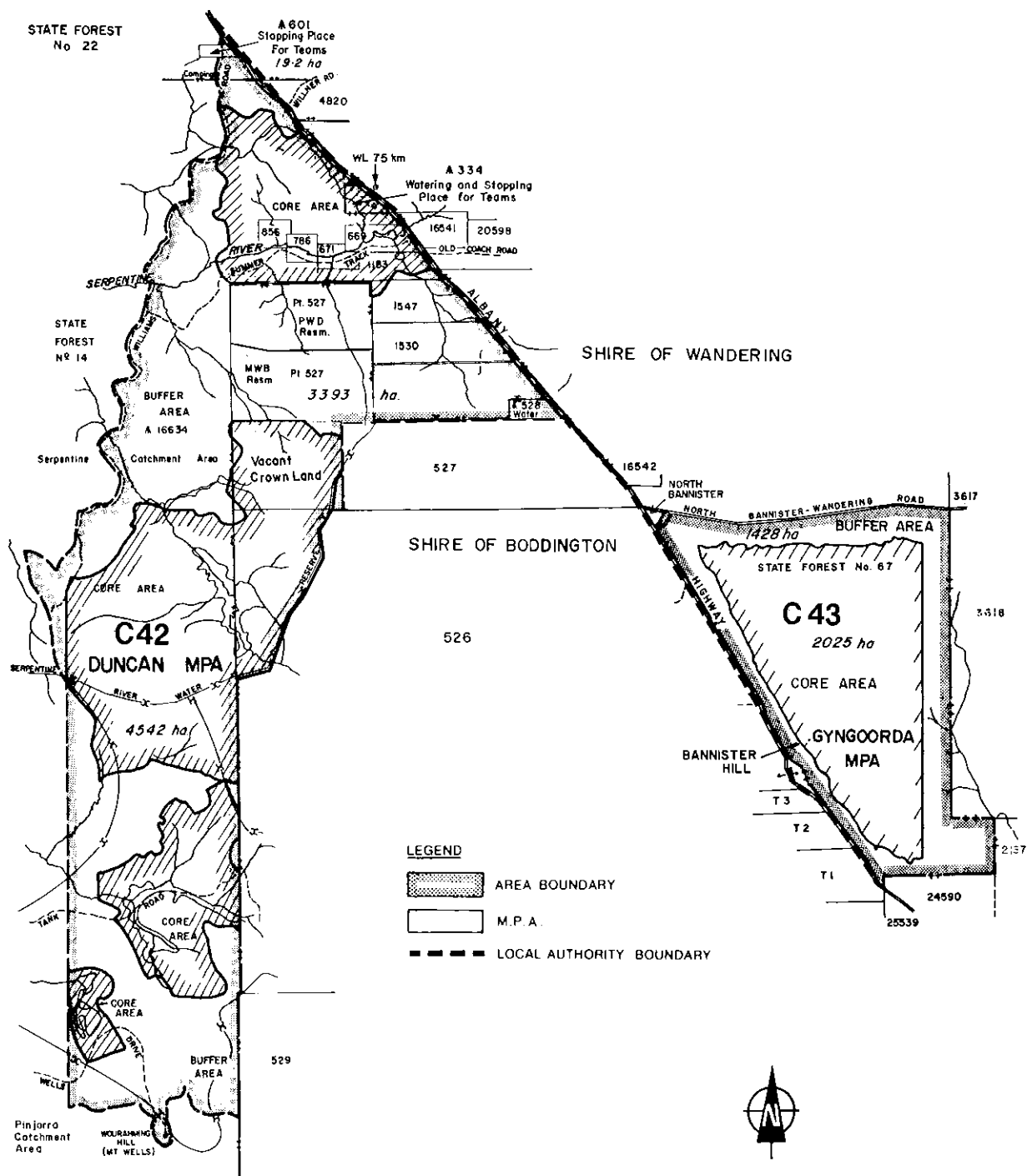
There is a wide range of vegetation in the area. Open-forest of jarrah and some marri, with a second storey of sheoak and banksia and a shrub storey which includes prickly bitter-pea, occurs on the upper slopes. The valleys carry open-forest of jarrah and marri, with a small admixture of yarri, and shrubs including white myrtle. Elsewhere this vegetation type has been severely depleted by dieback, but in Duncan MPA there is a large section which is unaffected, and it is extremely important to preserve it. Along the lower slopes of the valleys and gullies there is open-woodland of wandoo, which in parts is uncut. The area has a variety of other vegetation and plant communities including rock sheoak, an extensive stand of the rare Drummond's gum to the north of Mt. Wells, and swampland of paperbark.

The area, which was logged until 1960 and recently following dieback, is now under forest quarantine. Recreation pressure is low and activities should be zoned to protect the virgin wandoo and the dieback-free areas.

The area is within the Serpentine River and Dandalup River Water Reserves, potential sources of water supply. It may be affected by the proposed South Canning Dam. Public access would be restricted by Catchment Zone regulations. There are SEC lines in the area and more are proposed. The area may be affected by future requirements for the Albany Highway. The area is within the Alwest Agreement Area and the Alcoa Mining Lease and has considerable long term potential for bauxite mining. It has been excluded from Alwest's current long term bauxite mining plans.

Recommendations

- C42.1 Subject to agreement of the controlling body, Reserve C334 should be vested in the Conservator of Forests and managed as if part of Duncan Management Priority Area.
- C42.2 Subject to the agreement of the controlling body, the eastern section of Reserve C601 should be excised, vested in the Conservator of Forests and managed as if part of Duncan Management Priority Area.
- C42.3 Reserve C528 should be vested in the Conservator of Forests and managed as if part of Duncan Management Priority Area.
- C42.4 The vacant Crown land should be declared a Class C Reserve for the purpose of Conservation of Flora and Fauna and the Reserve should be vested in the Conservator of Forests.
- C42.5 The section of Locations 526 and 527 held by the Public Works Department and the section of Location 527 held by the Metropolitan Water Board should be managed as if part of Duncan Management Priority Area.
- C42.6 The Forests Department, in consultation with the Metropolitan Water Board, should prepare a management programme.
- C42.7 The Forests Department should ask Bunning Bros. Pty. Ltd. to provide a protective buffer along the eastern boundary.



SHIRES OF BODDINGTON AND WANDERING

LANDS DEPARTMENT PUBLIC PLAN No:
 379A/40, 379B/40, 379C/40, 379D/40
 Wandering NW, NE
 DCE Ref. No D16, D17

Figure 32

C43 GYNGOORDA MANAGEMENT PRIORITY AREA (MPA 3.4)

Gyngoorda MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 100 km south-east of Perth (Figure 32).

The MPA's purpose is to preserve the vegetation types, the granitic outcropping on Bannister Hill and the scenic value of Bannister Hill.

The MPA has a variety of soils and landforms, and vegetation which is characteristic of the lower rainfall areas. On the lateritic uplands, which predominate, there is open-forest of jarrah and some marri, with an understorey of sheoak and banksia. The upper and middle slopes carry open-woodland of wandoo with occasional marri and jarrah. Several ridges carry powderbark. The accessible forest has a network of tracks because it was cut over prior to 1970. There is a picnic spot beside the Albany Highway, and recreation will increase. The scenic views from Bannister Hill are outstanding. There is a risk of spread of dieback, therefore activities should be controlled.

The area is within the Murray River Catchment, a potential source of water supply. It may be affected by future realignment of the Albany Highway. It is within the Alwest Agreement Area, but has been excluded from current long term bauxite mining plans. Subdivision of land nearby is increasing, but should not be allowed to affect the area.

Recommendation

- C43.1 The Forests Department, in consultation with the Metropolitan Water Board and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.

C44 WANDERING MANAGEMENT PRIORITY AREA (MPA 3.10)

Wandering MPA, managed by the Forests Department for the conservation of flora and fauna, consists of part of Timber Reserves 145/25 and 160/25; and Reserve C18534, for Timber, not vested. It is situated within System 4, over 100 km south-east of Perth, adjacent to System 6 (Figure 33).

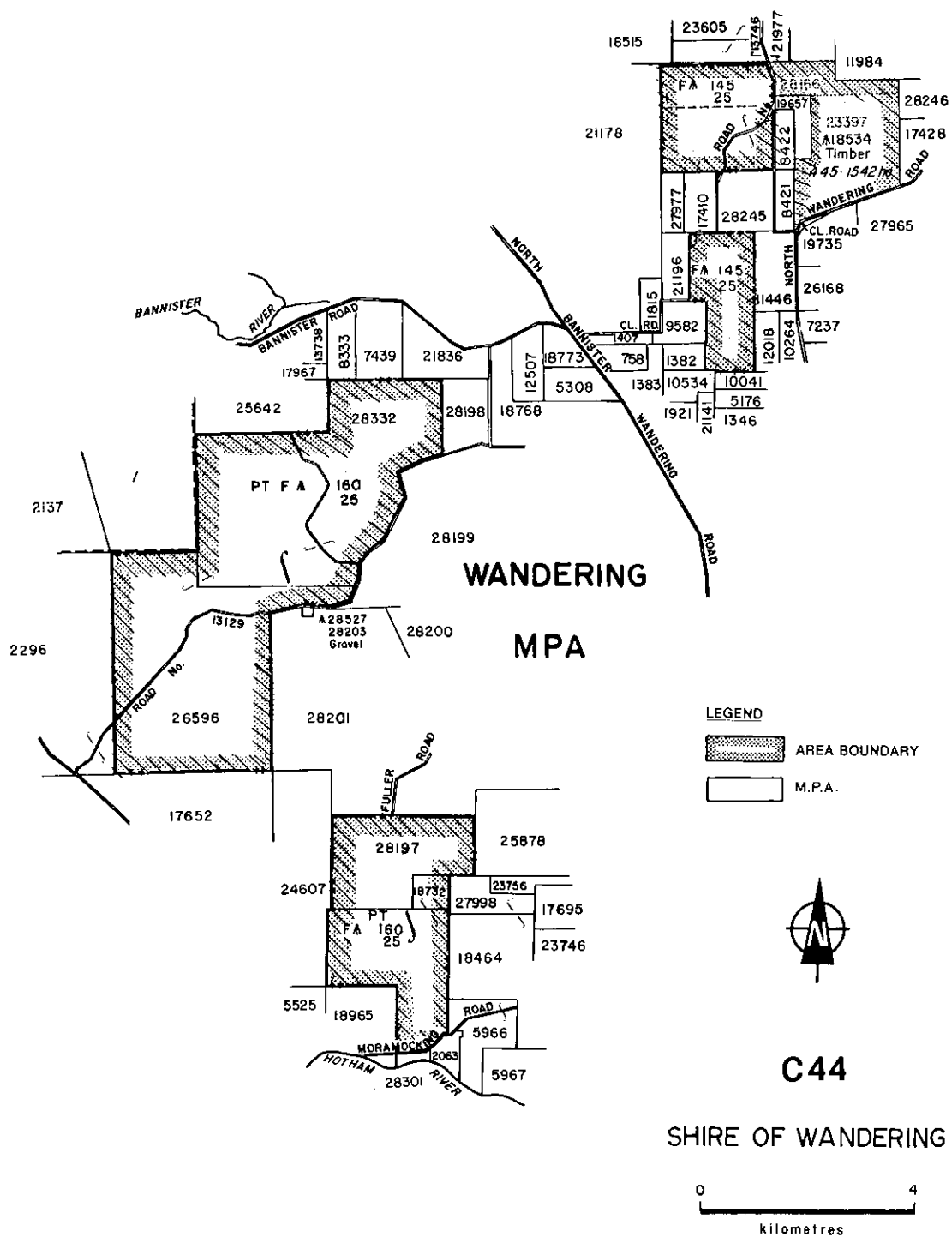
The MPA's purpose is to conserve a range of vegetation including stands of rock sheoak, jam and manna wattle (*Acacia microbotrya*).

The lateritic uplands support a variety of vegetation including open-woodland of wandoo and open-forest of jarrah and marri. Powderbark occurs on the ridges. The granitic outcrops support low woodland of rock sheoak and jam, and herblands. Open-woodland of wandoo and yarri occurs in the valleys. The MPA contains one of the easternmost occurrences of yarri. Some of the vegetation represented has been largely cleared for agriculture elsewhere. Some logging has occurred in the past but there are very few tracks and no known dieback. The MPA is not used much for recreation.

The area is within the Murray River Catchment, a potential source of water supply. It may be affected by future realignment of the Albany Highway. It is within the Alwest Agreement Area but has been excluded from current long term bauxite mining plans.

Recommendation

- C44.1 Reserve C18534 should be vested in the Conservator of Forests and managed for the conservation of flora and fauna as part of Wandering Management Priority Area.



LANDS DEPARTMENT PUBLIC PLAN No.
Wandering NE & SE, Dwarda NW & NE
DCE Ref. No D18

Figure 33

C45 ROTTNEST ISLAND

The area comprises Reserve A16713, for Public Recreation, vested in the Rottnest Island Board, and the adjacent waters, from the north-east side of Eagle Bay to, and including, Fish Hook Bay and from Phillip Rock to Parker Point. It is situated about 20 km west of Fremantle (Figure 34).

The greater part of Rottnest Island is covered by undulating sand hills. A chain of lakes dominates the north-eastern sector, and covers about a tenth of the island. Many small swamps and soaks, mainly located in interdunal depressions, are scattered around the eastern half of the island. The serrated coastline consists of a succession of exposed limestone headlands and sandy bays, with rock platforms extending seaward in many points. Smaller islands and rocky islets dot the surrounding waters.

The vegetation has changed dramatically since human occupation. Originally the island was covered by an almost impenetrable low closed-forest of Rottnest cypress (the dominant species), Rottnest tea-tree and *Pittosporum*. Fire gradually eliminated the first two types in favour of *Acacia rostellifera*, which was dominant in the early 1900s. Since then grazing by quokkas has resulted in a closed-heath of *Stipa variabilis* and *Acanthocarpus preissii* becoming by far the most widespread plant community on the island. This closed-heath, which now covers most of the island west of the lakes, is often associated with a variety of other species.

Confined to the eastern end of the island there are patches of closed-scrub and low closed-forest of Rottnest tea-tree, and, on limestone ridges near the major lakes, there is closed-heath of cockies' tongue, in places mixed with other plants and Rottnest cypress. On the stable dunes around Narro neck and elsewhere closed-heath occurs, the principal species being *Westringia rigida*, *Olearia axillaris*, *Rhagodia* spp., *Scaevola crassifolia*, *Threlkeldia diffusa* and *Senecio lautus*. In other areas with limestone at or near the surface, such as at Parker Point and in places east of Narro neck, closed-heath of *Acacia truncata* occurs. Various species associate with the acacia depending on local conditions.

There are sand blowouts, which support little or no vegetation, in twenty-two locations on the island. Although blowouts occur naturally, their initiation and spread is helped by fire and by disturbance of the soil.

Rottnest Island has a great variety and abundance of birds, related to the multiplicity of habitats: steppe, heath, scrub, samphire, salt lakes, brackish swamps, fresh water soaks, sandy beaches, rocky coasts, offshore islands and rocky islets. The forest and woodland are visited in winter by the fan-tailed cuckoo, which is common and breeds on the island; by contrast it is only a passage migrant around Perth. The scrub of *Acacia rostellifera* is the habitat of the golden whistler and the red-capped robin. The spotted scrub-wren inhabits the dunes, and is most numerous along the south coast from Narro neck to May Cove. The commonest species in the dunes is the singing honeyeater. The open *Stipa-Acanthocarpus* country supports the pipit, white-fronted chat, raven and kestrel.

The salt lakes near the eastern end of the island provide water-bird habitats that are not duplicated on the Coastal Plain. Water-birds include the banded stilt, mountain duck, fairy tern, red-necked stint, curlew sandpiper, turnstone, sanderling, large dotterel, sharp-tailed sandpiper, hooded dotterel, greenshank and golden plover. Rottnest Island's marine bird fauna owes its great diversity largely to the surrounding islands and rocky islets. The chief islands are Dyers Island, Green Island and Parakeet Island. A breeding colony of rock parrot exists on Dyers Island. This species was once plentiful on Rottnest Island but is now extremely rare. Other breeding colonies, on one or more of the islands, include the pied-cormorant, wedge-tailed shearwater, caspian tern, bridled tern, crested tern, little shearwater, mountain duck and osprey.

Rottnest Island supports two native mammals, the quokka and the Australian sea-lion. Two of Rottnest's reptiles, the bobtail lizard and the dugite snake are of interest in being morphologically distinct from the mainland specimens. In addition, the lined skink is a rare reptile found only on Rottnest and Garden Island and in a few southern suburbs of Perth; its future survival on the mainland is uncertain.

The waters of Rottnest Island contain a rich and diverse marine flora and fauna which should be retained. Of particular interest is the inter-tidal reef-flat fauna at West End, including numbers of tropical species not found so far south elsewhere, the sub-littoral zone at the eastern end of the island near Natural Jetty, and the sub-littoral coral reef at Parker Point. The waters around Rottnest Island are important for research and are used for educational purposes by the University of Western Australia. Seal Island, off the east side, is a nesting place for Australian sea-lions.

Large and increasing numbers of people visit Rottnest Island. In 1970, 93 140 visits were recorded, and in 1977, 257 535 visits, the number of visitors increasing by 178 per cent between those years. The island can be expected to draw in an ever increasing number of visitors owing to the coastal expansion of Perth along the South-West and North-West Corridors and the increasing size of the

metropolitan population. Pressures for more transport and accommodation are likely to continue rising on the island. The number of visitors that can be accommodated at any one time is being increased by the construction of the new settlement at Geordie Bay and Longreach Bay.

Because of the considerable importance of Rottnest Island and adjacent waters to the community of Western Australia as a recreation, conservation, historic and scientific area, there is a need for a management plan to be established. Such a plan should define areas for which priority is given to the conservation of flora and fauna, and detail the management regime to be introduced for those specific areas.

There are shortcomings in the Act under which the Rottnest Island Board is constituted. There is no stipulation that conservation interests should be represented on the Board, and there is no requirement for a management plan for the island.

Recommendations

- C45.1 The Harbour and Light Department should give recognition to the waters off Rottnest Island, from the north-east side of Eagle Bay to, and including, Fish Hook Bay and from Phillip Rock to Parker Point, as special areas for scientific research and education, and give consideration to setting them apart as Aquatic Reserves for Scientific Research and Education.
- C45.2 The membership of the Rottnest Island Board should include a representative of the Department of Tourism as well as representatives of the various scientific disciplines associated with the study and preservation of the island's flora, fauna and physiography.
- C45.3 The Rottnest Island Board should review its management programme for Rottnest Island, taking into account the need to:
 - (a) preserve the island's unique character and landscape;
 - (b) restrict the collection, except by line fishing, of shells and other marine life from the waters referred to in Recommendation C45.1 above;
 - (c) concentrate tourist accommodation so as not to impinge on the remaining undeveloped areas;
 - (d) limit accommodation facilities to a number which is compatible with the need to preserve the island's character, flora, fauna and natural features;
 - (e) obtain technical advice from the Department of Conservation and Environment on the problems of coastal management.

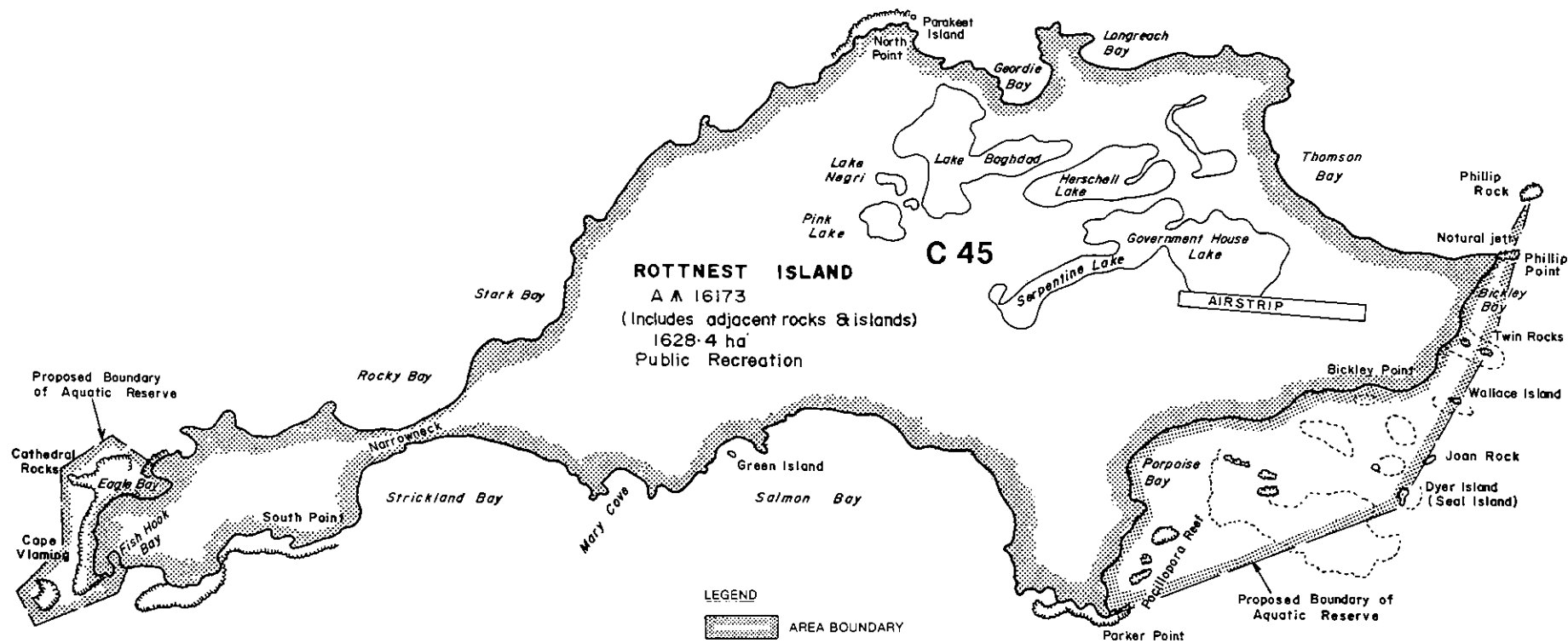


Figure 34

LANDS DEPARTMENT PUBLIC PLAN No
6480 D3
DCE Ref. No G1, G6

C46 CARNAC ISLAND

The area comprises Reserve A26646, for Recreation and Conservation of Fauna, vested in the W.A. Wildlife Authority, and the surrounding waters. It is situated about 3 km north of Garden Island (Figure 35).

Thirty-three species of birds have been recorded from the island and at least eight species breed there. The island is noteworthy as the only area of overlap between the breeding ranges of the little penguin (northern limit) and the wedge-tailed shearwater (southern limit).

Carnac Island contains the greatest concentration of tiger snakes in Western Australia, and is internationally important as a source of snake venom for scientific research. Australian sea-lions commonly rest on the island.

The limestone reefs around the island vary considerably in their exposure to waves, and hence in the flora and fauna represented. The eastern side of the island has a small, shallow bay with seagrass meadows. The western side has extensive exposed intertidal reef-flats. The southern and northern ends have small sheltered rocky bays and narrow fringing reef-flats. Offshore there are several deeply cavernous sub-littoral reefs. These reefs and shallows support a rich and diverse marine flora and fauna, including two species of echinoderms which are rare or unknown in reefs around Fremantle and other offshore islands. Study of the reefs' intertidal ecology is important in understanding the distribution of littoral fauna on the mainland reefs.

Carnac island has great value as a place to which people can make day-visits to study marine life. The area may be affected by industrial development projects in the future.

Recommendation

- C46.1 Subject to the agreement of the controlling body, the water and land which surrounds Reserve A26646, as shown on Figure 35, should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the W.A. Wildlife Authority.

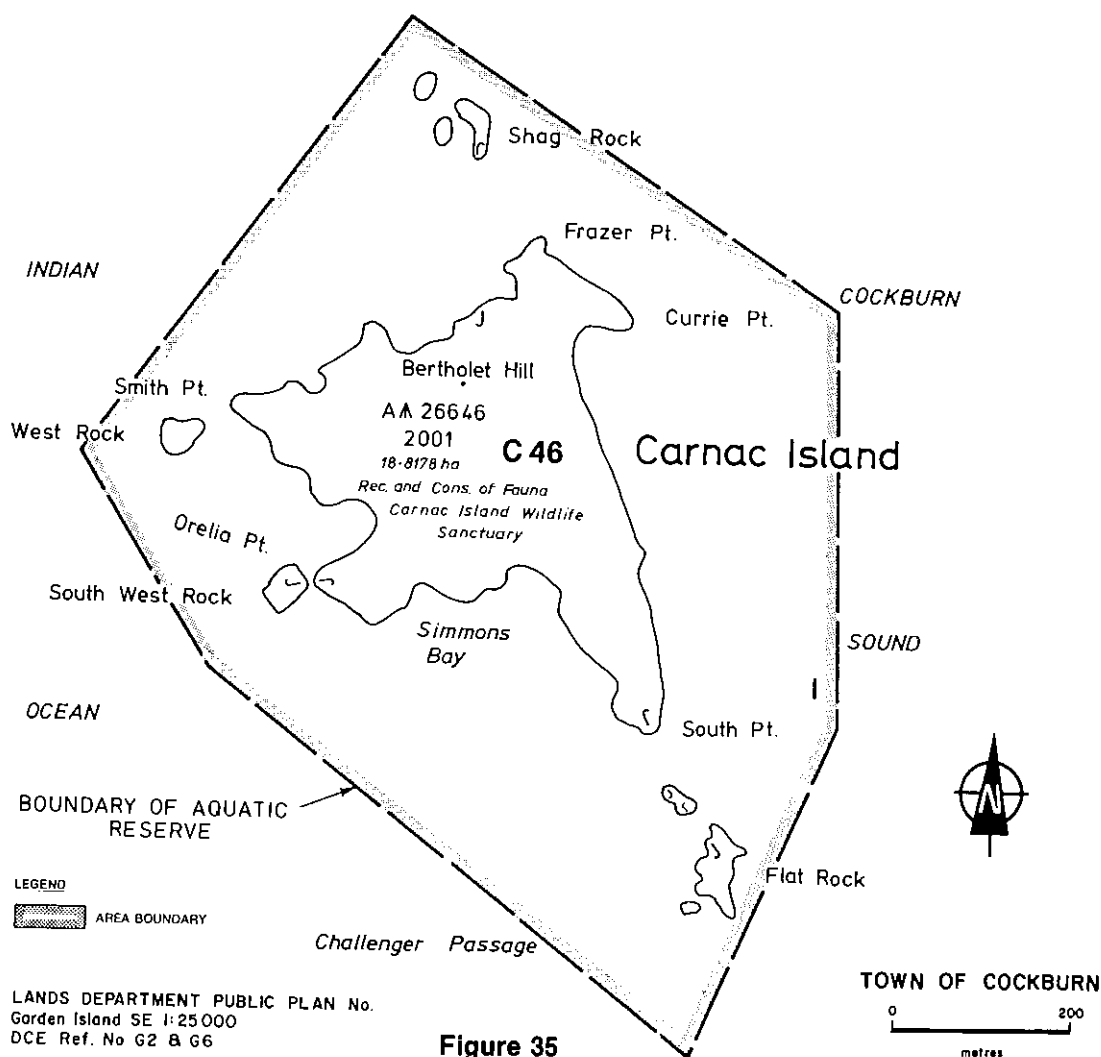


Figure 35

C47 RESERVE C14629, NORTH DANDALUP

Reserve C14629, for Timber for Settlers, not vested, is situated on the Darling Scarp about 5 km north-east of North Dandalup (Figure 36).

The Darling Scarp vegetation, which is inadequately represented elsewhere, is the significant feature of the Reserve. The vegetation ranges from open-forest of jarrah and marri on lateritic soils, to low open-woodland of wandoo with admixtures of marri and the rare butter gum, to heath and herbland on the granite outcrops.

Recommendation

C47.1 The purpose of Reserve C14629 should be amended to Conservation of Flora and Fauna, and Recreation, and the Reserve should be vested in the Conservator of Forests.

C48 RESERVE C19413, NORTH DANDALUP

Reserve C19413, for Timber, not vested, is situated on the Darling Scarp about 3 km north-east of North Dandalup (Figure 36).

The Darling Scarp vegetation, which is inadequately represented elsewhere, is the significant feature of the Reserve. The vegetation ranges from open-forest of jarrah and marri on lateritic soils, to low open-woodland of wandoo with admixtures of marri and the rare butter gum, to heath and herbland of the granite outcrops. The Reserve contains substantial stands of butter gum.

Recommendation

C48.1 The purpose of Reserve C19413 should be amended to Conservation of Flora and Fauna, and Recreation, and the Reserve should be vested in the Conservator of Forests.

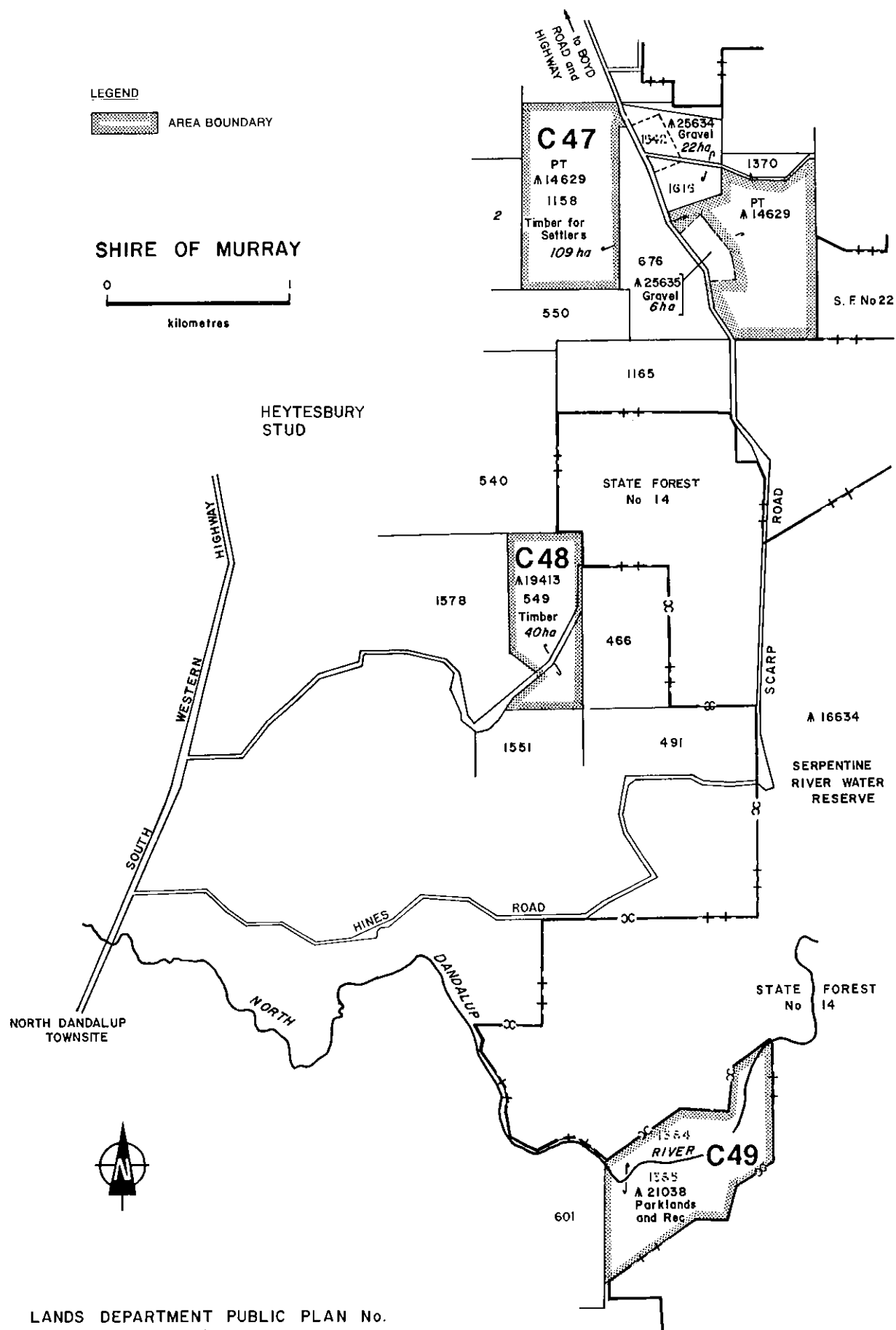
C49 RESERVE C21038, NORTH DANDALUP

Reserve C21038, for Parklands and Recreation, not vested, is situated about 3 km east of North Dandalup (Figure 36).

The Darling Scarp vegetation, which is inadequately represented elsewhere, is the significant feature of the Reserve. The vegetation ranges from open-forest of jarrah and marri on lateritic soils, to low open-woodland of wandoo with admixtures of marri and the rare butter gum, to heath and herbland on the granite outcrops. The Reserve contains substantial stands of butter gum.

Recommendation

C49.1 The purpose of Reserve C21038 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested jointly in the Ministers for Fisheries and Wildlife, and Water Resources.



LANDS DEPARTMENT PUBLIC PLAN No.
Peel 10 000 BG 33/5.2 & 5.1
DCE Ref. No D15

Figure 36

C50 PEEL INLET

The area comprises Reserves B4990, and B24036, for Conservation of Flora and Fauna and C28087, for Conservation of Fauna, all vested in the W.A. Wildlife Authority; C8185, for Recreation, vested in the Shire of Mandurah, C2707, for Conservation of Flora and Fauna, and C7502, for Water, both not vested; portions of the Peel Inlet surrounding Reserve C8185 to the north of Reserve C28087 and west of Reserve B4990 and in the entrance to the Inlet; and Coolup A.A. lots 223, 259, 276 to 278, Murray Locations 55, 295, 452, 842 and 1262, and part of Cockburn Sound Locations 5 and 16, privately owned freehold land. It is situated due south of Mandurah (Figure 37).

The Peel-Harvey Estuary is probably the most important estuary in the South-West as a conservation area for water-birds. It has by far the largest pelican population in the region. Waterfowl, such as grey teal and black swan, are resident and migratory wading birds are also abundant. Unusual species recorded include the glossy ibis, yellow-billed spoonbill and royal spoonbill. The most important areas of water-bird habitat in Peel Inlet are the extensive shallows around the southern and eastern shores.

The tidal flats and shallows around Channel and Creery Islands and the adjacent shores are also important as they are used in summer by many thousands of trans-equatorial migratory waders. Small parties of little egrets (*Egretta garzetta*) use the area throughout the year, a rare occurrence in the South-West.

The vegetation complexes in the area are of restricted occurrence elsewhere. The shores support samphire flats and marshes and are important for eastern curlews and whimbrels, being one of the few places in the South-West where these birds can always be seen.

The Peel-Harvey Estuary provides an important nursery area for commercial species of fish such as sea mullet, cobbler and King George whiting.

At present the Estuarine Marine Advisory Committee is studying the Peel-Harvey Estuarine system to gain an understanding of the working of the ecosystem and causes of algal growth. The data collected will assist in developing a management programme. The value of the Inlet in providing an area for human recreation and relaxation is well recognised.

Reserve C8185 includes Channel and Creery Islands and the outlet channel from the Inlet to the sea. Dredging of the channel might be beneficial. There are PWD drains in the south-east of Peel Inlet. The area will be affected by the bridge for the Mandurah by-pass road, which is due to be built north of Channel and Creery Islands.

Housing developments, a proposed canal development, and some recreation activities may diminish the conservation value of the area. The Mandurah and Murray Shire Councils should be consulted about this matter.

Recommendations

- C50.1 Subject to the agreement of the controlling body, the purpose of Reserve C8185 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested in the W.A. Wildlife Authority.
- C50.2 The implementation of Recommendation C50.1 should be subject to the findings of the Estuarine Marine Advisory Committee following the completion of its study of the Peel Inlet.
- C50.3 The area of water around Reserve C8185 and in the entrance to Peel Inlet, as shown on Figure 37 should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the W.A. Wildlife Authority.
- C50.4 Reserves B24036, C2707 and C7502 should be cancelled and their respective areas added to Reserve B4990.
- C50.5 The area of water to the west of Reserve B4990, as shown on Figure 37, should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the W.A. Wildlife Authority.
- C50.6 Subject to Recommendation C50.5 being implemented, Reserve C28087 should be cancelled, its land area added to Reserve B4990 and its area of water added to the Aquatic Reserve.
- C50.7 The Mandurah and Murray Shire Councils and the W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

C51 HARVEY ESTUARY

The area comprises Reserves A23756, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; A31922, for Recreation, vested in the Shire of Murray; C2990, for Recreation and Camping, vested in the Mandurah Road Board; C36126, for Drainage and Conservation of Flora and Fauna, vested in the Minister for Water Resources; C860, for Water, and C27528, for Recreation, and part of Reserves C15028 and C25391, both for Drainage, all not vested; the southern portion of the Harvey Estuary; and Murray Locations 77, 733, 1209, 1275, 1496, 2320, 2986 and parts of Murray Locations 437, 479, 613, 720 and 793, privately owned freehold land. It is situated to the east of the Old Coast Road, south of Mandurah (Figure 38).

The Peel-Harvey Estuary is probably the most important estuary in the South-West as a conservation area for water-birds. It has by far the largest pelican population in the region. Waterfowl, such as grey teal and black swan, are resident and migratory wading birds are also abundant. The most important areas of water-bird habitat in Harvey Estuary are the extensive shallows south of Herron Point, where thousands of grey teal, black swan, banded stilt, red-necked stint and coot and hundreds of black duck, pink-eared duck, shoveller, pelican and red-necked avocet have been recorded. The delta of the Harvey River is particularly important in late summer, when thousands of ducks congregate on its banks.

Reserve A23756, the large area on the eastern side of Harvey Estuary, supports woodland and open-woodland of jarrah, marri, bull banksia and slender banksia with some peppermint. Several low-lying swampy areas contain low woodland of swamp banksia and Moonah paperbark. The principal vegetation of Reserve A31922, also on the eastern side of the Estuary, is slender banksia.

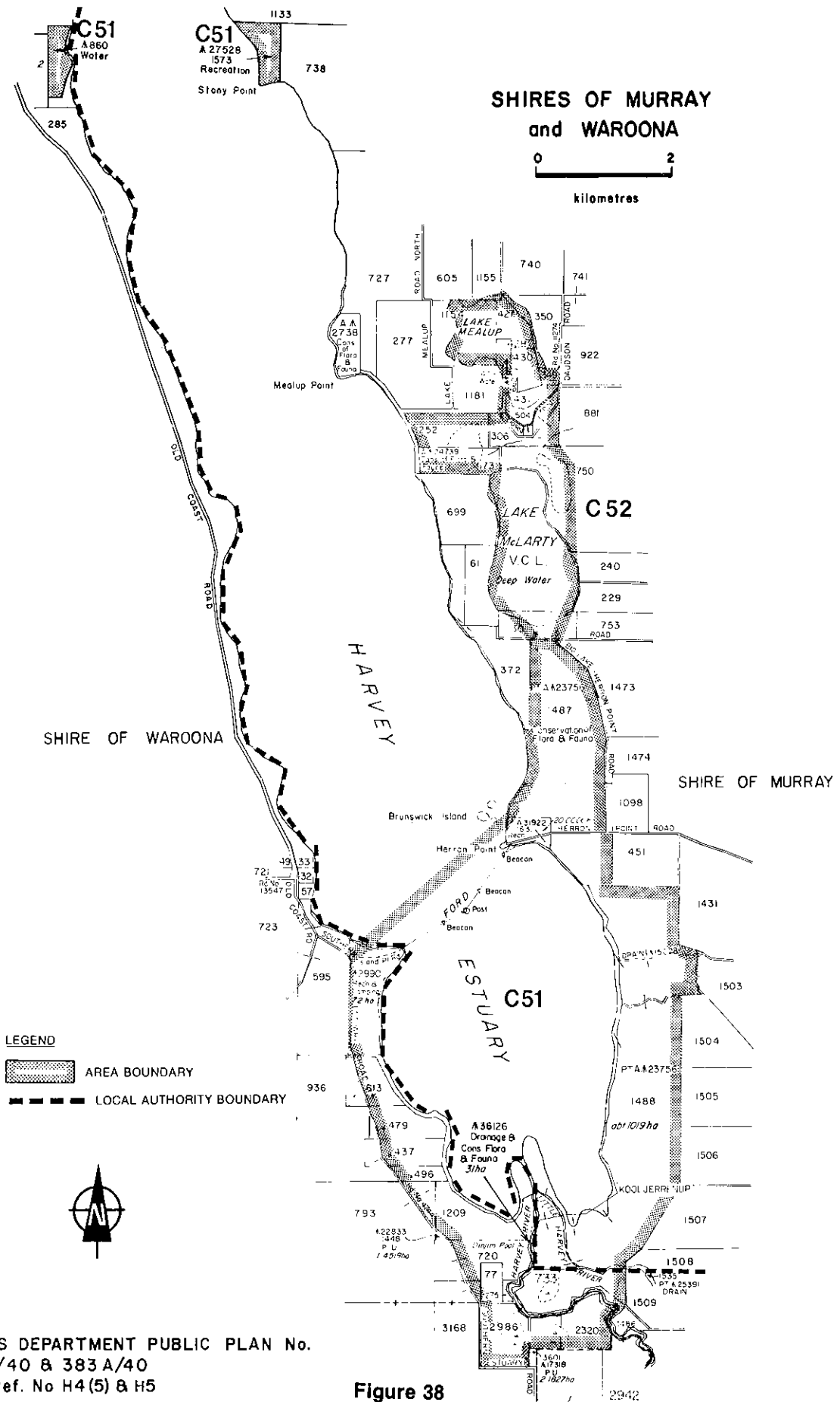
The vegetation of Reserve C2990, on the western side of the Estuary, is predominantly tall woodland dominated by tuart with an understorey of peppermint.

The Peel-Harvey Estuary provides an important nursery area for commercial species of fish such as sea mullet, cobbler and King George whiting.

At present the Estuarine Marine Advisory Committee is studying the Peel-Harvey Estuarine system to gain an understanding of the working of the ecosystem and causes of algal growth. The data collected will assist in developing a management programme. The value of the Estuary in providing an area for human recreation and relaxation is well recognised. Due to the Estuary's large size, and its attraction for recreational activities, especially aquatic, the concept of a 'regional park' as discussed in Chapter 5, may be relevant to a portion of the Estuary.

Recommendations

- C51.1 Subject to the agreement of the controlling body, the purpose of Reserve C2990 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested in the W.A. Wildlife Authority.
- C51.2 The Waroona Shire Council and the W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- C51.3 Subject to the agreement of the controlling body, the purpose of Reserve C860 should be amended to Parkland and Recreation and the Reserve should be vested in the Shire of Mandurah.
- C51.4 Subject to the agreement of the controlling body, the purpose of Reserve C27528 should be amended to Parkland and Recreation and the Reserve should be vested in the Shire of Murray.
- C51.5 The area of water at the south of the Harvey Estuary, as shown on Figure 38, should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the W.A. Wildlife Authority.



C52 LAKES McLARTY AND MEALUP

The area comprises Reserves A24739, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, and C6627, for Watering Place for Stock, not vested; vacant Crown land; Murray Locations 252, 306, 349, 427, 430, 431 and 504, and parts of Murray Locations 350, 605, 699, 730, 750, 1154 and 1155, privately owned freehold land. It is situated on the eastern side of the Harvey Estuary, about 16 km south-west of Pinjarra (Figure 38).

Lakes McLarty and Mealup provide fresh water in summer for the birds of Peel Inlet and Harvey Estuary. They also support a resident bird population, the bed of Lake McLarty having extensive areas of sedge, which are important for breeding swans and other water-birds. The southern section used to be heavily grazed but this pressure appears to have lessened in recent years. The lake is fringed by a narrow stand of paperbark. In some summers the lake dries up, possibly because of a drain from the southern edge to the Harvey Estuary. Negotiations to close the drain, thus retaining water in the lake for summer, are under way between the Department of Fisheries and Wildlife and the land owner.

The bed of Lake Mealup is spongy peat, fringed with tall stands of paperbarks with some *Baumea* and *Typha*. Mealup Drain passes close to the southern end of the lake.

The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

Reserve A24739 contains low woodland of jarrah, banksia, sheoak and Christmas tree. Where it adjoins the Harvey Estuary the shore is fringed with paperbark and flooded gum. The Reserve also contains closed-heath, including the rare species *Brachyloma preissii*, and stands of spearwood. Lying within this Reserve and uncleared land adjoining its northern boundary is a wetland which has been intersected by Mealup Drain.

Recommendations

- C52.1 Reserve C6627 should be cancelled and its area added to Reserve A24739.
- C52.2 The vacant Crown land should be added to Reserve A24739.
- C52.3 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- C52.4 The Environmental Protection Authority should support the negotiations of the Department of Fisheries and Wildlife to reduce the drainage from Lake McLarty.

C53 COOLUP RESERVES

The area comprises Reserves A20585, for Stopping Place, C31437, for Government Requirements, C31438, for Camping, and C31439, for Drainage, all not vested. It is situated adjacent to the South Western Highway, about 12 km south of Pinjarra (Figure 39).

The area is almost flat, with a few shallow depressions which become wet in winter. It carries low woodland and open-woodland of marri and jarrah. There are several populations of black gin. The depressions carry closed- to open-heath dominated by swamp tea-tree and *Hakea ceratophylla*.

These Reserves are important as the only uncleared land between Pinjarra and Waroona. They also carry the only vegetation of its type along the South Western Highway, and so are valuable for tourists.

Recommendations

C53.1 The purpose of Reserve A20585 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

C53.2 Reserves C31437, C31438 and C31439 should be cancelled and their respective areas added to Reserve A20585.

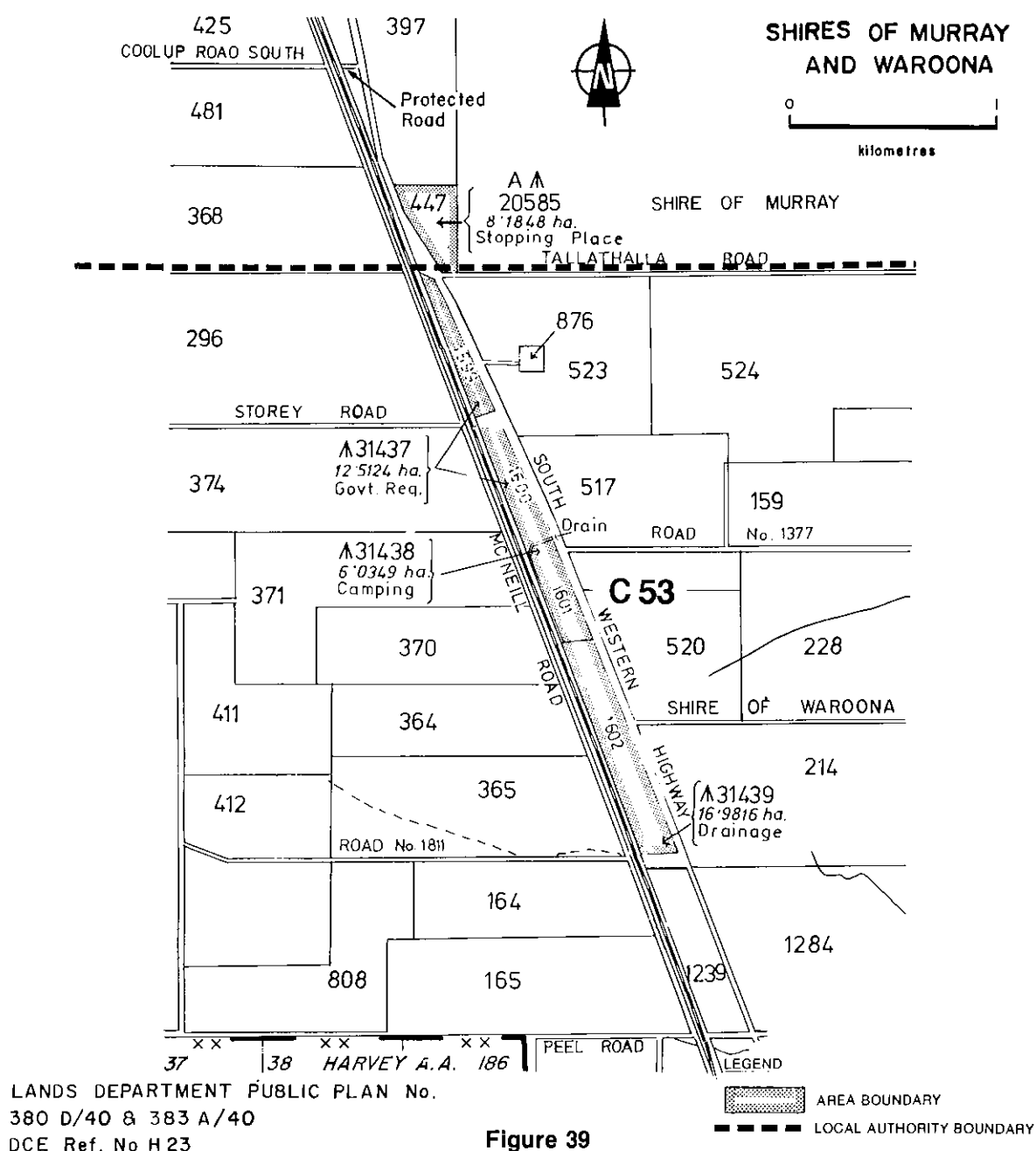


Figure 39

C54 YALGORUP NATIONAL PARK

The area comprises Reserves A11710, A12189, A22057 and C21271, all for National Park, vested in the National Parks Authority; Reserves C28796, C33283 and C33843, all for Public Recreation, not vested; C32261 for Recreation, not vested; and C24198, for Camping and Recreation, vested in the Shire of Mandurah. It is situated west and south-west of the Harvey Estuary and includes Lakes Clifton and Preston (Figures 40A and 40B).

The National Park contains shallow yellow and brown sands over limestone, and variable marine and estuarine deposits. The associated vegetation is poorly represented in conservation reserves. Vegetation formations include woodland of tuart, with peppermint and wattle in the understorey, and woodlands of jarrah, marri and banksia. There are some mobile, unvegetated dunes, as well as stable dunes which carry an open-heath of paperbark and acacia species. Closed-forest of paperbark fringes the lakes, and a small stand of Rottneet tea-tree, which is rare on the mainland, occurs on an island in Lake Preston. Sedgeland occur in poorly drained soils to the south-east of Lake Clifton. Reserve C24198 (Tims Thicket) has vegetation ranging from open-heath to tall open-woodland and includes Fremantle mallee, rare in System 6. The Reserve has an interesting geomorphological complex which extends into the Park and is worthy of conservation. Grey kangaroo, emu and brush wallaby occur in the Park, and there is a diverse bird population, at least one hundred and thirty species having been recorded.

Serious management problems are caused by the Park's long narrow shape and the enclaves of private land. Grazing of livestock extends to the shores of Lake Preston and the margins of the lake are being damaged.

The Park has high recreational value because of the lakes, its proximity to the coast and its accessibility from Perth. The greatest use occurs in the coastal area near White Hill and Tims Thicket and on the southern end of Lake Preston, which is used for water skiing.

MWB groundwater extraction may affect water levels in the area. The coast to the north and west of Lake Clifton may be affected by a proposed power station, which could require a site of approximately 200 ha, associated with a 2 km buffer reserve and access roads and powerlines. The area may also be affected by a future highway between Perth and Bunbury, and by widening of the Old Coast Road.

The Mandurah Shire Council proposes to develop a marina and other recreation facilities at Reserve C24198 (Tims Thicket). The MRD is interested in securing limestone resources in this area. The Waroona Shire Council has proposed that a reserve should be set aside within Lake Preston for extraction of salt for stock use by local farmers.

Recommendations

- C54.1 Reserves C28796, C32261, C33283 and C33843 should be cancelled and their respective areas added to Reserve A11710.
- C54.2 The National Parks Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

C55 CLIFTON MANAGEMENT PRIORITY AREA (MPA 10.1)

Clifton MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 25 km south of Mandurah, adjacent to the Old Coast Road (Figure 40A).

The MPA's purpose is to preserve open-forest of tuart and the forest-woodland transition of jarrah and slender banksia.

Clifton MPA contains forest types which are being progressively cleared on the Coastal Plain. The shallower sands overlying limestone carry open-forest of tuart with an understorey of peppermint, and the deeper sands carry a mixture of jarrah and slender banksia. The vegetation is relatively undisturbed, despite its proximity to a main tourist road. Some dieback has been recorded in depressions in the north-eastern section. While access to pedestrians should be allowed, vehicles should be excluded to reduce the spread of dieback.

The only extensive stands of tuart and peppermint in System 6 are to be found in Yalgorup National Park (C54) and Clifton, Myalup (C57) and McLarty (C56) MPAs. Thus Clifton MPA, which is also significant for woody pear, has high conservation value. It is also important as an area of forest along the Old Coast Road, which is a significant tourist route.

The MPA may be affected by widening of the Old Coast Road and a future highway between Perth and Bunbury.

The Study endorses the present purpose of Clifton Management Priority Area.

C56 McLARTY MANAGEMENT PRIORITY AREA (MPA 10.11)

The area comprises McLarty MPA, managed by the Forests Department for the conservation of flora and fauna; and Reserve C11709, for Water, not vested. It is situated about 30 km south of Mandurah, adjacent to the Old Coast Road (Figure 40B).

The MPA's purpose is to preserve a narrow strip of tuart and provide a buffer zone between the Old Coast Road and pine plantations.

McLarty MPA forms a long narrow strip between Clifton and Myalup MPAs. Vegetation consists of open-forest of tuart with an understorey of peppermint. The area provides a visual barrier between the Old Coast Road and State Forest pine plantations. Vehicle access should be limited to parking areas off the Old Coast Road, so as to reduce the spread of dieback.

Reserve C11709, which divides the MPA into two parts, should be included in order to facilitate management.

The only extensive stands of tuart and peppermint in System 6 are to be found in Yalgorup National Park and Clifton, Myalup and McLarty MPAs. Thus McLarty MPA has high conservation value. It is also important as an area of forest along the Old Coast Road, which is a significant tourist route.

The portion of McLarty MPA south of Peppermint Grove Road has potential for high grade limestone. The Shire of Waroona holds a lease of approximately 3 ha for extraction of limestone in McLarty MPA, to the north of Reserve C11709, and the Shire Council requests that this extraction should be allowed to continue. The MPA may be affected by widening the Old Coast Road and a future highway between Perth and Bunbury.

Recommendation

C56.1 Reserve C11709 should be vested in the Conservator of Forests and managed as if part of McLarty Management Priority Area.

C57 MYALUP MANAGEMENT PRIORITY AREA (MPA 10.2)

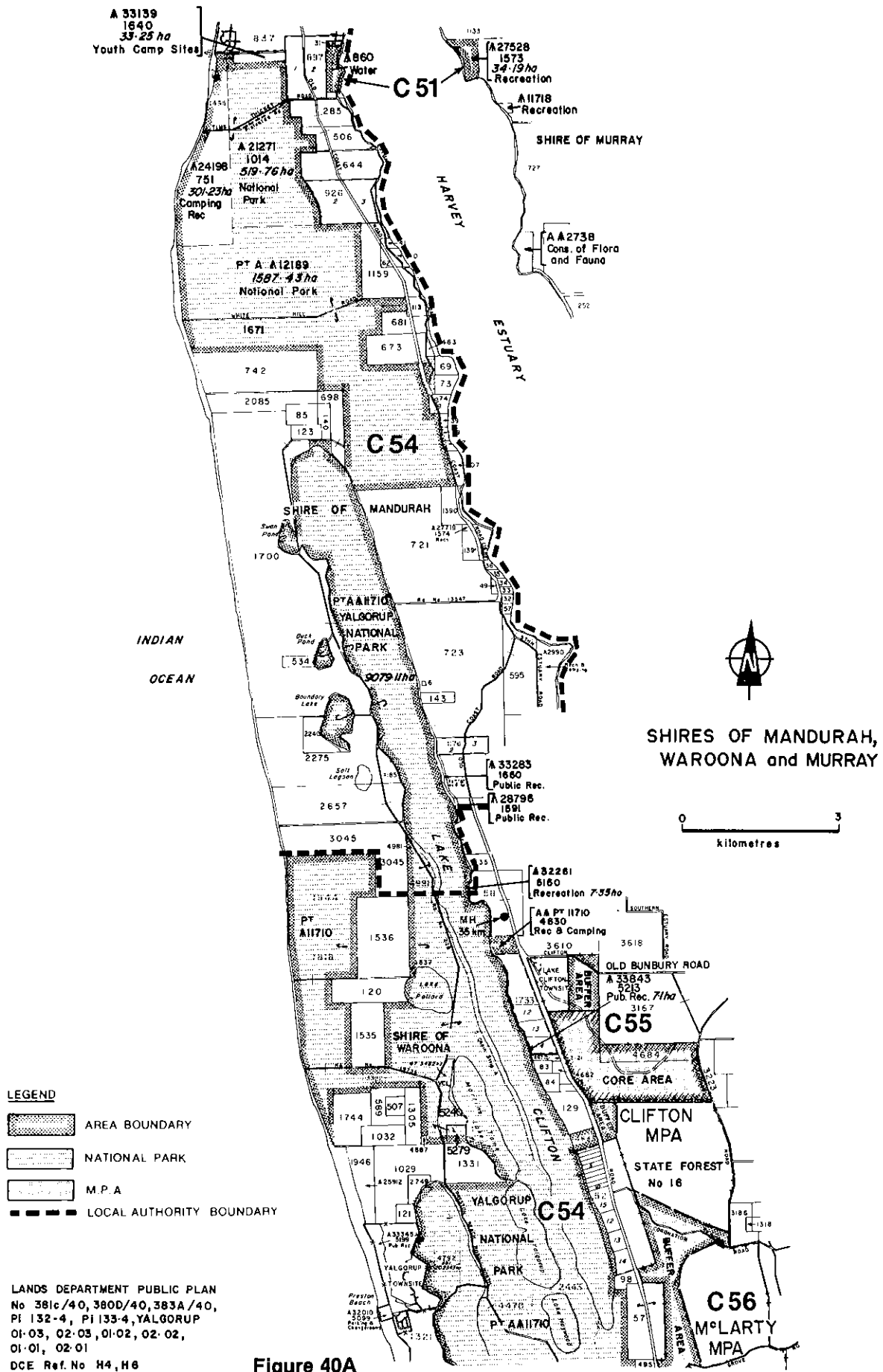
Myalup MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 35 km south of Mandurah, adjacent to the Old Coast Road (Figure 40B).

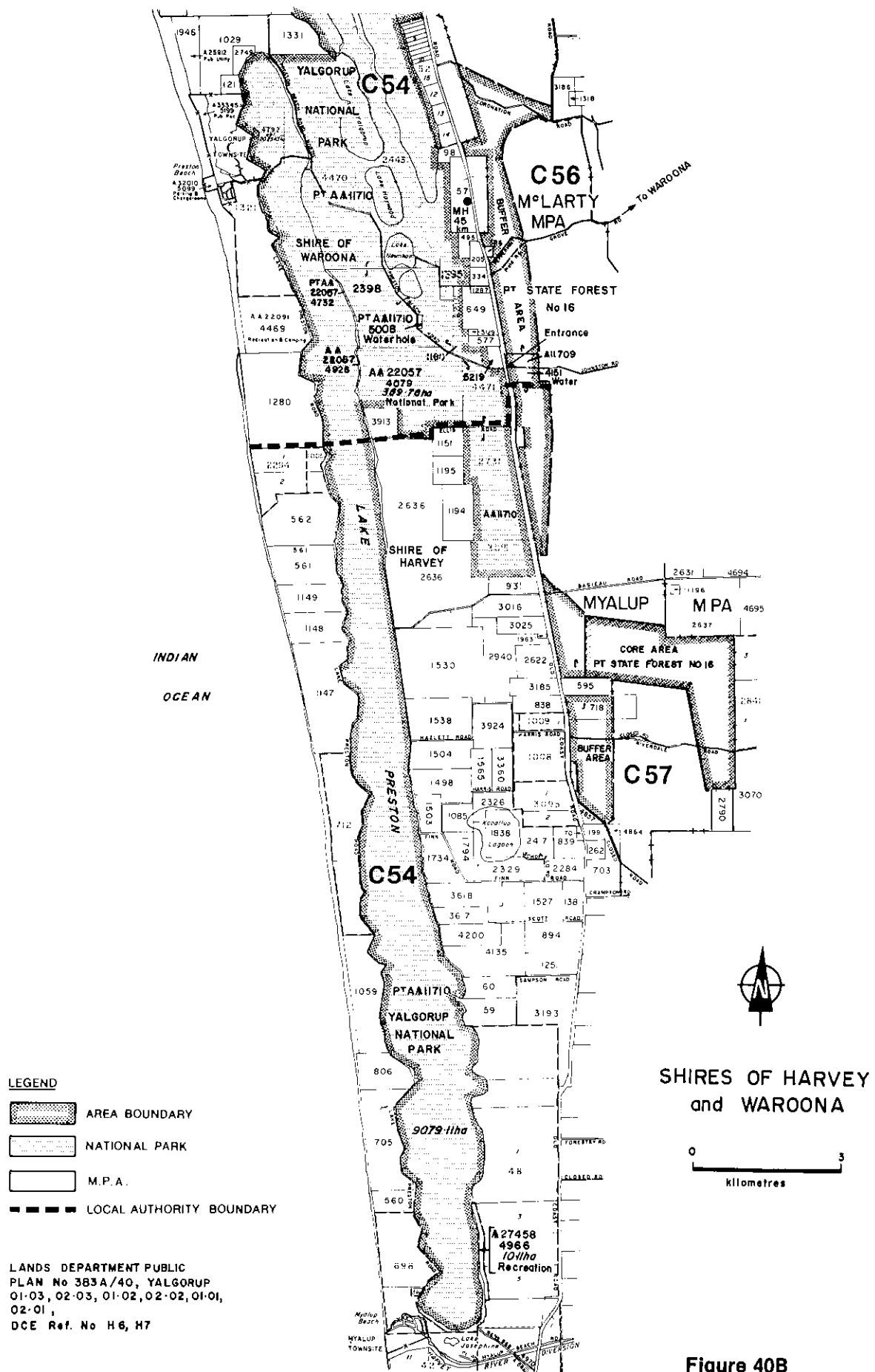
The MPA's purpose is to preserve the coastal forest types and to provide a migration corridor for fauna between Myalup Swamp and Yalgorup National Park.

Myalup MPA is distinctive in providing a range of vegetation types. The western portion carries open-forest of tuart and jarrah, and the eastern portion contains a swampy area dominated by paperbark. Dieback has been recorded in the south-eastern section. Recreation should be limited to scenic drives and walking. The only extensive stands of tuart and peppermint in System 6 are to be found in Yalgorup National Park and Clifton, Myalup and McLarty MPAs. Thus Myalup MPA has high conservation value. It is also important as an area of forest along the Old Coast Road, which is a significant tourist route.

The western half of Myalup MPA has potential for high grade limestone. The MPA may be affected by widening of the Old Coast Road and a future highway between Perth and Bunbury.

The Study endorses the present purpose of Myalup Management Priority Area.





C58 RESERVE A23172, HARVEY RIVER

Reserve A23172, for Camping, vested in the Shire of Waroona, is situated adjacent to the Harvey River, approximately half way between Waroona and the coast, and about 40 km south of Mandurah (Figure 41).

The northern part of the Reserve has been cleared. In the southern section, near the river, there is woodland of marri, jarrah and paperbark. The understorey has mostly been replaced by grasses. Farther from the river the woodland also contains Christmas tree and banksia. The understorey is dense, and includes spearwood, stinkwood and pixie mops. An area on the north side of the Reserve carries closed-heath on grey sandy clay but is dominated by paperbark, associated with swishbush, swamp cypress and *Hakea varia*. This is an unusual association of plants.

The Reserve should be managed so as to retain areas of natural vegetation, with camping catered for on the grasses near the river. There are two other local Reserves, C13987 and C22545, for Camping, which can take some pressure off Reserve A23172.

Recommendation

C58.1 The Waroona Shire Council, in consultation with the Department of Conservation and Environment, should prepare a management programme giving consideration to:

- (a) encouraging the growth and regeneration of local indigenous flora;
- (b) providing for camping in part of the Reserve.

C59 RESERVE C22199, WAGERUP

Reserve C22199, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated about 100 km south of Perth and 7 km south-west of Wagerup (Figure 41).

The Reserve which contains grey sandy soils, is the only large area of its type between Mandurah and Bunbury. It carries woodland of jarrah, marri, bull banksia and sheoak. The understorey is fairly dense, and includes blackboy, zamia, spearwood, Swan River myrtle, pepper and salt and blueboy. In the centre of the Reserve there is a small swamp, believed to be semi-permanent.

Recommendation

C59.1 Reserve C22199 should be classified as Class A.

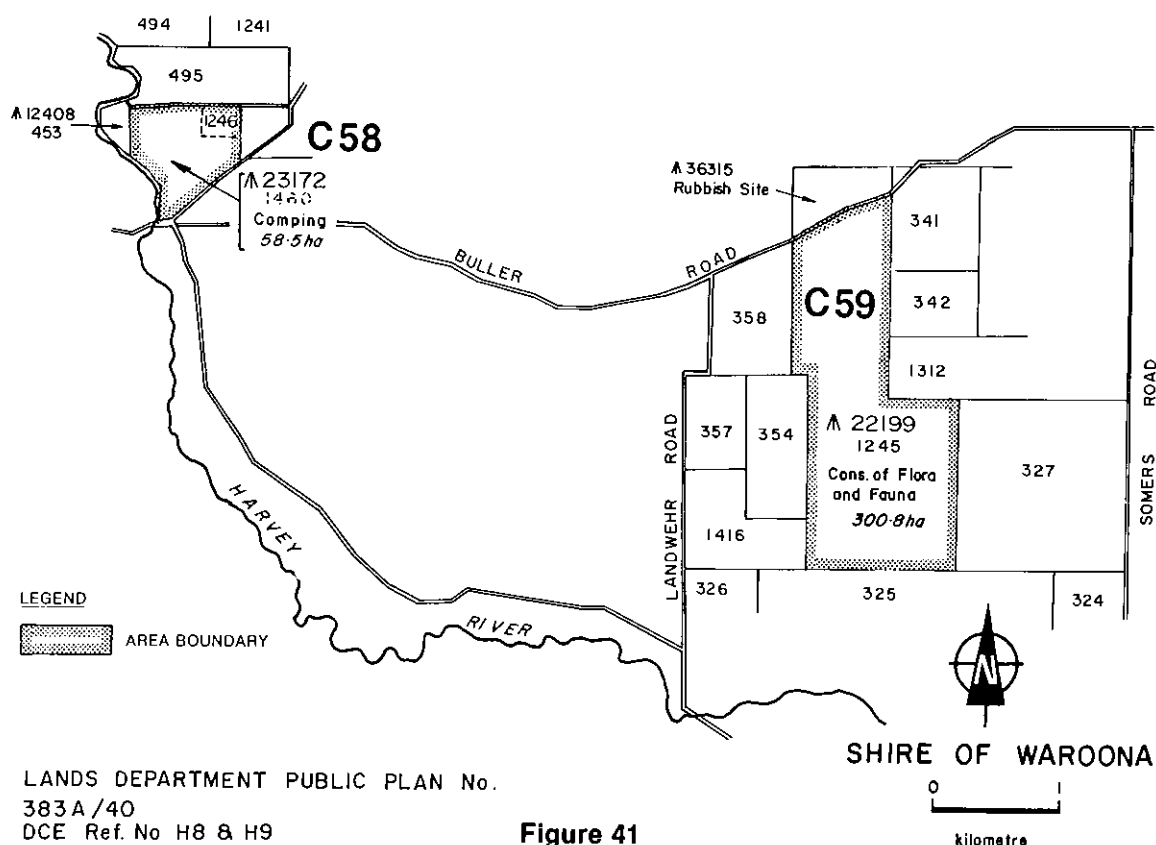


Figure 41

C60 RESERVES C12049 AND C12632, HARVEY

The area comprises Reserves C12049 and C12632, both for Water, and Conservation of Flora and Aquatic Life, not vested. It is situated about 12 km north-west of Harvey (Figure 42).

Reserve C12049 represents the grey sands of the Coastal Plain. It includes a lake which usually contains water throughout the year. The lakeside vegetation is a low woodland of Moonah paperbark with a dense ground cover of sedges, including jointed twig rush, and the shrubs *Astartea fascicularis* and *Pultenaea reticulata*. Behind this there is open-forest, dominated by jarrah and banksia, with a dense understorey which includes *Adenanthos meissneri*, *Conostephium minus*, *Calytrix fraseri*, and *Anarthria prolifera*, a species which is otherwise found only on the south coast.

Reserve C12632 represents the grey sands and low-lying flats of clay and loam of the Coastal Plain. The flats support closed-heath, species including robin redbreast bush, white myrtle and paperbark. In some areas there are emergent trees and tall shrubs such as swamp paperbark, swishbush and spearwood. There are also sandy rises which carry low open-woodland of jarrah, Christmas tree and banksia. The vegetation is in good condition and should be preserved, particularly the heath vegetation which is unusual in both formation and composition.

Recommendation

C60.1 Reserves C12049 and C12632 should be vested in the W.A. Wildlife Authority.

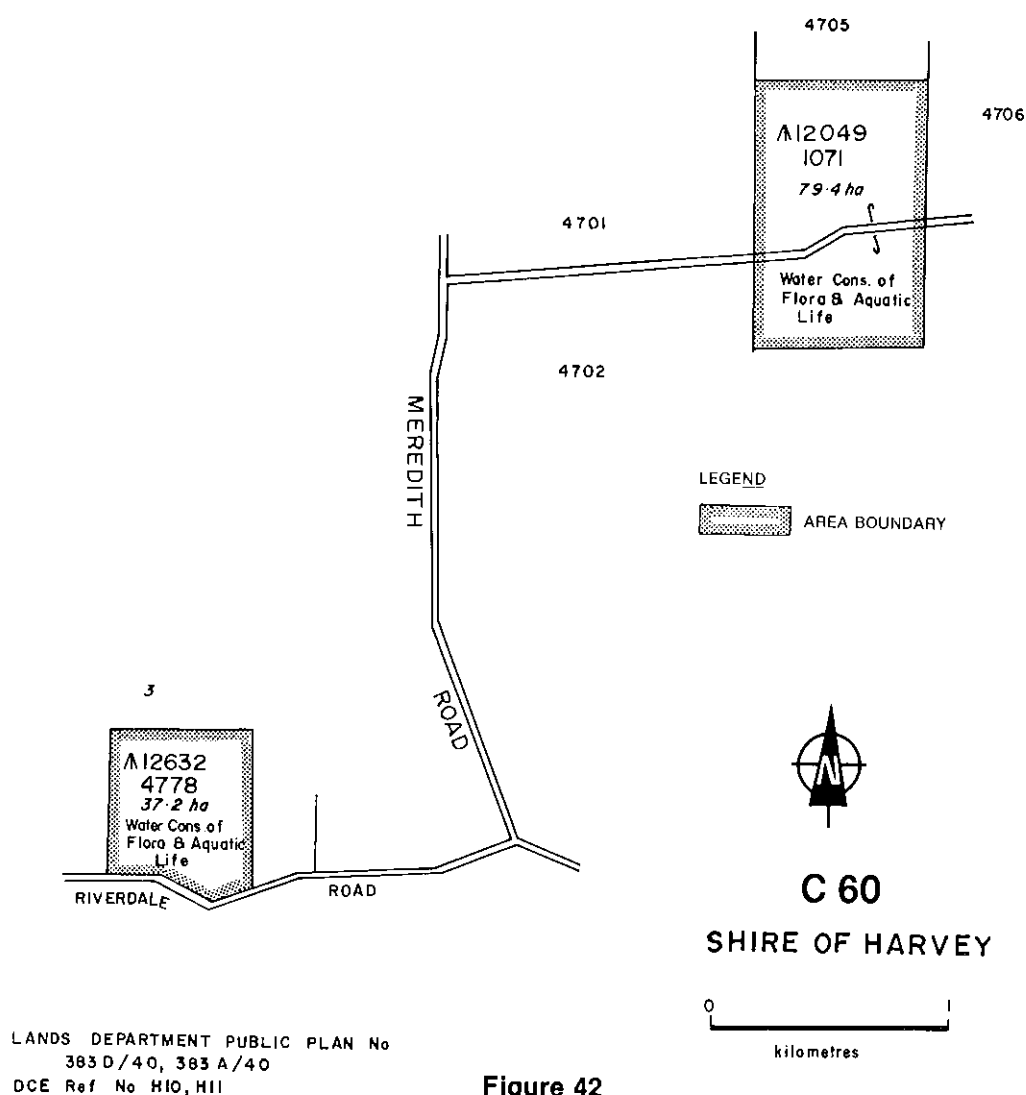


Figure 42

C61 RESERVE C24472, LAKE PRESTON

Reserve C24472, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated next to the Old Coast Road, about 3 km east of Lake Preston (Figure 43).

The Reserve represents the yellow sands of the Coastal Plain. It is fairly flat, and contains low closed- to open-forest of jarrah, banksia and Christmas tree, with an understorey including *Hakea varia* and *Acacia stenoptera*. The vegetation is in good condition and is worth preserving.

The Study endorses the present purpose and vesting of Reserve C24472.

C62 RESERVE C2547, HARVEY

Reserve C2547, for Public Utility, not vested, is situated about 8 km west of Harvey (Figure 43).

The Reserve is almost flat, and being low-lying, is partly under water in winter. It represents the poorly drained clay flats of the Coastal Plain. The vegetation is low open-woodland dominated by paperbark, peppermint, flooded gum and Christmas tree with tall shrubs such as spearwood and swishbush, and closed- to open-heath of grey honeymyrtle, hakea, jacksonia, white myrtle, mountain kunzea and swamp tea-tree, as well as some sedge species. The vegetation is in good condition, and should be retained since it is poorly represented elsewhere and is in a region which is mostly freehold and cleared.

There is a PWD drain on the southern boundary of the Reserve.

Recommendation

- C62.1 The purpose of Reserve C2547 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

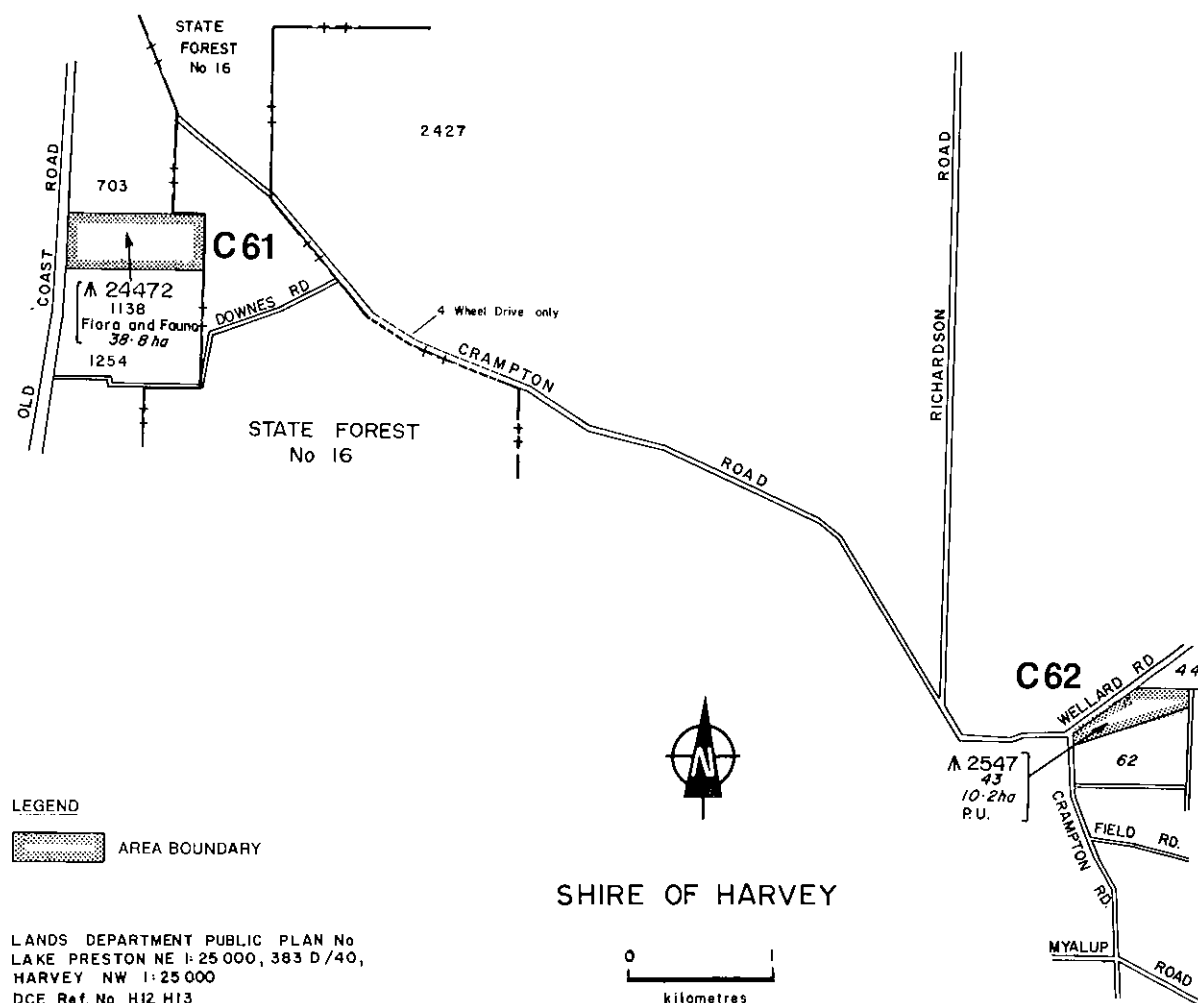


Figure 43

C63 MYALUP SWAMP AND MIALLA LAGOON

The area comprises parts of lots 1, 3, 4, 8, 12, 17, 20 and 21 of Wellington Location 1; part of lot 2 of Wellington Location 48 and parts of Wellington Locations 48 and 1, privately owned freehold land. It is situated east of the Old Coast Road about 20 km north-east of Bunbury (Figure 44).

The area, which provides essential fresh water for water-birds from Leschenault Inlet and Lake Preston, is essential to the feeding and living cycle for the birds and is an essential part of the Inlet water-bird haven.

The concept of a 'conservation buffer zone', as discussed in Chapter 5, may be relevant.

Myalup Swamp is drained and subject to controlled drainage. Mialla Lagoon is being pumped for drainage purposes. Lots 1 and 6 have been the subject of applications for drainage for agricultural use. The area may be affected by widening of the Old Coast Road and a highway planned between Perth and Bunbury.

Recommendations

- C63.1 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- C63.2 The Department of Fisheries and Wildlife should investigate the area's value as a water-bird habitat, and report its findings to the Environmental Protection Authority.

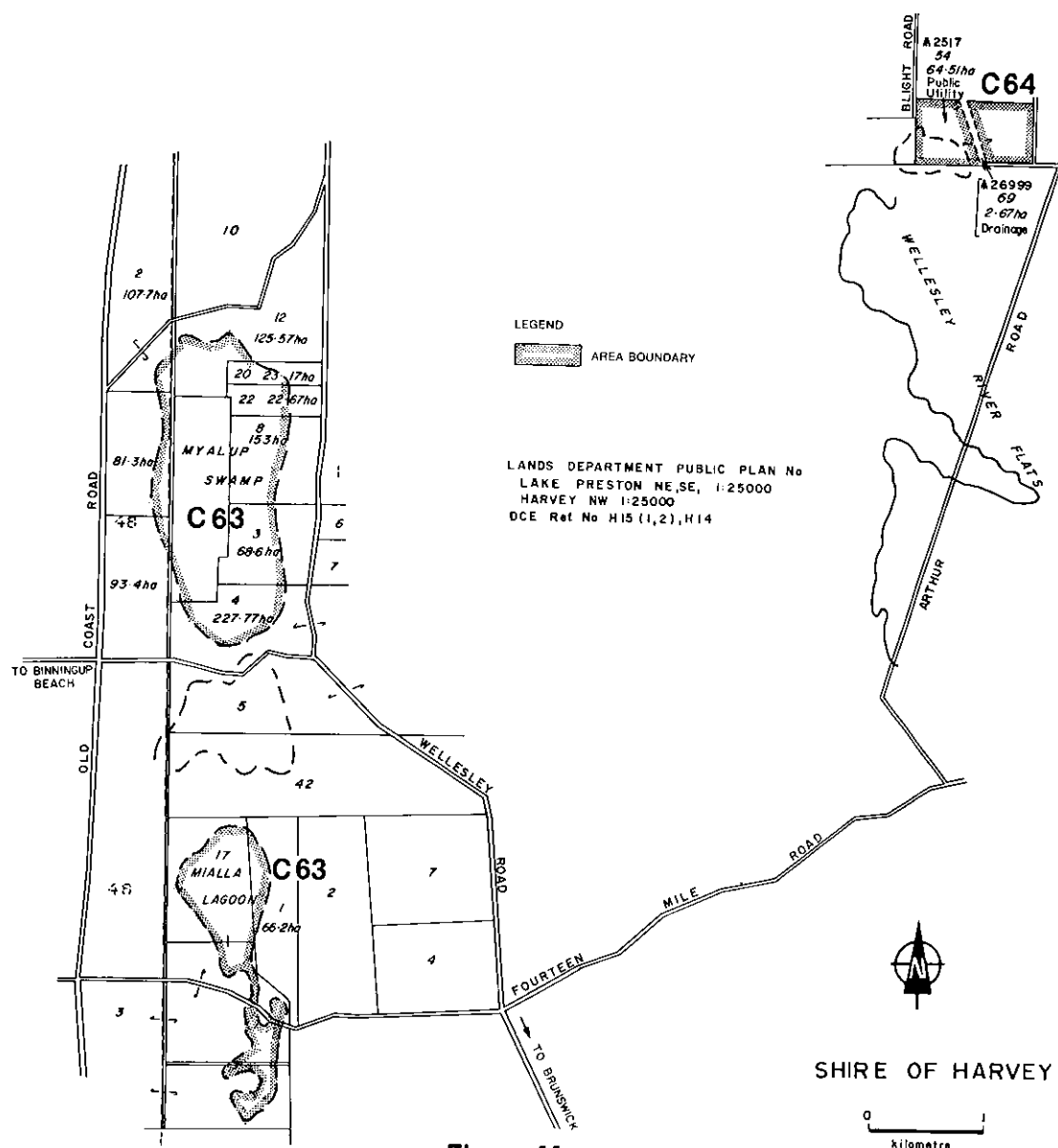


Figure 44

C64 RESERVE C2517, HARVEY

Reserve C2517, for Public Utility, not vested, but currently leased for grazing, is situated about 8 km south-west of Harvey (Figure 44).

The Reserve represents the clay flats of the Coastal Plain. It has some deep sands and carries an unusual association of species, providing a very good example of low closed-heath. There are a few areas of swamp paperbark.

The Reserve is bisected by Reserve C2699, which contains a PWD drain.

Recommendations

C64.1 The purpose of Reserve C2517 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.

C64.2 The lease on Reserve C2517 should not be renewed.

C65 BENDER SWAMP

The area comprises Bender Swamp, approximately 90 per cent of which is owned by the Department of Fisheries and Wildlife, the remainder consisting of lots 5(E), 9(E), 10, 12, 12(W), 14(E), 18(W), 19, 23, 26, 27, 27(E), 28, 41(W), 42(E), 44(E), 52, 59, 66, 68, 69, 71, 72, 74, 80, 104, 105 of Wellington Location 1, privately owned freehold land; and Reserve C34811, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority. It is situated just west of the South Western Highway, about 10 km south of Harvey (Figure 45).

Bender Swamp is surrounded by stands of swamp paperbark, containing dodder-laurel, lesser bottlebrush and other species. There are wide tracts of closed-sedgeland of bulrushes, and some clumps of *Juncus pallidus*. The dominant water plants are *Lemna minor*, *Spirogyra*, and some *Myriophyllum* species. The swamp is a haven for water-birds, and many thousands use it as a drought refuge in early summer. The most common birds include Australian pelican, little pied cormorant and straw-necked ibis. The swamp is also one of the few known areas where one of the world's rarest water-fowl, the freckled duck, breeds and rears its young. Bender Swamp has a long tradition of use by naturalists, tourists and duck-shooters, and is known throughout West Australia as a prime water-fowl habitat.

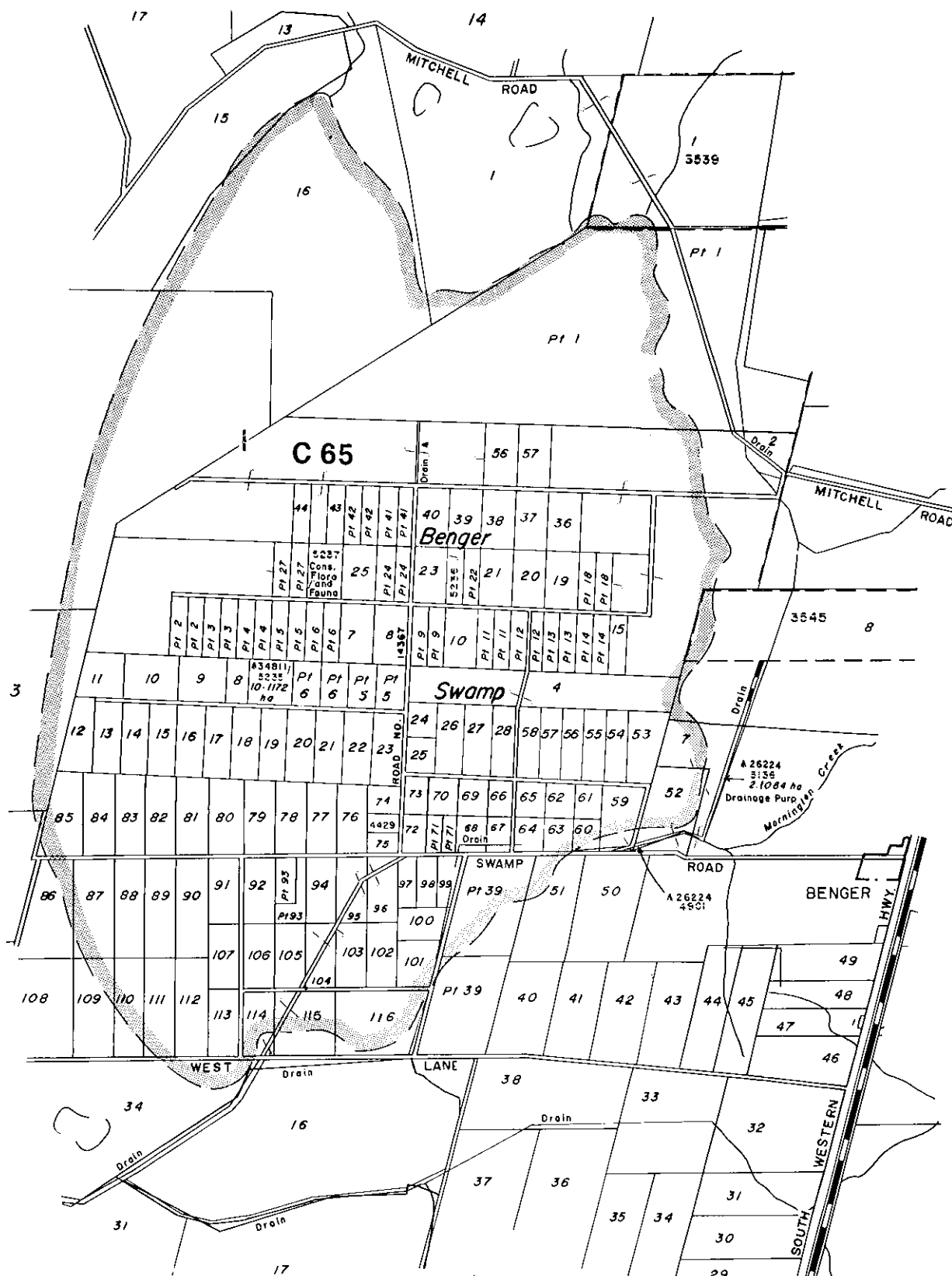
The Department of Fisheries and Wildlife has been progressively buying the land since 1973. When all of Bender Swamp has been acquired the Department will manage it as a water-bird habitat, keeping a balance between open water and vegetated areas so as to accommodate as many species as possible, and allowing a longer period of flooding each year to increase its value as a drought refuge.

Recommendations

C65.1 Reserve C34811 should be classified as Class A.

C65.2 The land owned by the Department of Fisheries and Wildlife should be added to Reserve C34811.

C65.3 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



C66 LESCHENAULT INLET

The area comprises Reserves A18414, for Stopping Place, not vested, and C13531, for Camping and Picnic Ground, vested in the City of Bunbury; vacant Crown land; a temporary Reserve; all of the Leschenault Estuary Inlet north from the mouth of the Collie River; lot 1 (part of Wellington Locations 18 and 24), lots 2, 3 and 4 of Wellington Location 24, Wellington Locations 7 and 14 and part of Wellington Location 22, privately owned freehold land and the swamp on the south-eastern side of Leschenault Inlet on land owned by Laporte Titanium (Australia) Pty. Ltd. It is situated between Australind and the Indian Ocean, a few kilometres north of Bunbury (Figure 46).

The northern part of the Inlet carries a very extensive area of samphire, surrounded by closed-sedgeland, which is bordered by low woodland of salt water paperbark. Adjacent to this there is closed-forest of swamp paperbark, which is surrounded by woodland of flooded gum and Moonah paperbark in the swampy land north of the estuary. The higher ground has been partly cleared, and supports remnants of tall open-forest of tuart. The peninsula between the estuary and the sea carries low closed-forest of peppermint and some open-forest of tuart, with an understorey dominated by cockies' tongue. Bordering the estuary there is a small area of the rare white mangrove (*Avicennia marina* var. *resinifera*). The peninsula includes fragile mobile dunes with numerous blowouts, so vehicular access should be controlled.

The Leschenault Inlet is of considerable importance for water-birds. More than fifty species, some with populations of over a thousand, have been recorded. The most important area is the northern section, which is a breeding ground and refuge for migratory birds, including greenshank. The estuary is also an important summer refuge for water-fowl, including black duck, black swan, grey teal, mountain duck, musk duck and the pelican. During mid and late summer, most of the swans and ducks move to a point on the western shore, opposite Australind, where there are fresh water seepages. This area is extremely important as a bird refuge.

The shallower waters are an important nursery area for commercial species of fish, which include whiting, cobbler, mullet, bream, tailer, garfish, flathead and flounder. These waters also support the blue manna crab, which is extremely popular for recreational fishing. There are plans to dredge the estuary channel. This should be prevented as it will disturb the ecosystem and badly damage the fish nursery and bird sanctuaries.

The Laporte Egret Swamp, on the south-eastern side of the Estuary, supports one of the few Western Australian breeding colonies of the white egret. The egret colony has bred successfully for a number of years and as a result, Leschenault Inlet has the second largest white egret population in the South-West. Other species, including nankeen night heron, little pied cormorant and little black cormorant, also nest in the swamp. Urban type development in this area would not be in the interest of either conservation or Laporte Titanium (Australia) Pty. Ltd.

The Leschenault Peninsula to the west of Leschenault Inlet has been committed for long term use by the PWD as an area for industrial effluent disposal. The disposal lagoons contain acid effluent and should not therefore be accessible to the general public. Even if an alternative disposal system is adopted it is likely that the peninsula will be used in emergencies, and possibly for continuing disposal of one component of the effluent, basically cooling water, for at least thirty years.

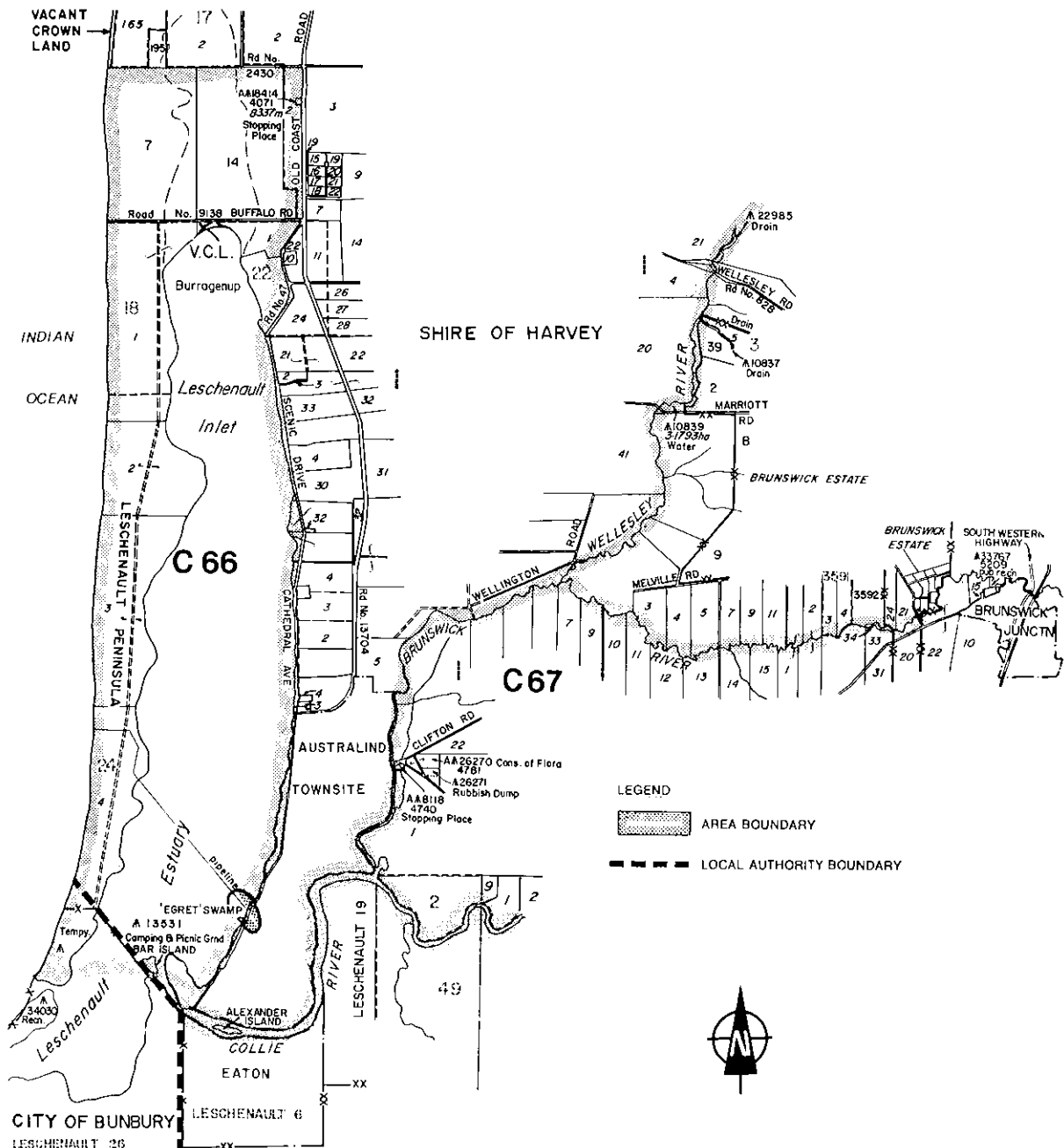
The concept of a 'regional park', as discussed in Chapter 5, may be relevant to portion of Leschenault Inlet and its shores.

The whole area is used heavily for recreation and has very high conservation value. It is under increasing pressure from urban development, which should be restricted as it will have adverse effects upon conservation and recreation. There is increasing pressure for industrial development near Bunbury, which will increase the demand for recreational use of Leschenault Inlet and increase the need to preserve its conservation value. The area may be affected in the future by underground gas pipelines.

Recommendations

- C66.1 The purpose of Reserve A18414 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the Leschenault Inlet Management Authority.
- C66.2 The vacant Crown land should be added to Reserve A18414.
- C66.3 Leschenault Inlet, its eastern shores, the adjacent low-lying land to the north and the peninsula between the Inlet and the Indian Ocean as shown on Figure 46, should be managed by the Leschenault Inlet Management Authority.
- C66.4 The Leschenault Inlet Management Authority, in consultation with relevant authorities and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- C66.5 The Public Works Department, in consultation with the Department of Conservation and Environment, should investigate and develop techniques which will minimise the environmental damage caused by the disposal of industrial effluent.
- C66.6 Urban development should be prevented, or only allowed if associated with deep sewerage systems which will not lead to pollution of the inlet.
- C66.7 The inlet channel should not be dredged.



SHIRE OF HARVEY and
CITY OF BUNBURY

LANDS DEPARTMENT PUBLIC PLAN No
B54-4, B55-4, B71-4, 411A/40
PRESTON SE 1:25000,
BRUNSWICK JUNCTION, AUSTRALIND;
DCE Ref. No H17, H18, H19,

Figure 46



C67 BRUNSWICK, COLLIE AND WELLESLEY RIVERS

The area comprises the Brunswick River downstream from Brunswick Junction, the Wellesley River downstream from about 1 km north of its intersection with Wellesley Road, and the Collie River from its mouth in the Leschenault Inlet upstream as shown (Figure 46). The rivers flow mainly through privately owned freehold land.

The rivers are lined with flooded gum and provide very peaceful surroundings for passive recreation. The demand to use rivers for recreation is likely to increase, as the population of Bunbury grows. Riverside footpaths and picnic areas would be most suitable. A study will be needed to determine which areas are best suited to these purposes and this should be carried out by the Leschenault Inlet Management Authority. Several concepts, discussed in Chapter 5 and Chapter 6, are relevant; they are 'pathway systems' (Section 5.4) and 'riverline linear parks' (Section 6.7).

There are SEC lines in the area, and future lines are planned. The area may be affected by the proposed Perth to Bunbury highway and by widening of the Old Coast Road. The PWD is vested with powers to control waterflow, and to initiate irrigation and drainage works.

Recommendations

- C67.1 The Leschenault Inlet Management Authority, in consultation with the Dardanup and Harvey Shire Councils, the Department for Youth, Sport and Recreation, the Public Works Department, local land owners and other interested groups or individuals, should investigate the area for sites suitable for footpaths and picnic grounds.
- C67.2 If such sites are identified, the Leschenault Inlet Management Authority should prepare a management programme, giving consideration to:
 - (a) preservation of the local indigenous flora and natural features;
 - (b) allowing only passive recreation.

C68 ANGLESEA ISLAND

The area comprises Reserve A12636, for Recreation; part of Reserve C28033, for Caravan Park, Camping, Beach Resort, Recreation and Aquatic Sports, part of Reserve C28034, for Recreation, all vested in the City of Bunbury; and vacant Crown land. It is situated immediately to the north of Bunbury (Figure 47).

Apart from a very small stand in the north of the Leschenault Estuary, this is the only area south of Shark Bay where the white mangrove occurs. It is an unusual plant, believed to be a relic of an earlier tropical period. There are associated salt marsh plants such as samphire, and an occasional swamp sheoak.

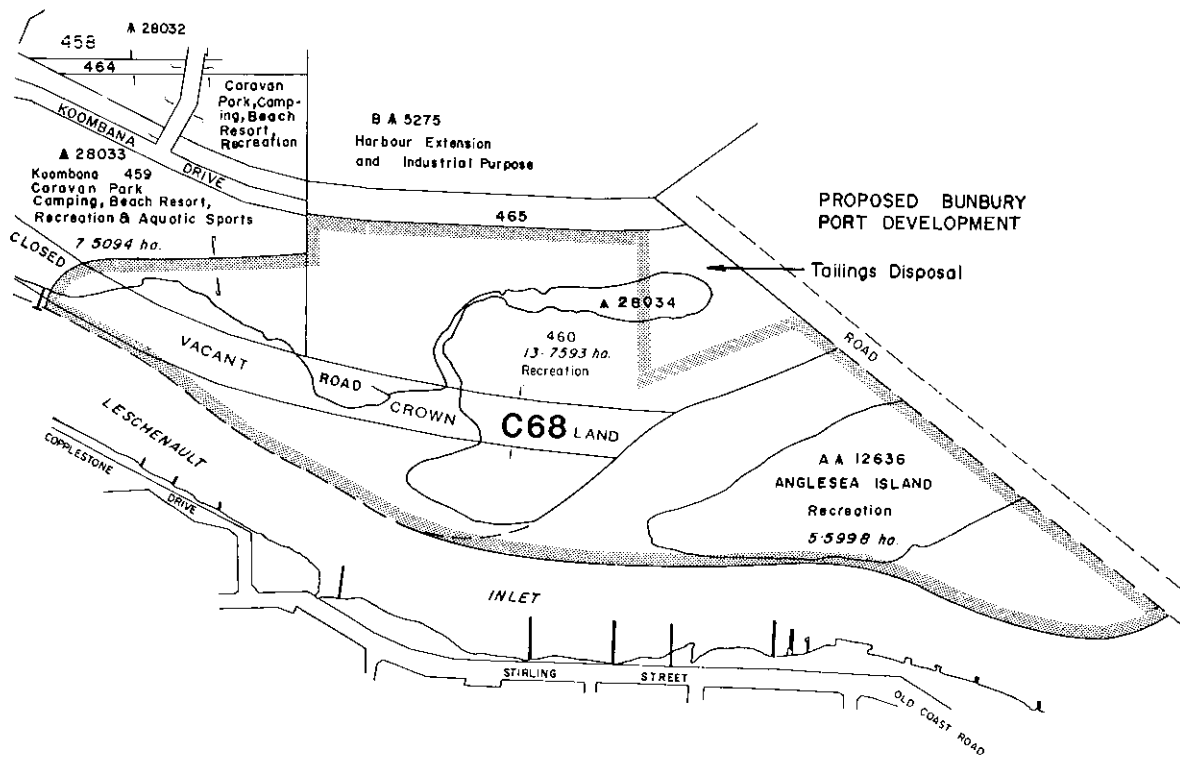
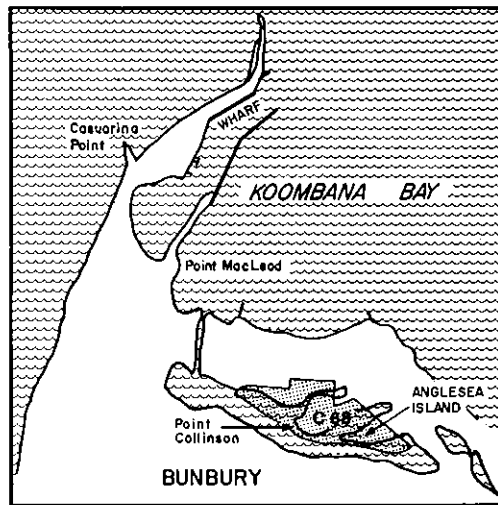
Anglesea Island has pools of permanent water and low-lying samphire flats which provide good feeding and roosting areas for many water-birds, including greenshank, white-faced heron, white egret and common sandpiper. Some of these species migrate annually from the northern hemisphere, and in all, over fifty species have been recorded here. One of this area's greatest values is that it has a complete range of the estuary's major water-bird species, right next to Bunbury. Therefore it rates highly from the points of view of conservation, scientific interest and recreation.

The mudflats adjacent to Koombana Park and Anglesea Island provide large numbers of worms, molluscs and crustacea, which are essential for most of the wading birds. The tidal flats are also nursery areas for commercial and angling species of fish.

Cable Sands Pty. Ltd. has an agreement with Bunbury City Council to deposit tailings on part of Reserve C28034. Anglesea Island and its surrounding waters may be affected by PWD works, necessary to control flooding of nearby low-lying residential land. There are SEC lines in the area, which may be affected by future SEC lines and underground gas pipelines, and by port and industrial developments.

Recommendations

- C68.1 Subject to the agreement of the controlling body, the purpose of Reserve A12636 should be amended to Conservation of Flora and Fauna and the Reserve should be vested jointly in the City of Bunbury and the W.A. Wildlife Authority.
- C68.2 The vacant Crown land and the area of water, as shown in Figure 47, should be added to Reserve A12636.
- C68.3 Subject to the agreement of the controlling body, the southern portion of Reserve C28033 and all but the north-eastern portion of Reserve C28034 should be excised and their respective areas added to Reserve A12636.



LEGEND

 AREA BOUNDARY

LANDS DEPARTMENT PUBLIC PLAN No
 Bunbury BG 30/02-33, BG 30/02-32
 DCE Ref. No H 20



CITY OF BUNBURY

0 200
 metres

Figure 47

C69 BIG SWAMP, SOUTH BUNBURY

The area comprises Reserve C31988, for Government Requirements (Public Works Department), vested in the Minister for Works; lots 1, 28, 36, 222, 224 to 230, 235 to 238, 241 to 244, 247 to 257, 262 to 265, 308 to 310, and part of lots 7, 13 (Tuart Street), 13 to 21, 61, 100, 189, 190, 239, 240, 259 to 261 (Leschenault Location 26), privately owned freehold land. It is situated about 3 km south of Bunbury (Figure 48).

Big Swamp has a very wide range of birds, as many as seventy species having been recorded. The area is excellent for study by school and other groups.

Nearby sanitary landfill is changing the swamp's character and should therefore be stopped. The Bunbury City Council has prepared plans to develop the area for passive and active recreation. Aquatic recreation should not be permitted, as this will interfere with conservation of the wetland habitat.

The area may be affected by future groundwater extraction and associated works.

Recommendations

C69.1 Big Swamp should be managed by the Bunbury City Council for conservation of flora and fauna, and recreation.

C69.2 Any future Land Act Reserves should include Water as a purpose.

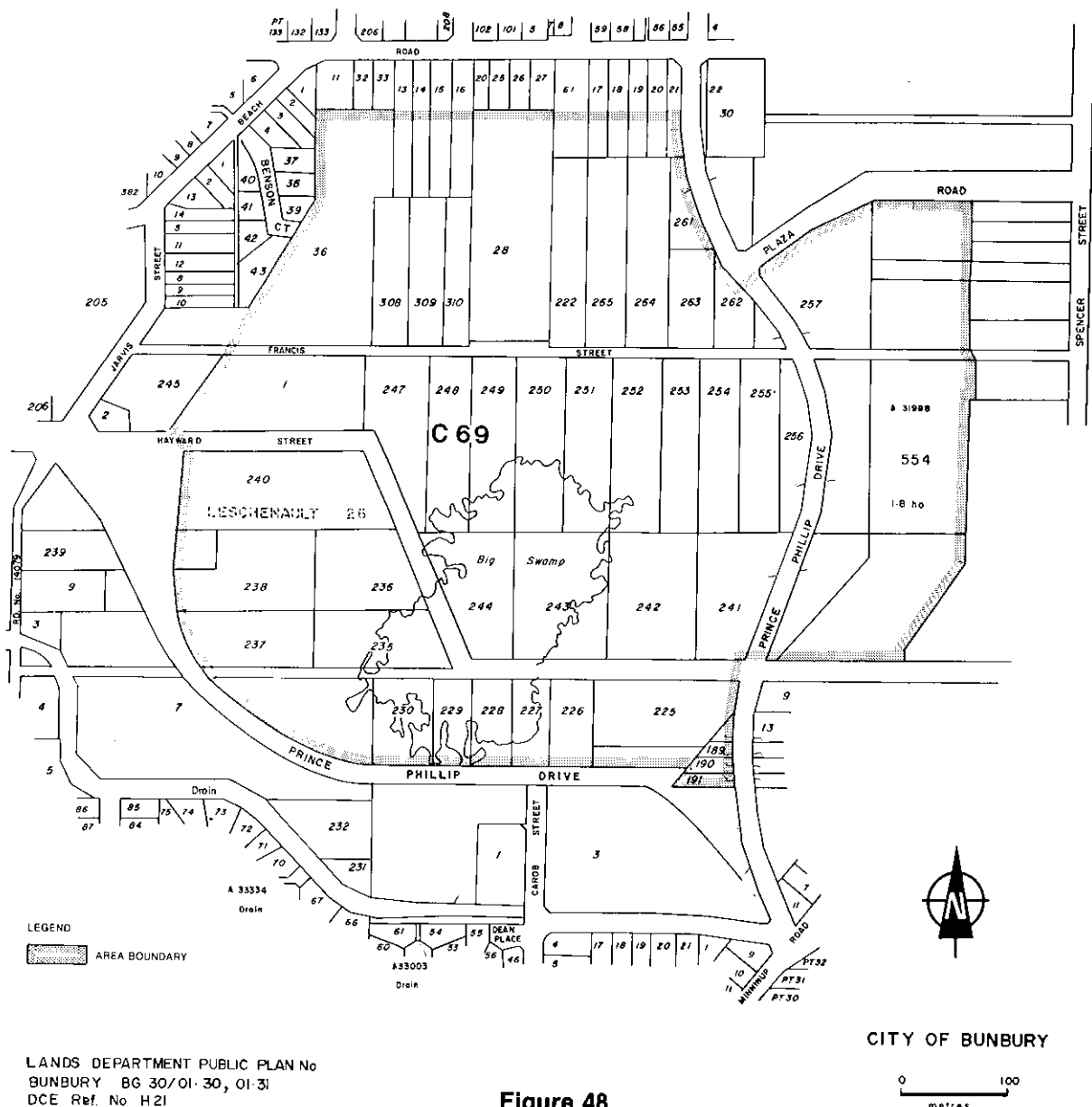


Figure 48

C70 SOUTH BUNBURY COASTAL LAND

The area comprises part of Reserve C670, for Endowment for Bunbury City, vested in the City of Bunbury; and parts of lots 301 to 304 (Leschenault Location 26), freehold land, owned by the City of Bunbury. It is situated about 5 km south of Bunbury (Figure 49).

The coastal land which forms part of Reserve C670 has vegetation ranging from open-heath to tall open-forest. There are high sand dunes which offer extensive views and which support open-heath, dominated by myrtle, acacia and cottonhead around their tops, with some low closed-forest of peppermint on their sides. In the valleys and to the east of the dunes there is tuart. This forms tall open-forest and tall woodland, with occasional jarrah and marri, with an understorey dominated by peppermint and slender banksia, and a very diverse groundstorey including buttercup, wild sarsaparilla and greenhood orchid. The dunes have been badly affected by off-road vehicles. This activity will eventually result in blowouts, unless it is controlled.

The area may be affected by future groundwater extraction and associated works. The Bunbury City Council is planning subdivision development in the area.

Recommendations

- C70.1 An area of Public Open Space, containing attractive and important features such as 'The Maidens' and important stands of tuart, should be set aside at the time of subdivision of the coastal land south of Bunbury.
- C70.2 The Bunbury City Council should prepare a programme for the planned subdivision, giving consideration to:
- the siting of Public Open Space so as to protect the coast and provide a buffer between the beach and proposed residential development at South Bunbury;
 - control of access to the beach by appropriate placement of car parks and pedestrian pathways;
 - protection of the coast by siting roads so that they do not run parallel to and continuously near the coast;
 - protection of sensitive areas by prohibiting or limiting access.

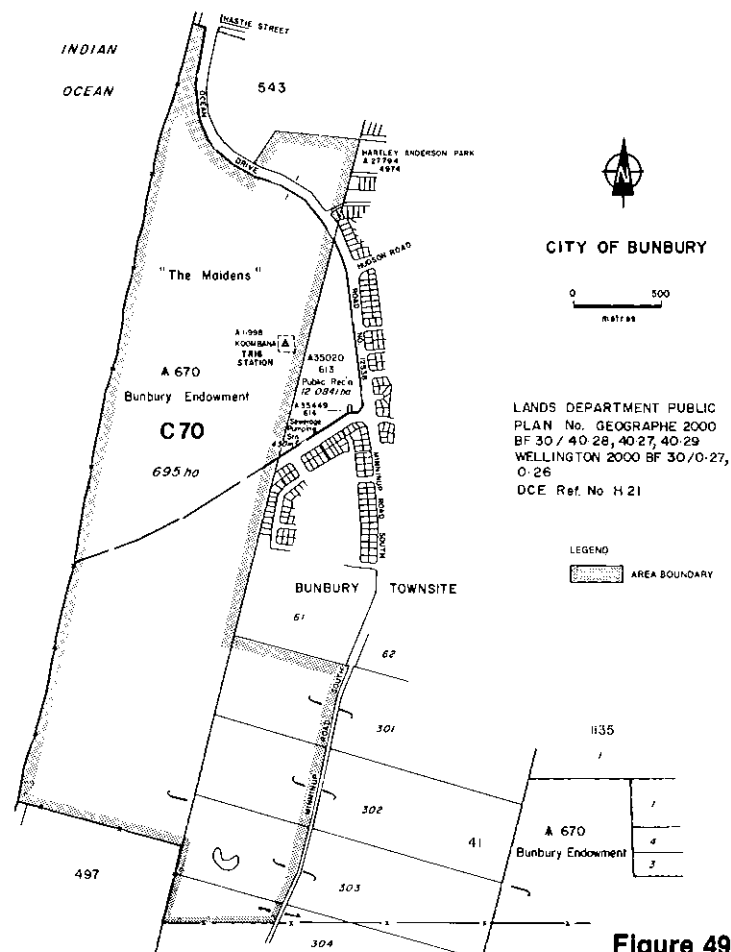


Figure 49

C71 RESERVES NEAR DALYELLUP

The area comprises Reserves A23000, for Travellers, Stopping Place and Caravan Park; and C28825 and C28836, both for Public Recreation; all vested in the Shire of Capel. It is situated about 10 km south of Bunbury (Figure 50).

The area carries open-forest of jarrah, marri, banksia, woody pear, peppermint and snottygobble, with a varied understorey which includes pixie mops, acacia, buttercup and purple flag. During spring the vegetation provides a colourful display beside the Bussell Highway, there being no similar area along the main roads of the district. Consequently the area has high tourist value.

Part of Reserve C28825 has been developed for sporting events. The area may be affected by future groundwater extraction and associated works as well as by road widening and a proposed road interchange. The area contains sandy limestone which may be required for upgrading of the Bussell Highway.

Recommendations

- C71.1 Subject to the agreement of the controlling body, the purpose of Reserve A23000 should be amended to Travellers, Stopping Place, Caravan Park, and Water.
- C71.2 Subject to the agreement of the controlling body, the purpose of Reserve C28825 and C28836 should be amended to Public Recreation and Water.
- C71.3 The Capel Shire Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:
- encouraging the growth and regeneration of local indigenous flora, especially along the Bussell Highway;
 - protecting the brush wallabies in the area.

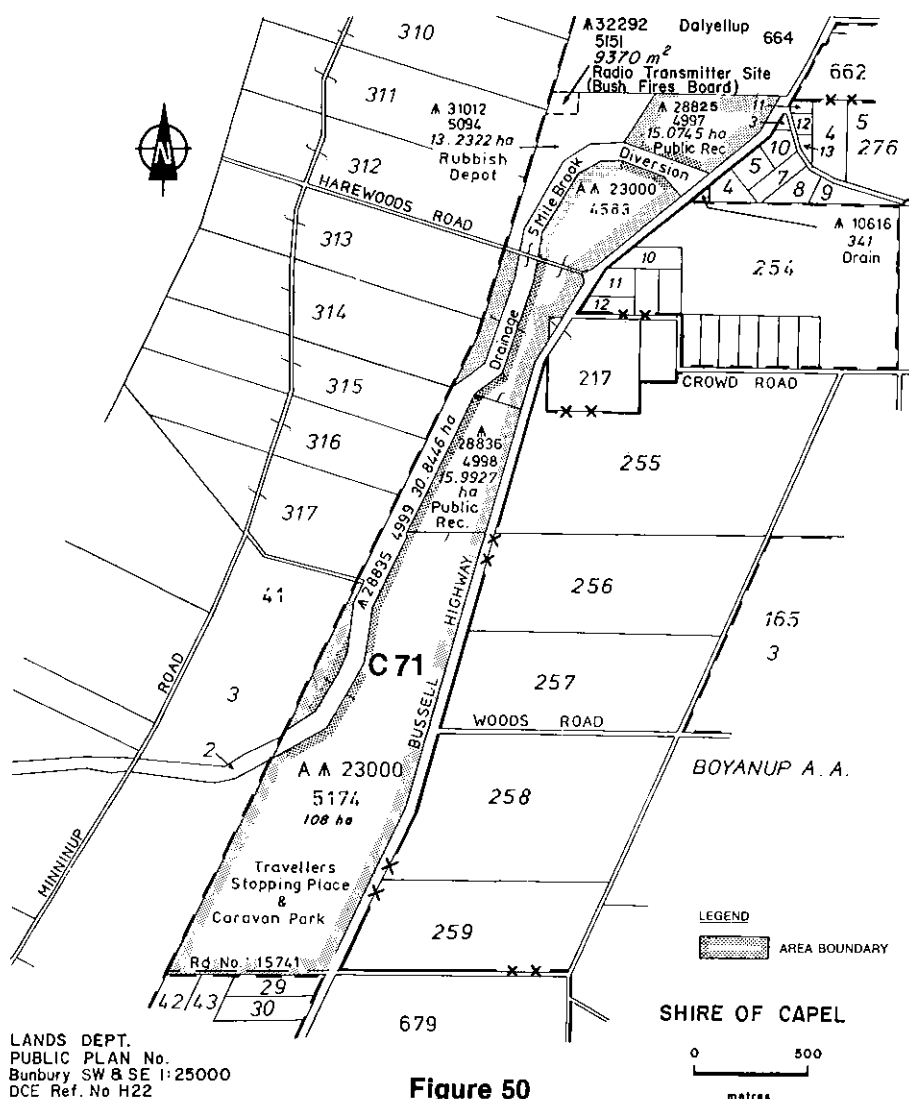


Figure 50

C72 TEESDALE MANAGEMENT PRIORITY AREA (MPA 3.7)

Teesdale MPA, managed by the Forests Department for the conservation of flora and fauna, comprises Reserves A5099, A5100 and A5101, for Parkland and Recreation, all vested in the Conservator of Forests; Reserve A5098, for Parkland and Recreation, not vested; that part of a foreshore reserve along the Murray River between Reserves A5098 and A5099; and Location 1055, privately owned freehold land. It is situated about 7 km south-west of Dwellingup (Figure 51).

The MPA's purpose is the conservation of a small stand of virgin jarrah-marri with a larger area of disturbed mixed valley forest.

The deeply dissected landscape typifies the western fringe of the Darling Scarp. Lateritic uplands predominate while a few granite outcrops occur. The area is drained by the Murray River. The MPA provides significant areas of upland and valley vegetation which are elsewhere threatened. In particular it provides the only area of uncut forest of jarrah and marri close to the escarpment and in the high rainfall area. It also includes a substantial area of high quality open-forest of yarri along the slopes of the Murray Valley. Most of the uplands are badly affected by dieback.

The MPA is well used for recreation. It provides access to the Murray River, established barbecue areas and footpaths. Recreation will increase and should be monitored for its effect on vegetation. The MPA's eastern section is within the Murray River Water Reserve, a potential source of water supply. This may be harnessed by a major dam near Reserve A5101 and might be coupled with a desalination plant further downstream. The MPA is affected by SEC lines and is within the Alcoa Mining Lease but has relatively little significance for bauxite mining. Road and bauxite conveyor access across the Murray Valley may need to be considered.

The concepts of 'wild' and 'scenic' rivers, as discussed in Chapter 5, are relevant.

Recommendations

C72.1 Reserve A5098 should be vested in the Conservator of Forests.

C72.2 Reserves A5098, A5099, A5100 and A5101 should be managed by the Conservator of Forests as if part of Teesdale Management Priority Area.

C72.3 The Forests Department, in consultation with the Metropolitan Water Board and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- including water as a purpose of management;
- only allowing recreation activities which are compatible with the conservation of flora and fauna;
- excluding off-road vehicles;
- establishing walk trails;
- the fact that this part of the river course is an important recreational resource.

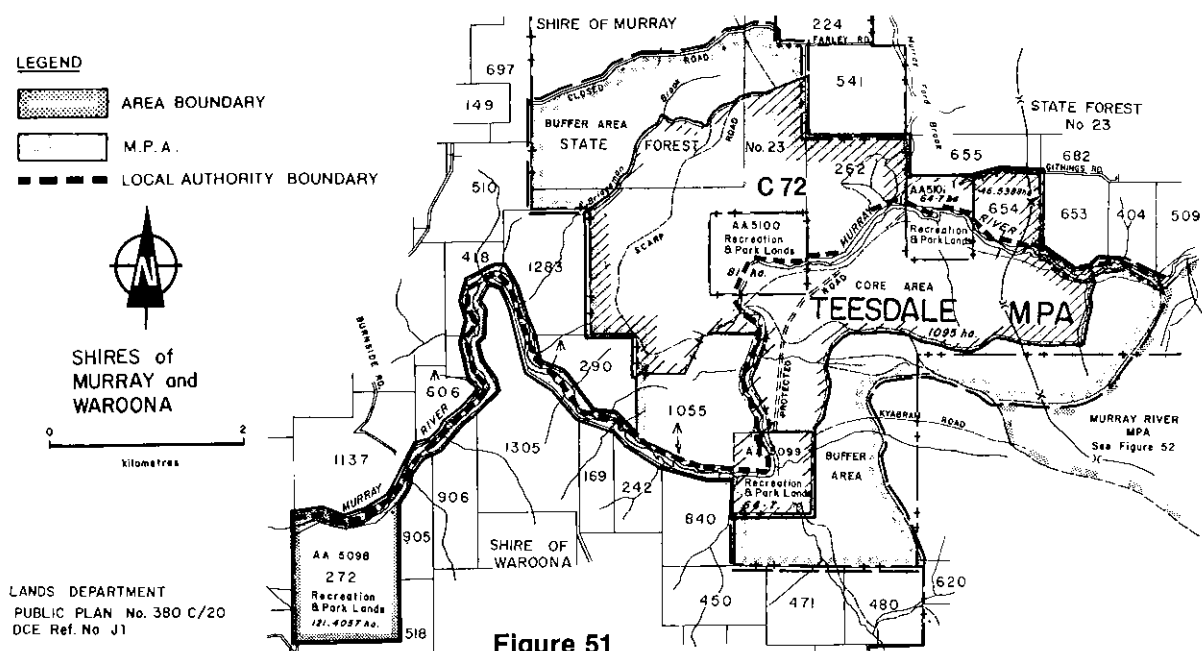


Figure 51

C73 MURRAY VALLEY MANAGEMENT PRIORITY AREA (MPA 3.3)

The area comprises Murray Valley MPA, managed by the Forests Department for recreation; Reserve A5102, for Recreation and Parklands, vested in the Conservator of Forests; and Locations 797 and 841, privately owned freehold land. It is situated about 10 km south of Dwellingup (Figure 52).

The vegetation includes open-forest of jarrah-marri and yarri-marri-jarráh, woodland of flooded gum and melaleuca on the valley floor, and shrublands and lithic complexes associated with granitic outcrops.

The Murray River is the last large undammed stream within the day-use zone south of Perth. It is also readily accessible by road from urban centres at Pinjarra, Mandurah and Bunbury, and so has important recreational value. The section of the Murray River within the MPA provides opportunities for picnics, sightseeing, bushwalking, canoeing and fishing. The level of marron fishing has increased substantially over the past six years, and the Murray also remains the most prolific trout stream north of the Pemberton area. A long section of the Bibbulmun Track traverses the MPA.

In the north of the MPA vehicular access is good, with roads near both banks of the Murray River, which consists largely of long pools and small rapids suitable for simple canoeing. There are picnic areas east of Nanga, at Island Pool and at Reserve A5102. In the MPA south of Yarragil Brook, vehicular access is limited by lack of proper roads, and the dieback quarantine zone east of the Murray River. A Recreation Management Plan, involving zoning for recreational use, is being prepared by the Forests Department. Restrictions under the plan will be greatest in areas of dieback quarantine.

Due to the scenic qualities of the MPA, and the wider range of popular recreational activities it can cater for, the concepts of 'regional parks' and 'scenic rivers', as discussed in Chapter 5, are relevant.

The area is within the Murray River Water Reserve, and a substantial part of it will be inundated if the river is dammed in the future, probably at a site in the Teesdale MPA which lies to the north-west. The MPA lies within the Alcoa Mining Lease and has some bauxite potential in the fringing upland areas. It could be affected by mining strategies which involve transporting ore across the Murray River Valley.

Recommendations

- C73.1 The Forests Department should consult the Department for Youth, Sport and Recreation and the Metropolitan Water Board, in the development of its management programme for the Murray Valley Management Priority Area.
- C73.2 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

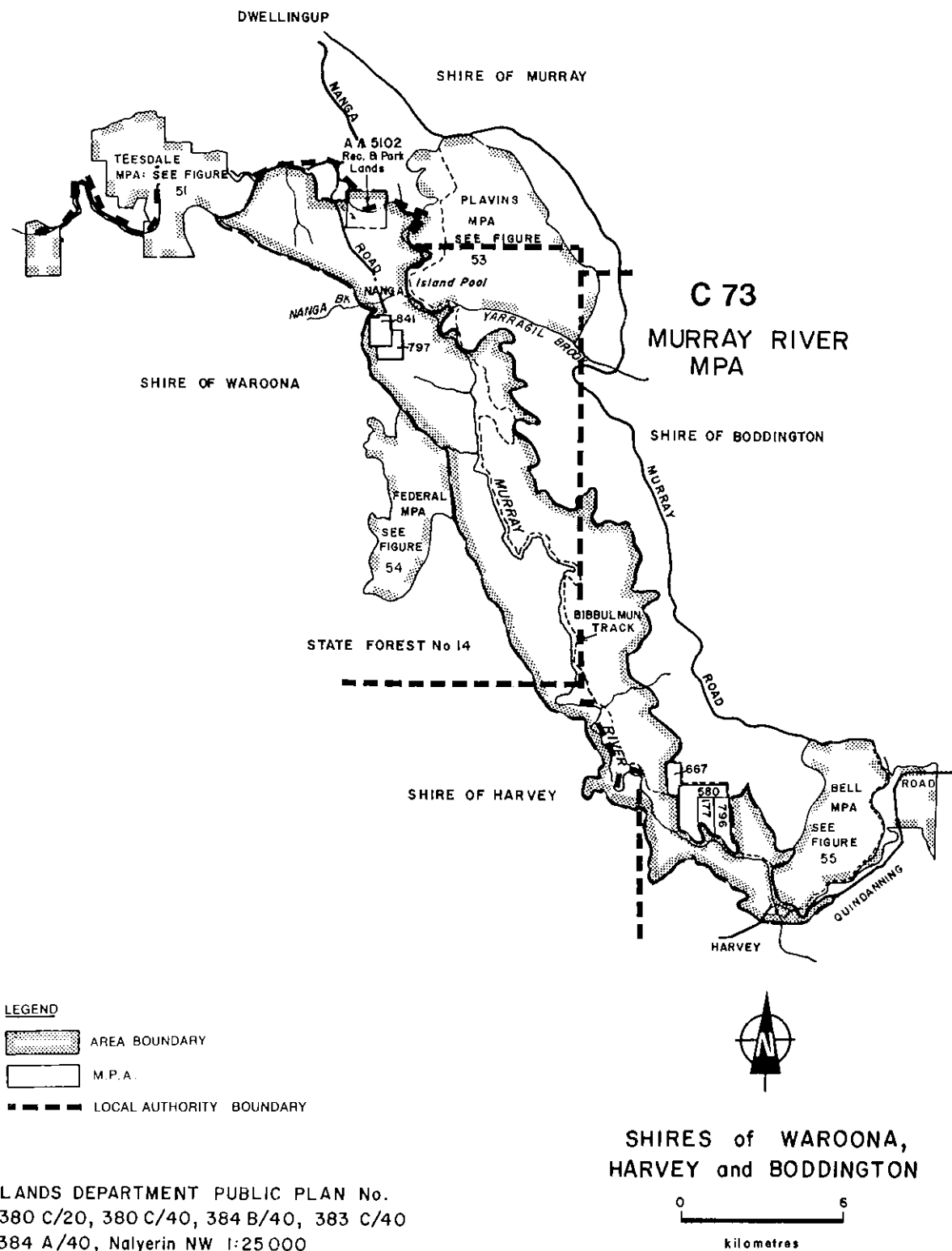


Figure 52

C74 PLAVINS MANAGEMENT PRIORITY AREA (MPA 3.6)

Plavins MPA, managed by the Forests Department for conservation of flora and fauna, is situated about 5 km south-east of Dwellingup (Figure 53).

The MPA's purpose is to preserve the valley vegetation of the high rainfall zone and to ensure survival of river banksia and of jarrah-marri tall open-forest characteristic of the moderately dissected lateritic uplands.

The MPA with its dissected landscape, is typical of the higher rainfall area of the western fringe of the Darling Range. The ridges are lateritic and loams predominate in the gullies.

The MPA incorporates a large area of tall open-forest of jarrah and marri that is of high quality and unaffected by dieback. Along Swamp Oak Brook there is an extensive stand of river banksia, a species which occurs in localised patches in the high rainfall area on the western fringe of the Darling Range and which is in danger from the effects of dam construction and dieback. The vegetation types of the Murray Valley, one of the last major valleys not yet flooded for water supply, are well represented. The area is under forest quarantine, dieback having been recorded on the eastern and northern fringes of the MPA. Logging occurred prior to 1940, with little impact on steep slopes in the southern section. Part of the perimeter of the MPA is used extensively for passive and active recreation.

Plavins MPA is within the Murray River Water Reserve, a potential source of water supply. Part of the MPA will be inundated if a major dam is built on the Murray River, or alternatively, if smaller dams are built on Swamp Oak, Davies and/or Yarragil Brooks. Public access would then be restricted by Catchment Zone regulations. The area is within the Alcoa Mining Lease and is highly significant for mining in the medium term. Over half of the bauxite occurs in the buffer area and one third in the north-east section, including portions of both core and buffer areas.

The concepts of 'wild' and 'scenic' rivers, as discussed in Chapter 5, are relevant.

Recommendation

C74.1 The Forests Department, in consultation with the Metropolitan Water Board and the Department for Youth, Sport and Recreation, should prepare a management programme giving consideration to:

- (a) potential use of water resources;
- (b) recreation activities;
- (c) the fact that this part of the river course is an important recreational resource.

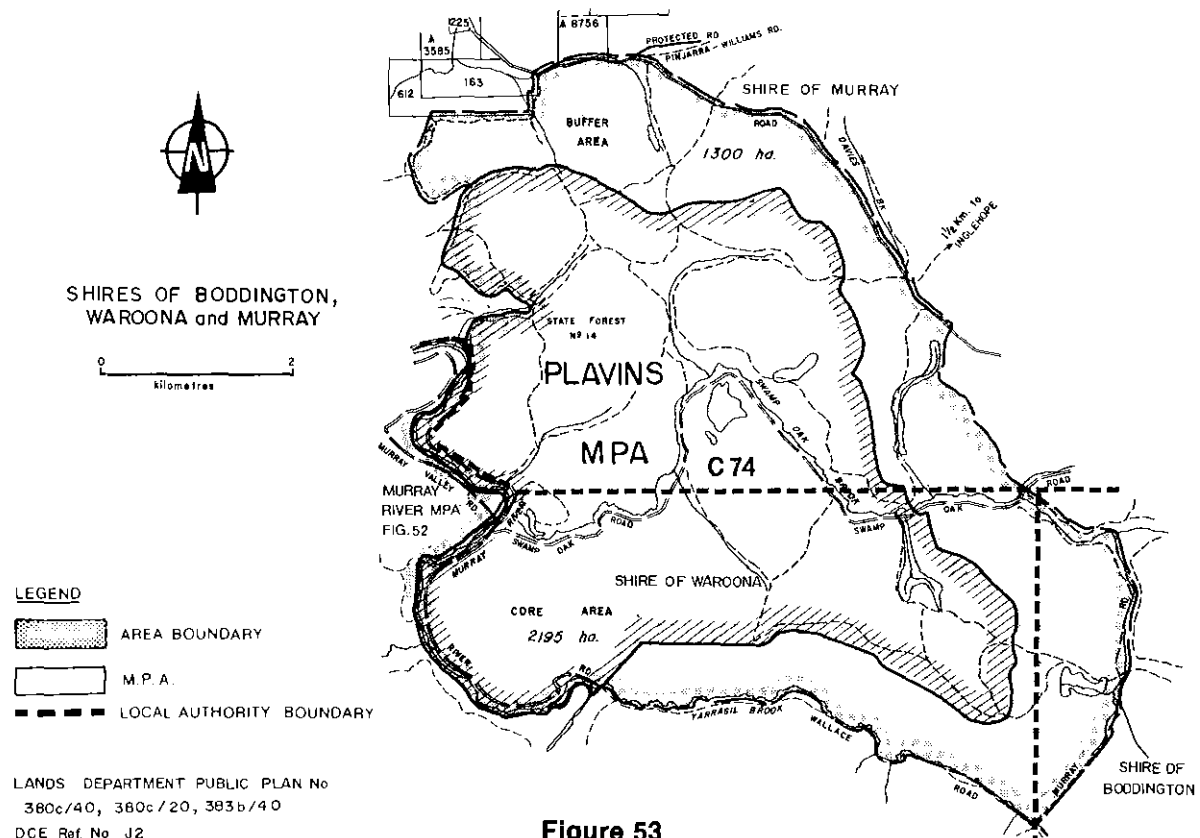


Figure 53

C75 SAMSON MANAGEMENT PRIORITY AREA (MPA 10.5)

Samson MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 22 km south of Dwellingup (Figure 54).

The MPA's purpose is to conserve the best stands of bullich in the Darling Range.

Samson MPA has lateritic uplands, which support open-forest of yarri, jarrah and marri, and extensive and outstanding bullich stands which are the best to be found anywhere. There is some dieback in the area, mainly in the valleys.

Due to its proximity to the Samson Dam, which is used for water-based recreational activities such as fishing and canoeing, the MPA is subject to considerable visitor pressure during some seasons. Because of dieback, access to the core should be controlled to minimise further deterioration of the area's outstanding vegetation.

The MPA is within the Samson Brook Reservoir Catchment, a source of water supply. Public access is restricted by Catchment Zone regulations. The area is affected by an SEC line route. It is within the Alcoa Mining Lease and has considerable medium term significance for bauxite mining. The effects of any mining on the stands of bullich should be carefully considered.

Recommendation

C75.1 The Forests Department, in consultation with the Public Works Department, should prepare a management programme.

C76 FEDERAL MANAGEMENT PRIORITY AREA (MPA 10.4)

Federal MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 20 km south of Dwellingup (Figure 54).

The MPA's purpose is to preserve a representative sample of high quality forest dominated by yarri.

Federal MPA includes a variety of soils, landforms and vegetation. It has an extensive area of lightly logged and relatively undisturbed open-forest of yarri, which elsewhere has been cleared for agriculture, logged, or flooded by damming of valleys. River banksia, which elsewhere has also been affected by flooding of valleys, is found in isolated patches. Some bullich occurs along the creeks in the southern section. The area, some portions of which were logged in the 1930s, is under forest quarantine. It has seldom been used for recreation.

The MPA is within the Murray River Water Reserve, a potential source of water supply. If a major dam is built on the Murray River, public access would be restricted by Catchment Zone regulations. The area is within the Alcoa Mining Lease and has considerable long term significance for bauxite mining. The effects of any mining on the stands of yarri should be carefully considered.

Recommendation

C76.1 The Forests Department, in consultation with the Metropolitan Water Board, should prepare a management programme.

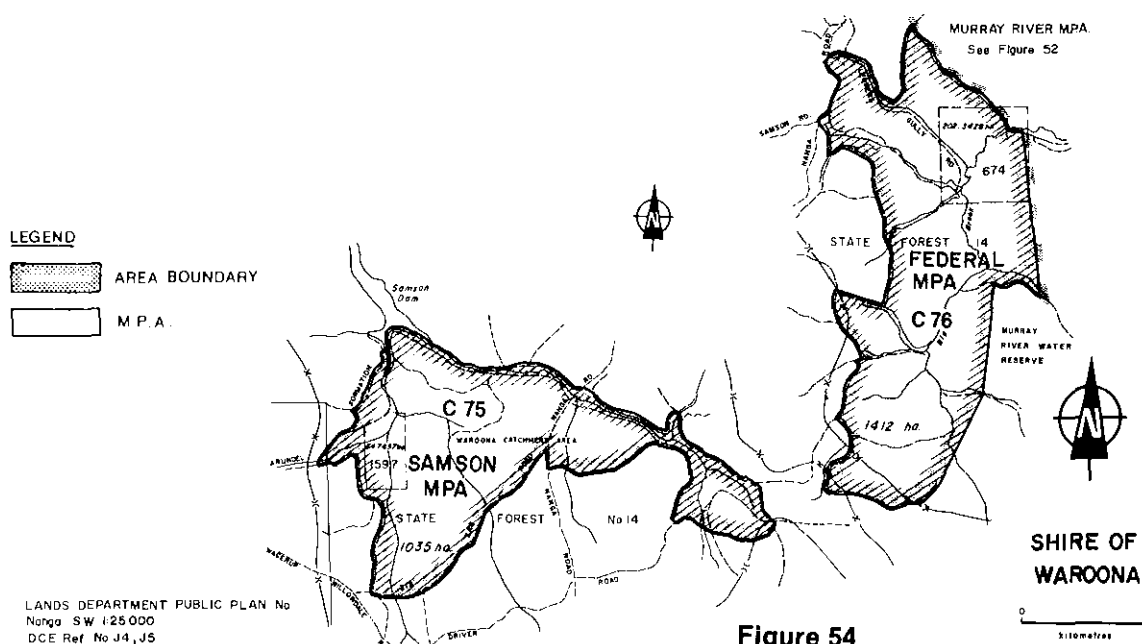


Figure 54

C77 BELL MANAGEMENT PRIORITY AREA (MPA 10.3)

Bell MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 35 km south-east of Dwellingup (Figure 55).

The MPA's purpose is to conserve vegetation types.

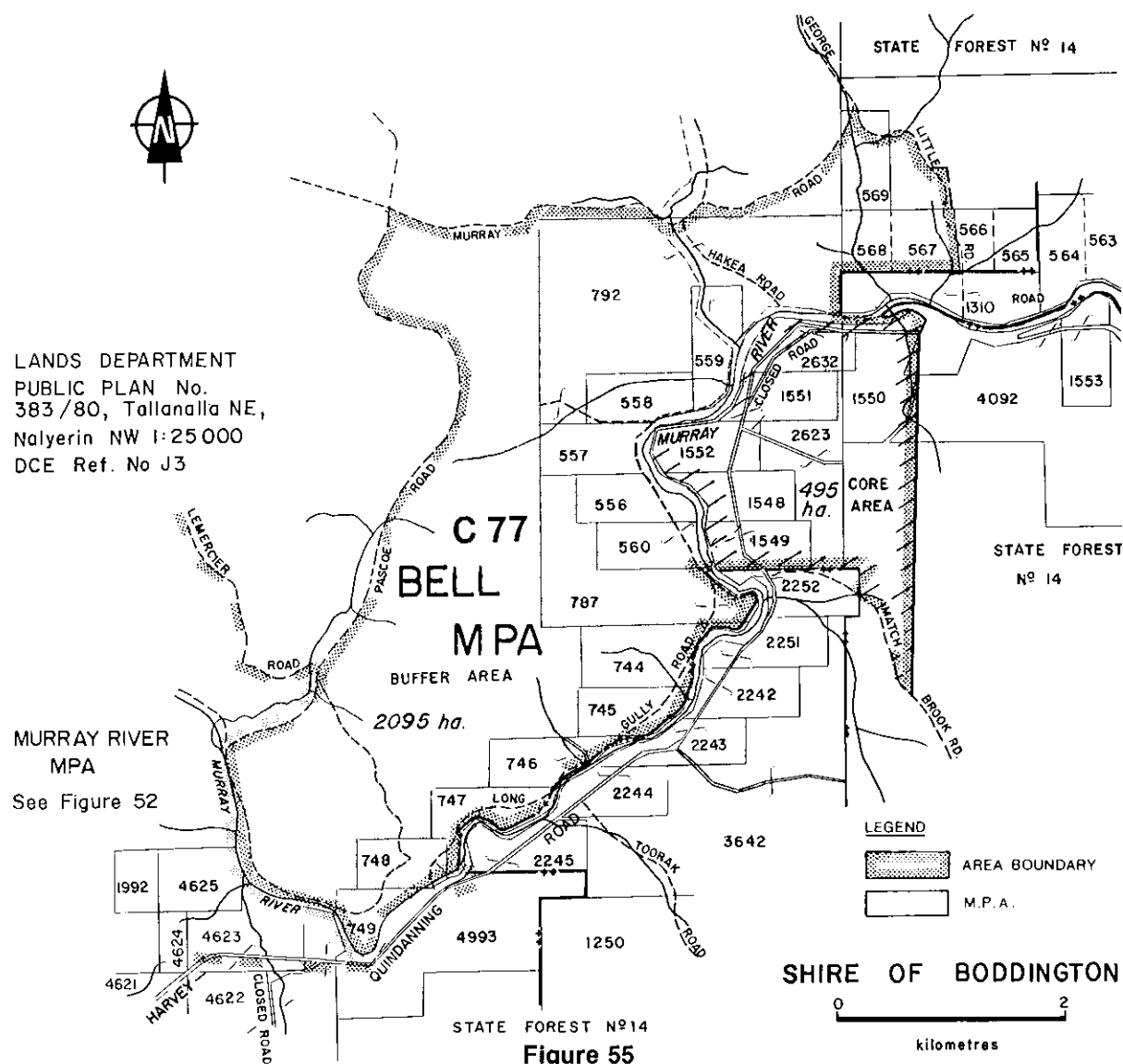
The MPA has lateritic uplands and sloping valleys and is drained by the Murray River. It has a range of vegetation complexes both on the uplands and in the gullies. It is one of the few examples of a major valley along the eastern perimeter of the State Forest.

The most outstanding features of Bell MPA are the largely undisturbed woodlands of wandoo and open-forest of jarrah in the north-eastern section. Areas of low closed-forest of swamp paperbark and flooded gum and localised patches of river banksia are also significant. The area is under forest quarantine, although dieback is restricted to the gullies. The forest of the eastern section is virtually undisturbed but the western section has been recently logged.

Bell MPA is within the Murray River Water Reserve and the Bell Brook Catchment, potential sources of water supply. The area may in the future be affected by MWB development on Bell Brook and by headwaters of the proposed Murray River Reservoir which, if built, would inundate a small portion of the area. There are SEC lines along the eastern boundary and another line is proposed. The MPA is within the Alcoa Mining Lease but has relatively low long term potential for bauxite mining. The area is affected by an existing claim for titaniferous magnetite.

Recommendation

C77.1 The Forests Department, in consultation with the Metropolitan Water Board, should prepare a management programme.



C78 RESERVE C22977, HARVEY

Reserve C22977, for Common, vested in the Shire of Harvey, is situated on a tributary of the Harvey River, about 2 km north-east of Harvey (Figure 56).

The Reserve incorporates the unique vegetation of the Darling Scarp, including herblands, shrublands and low open-woodland of wandoo and marri. There are a few occurrences of the rare butter gum.

Since the flora of the Scarp varies considerably in composition from north to south, and a large section of the Scarp has already been disturbed by various activities, it is vital that areas should be reserved along the length of the Scarp for conservation.

Recommendation

C78.1 Subject to the agreement of the controlling body, the purpose of Reserve C22977 should be amended to Conservation of Flora and Fauna and the Reserve should be vested jointly in the Shire of Harvey and the W.A. Wildlife Authority.

C79 RESERVE C15515, HARVEY

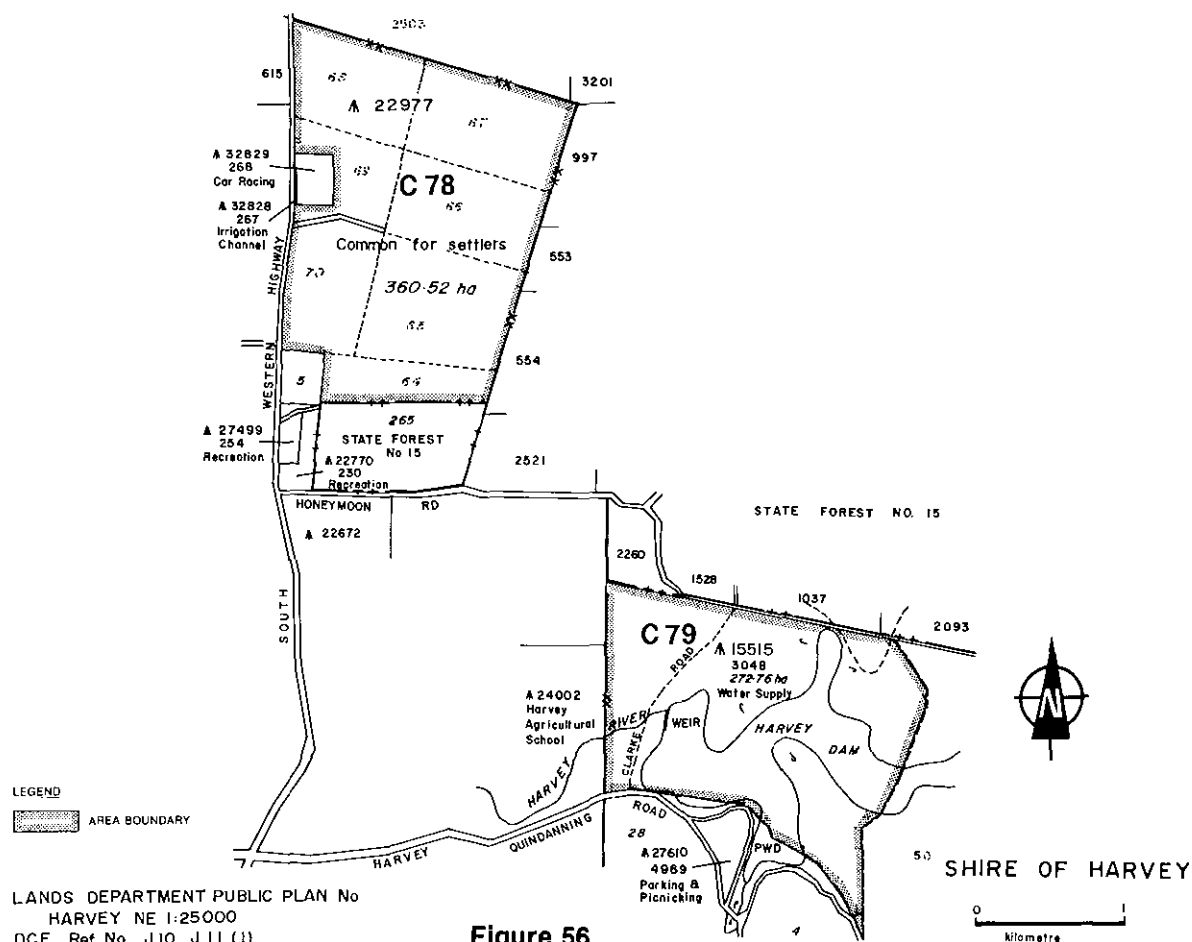
Reserve C15515, for Water Supply, vested in the Minister for Water Resources, is situated about 3 km east of Harvey (Figure 56).

The Reserve is largely covered by open-forest of jarrah and marri, with smaller occurrences of yarri in the gullies. An interesting feature is the presence of peppermint in several gullies.

A large portion of Reserve C15515 could be inundated by a proposed new Harvey Dam. The area is within the Alcoa Mining Lease, but has negligible significance for bauxite mining. Pines have been planted by the Forests Department in the northern part of the Reserve.

Recommendation

C79.1 The Public Works Department, in consultation with the W.A. Wildlife Authority, should ensure that conservation of flora and fauna is given adequate consideration in the management of Reserve C15515.



C80 RESERVES EAST OF HARVEY

The area comprises Reserves C10745, for Preservation of Beauty Spot, C14564, for Timber for Settlers, C22797, for Conservation of Flora and Fauna, and C22958 for Public Utility, all not vested. It is situated about 9 km east of Harvey (Figure 57).

The Reserves support open-forest of jarrah and marri with some yarri in the gullies. The vegetation in the area is poorly represented elsewhere in System 6. Mining, intensive forestry and agriculture, as well as the occurrence of dieback, threaten large sections of the high rainfall area of the western fringe of the Darling Range. Therefore it is important that the area should be reserved for conservation.

The area is within the Harvey River Catchment, and public access is restricted by PWD Catchment Zone regulations. It may be affected by a proposed SEC line. The area is within the Alcoa Mining Lease, but has little potential for bauxite mining.

Recommendations

- C80.1 Reserve C22797 should be vested in the W.A. Wildlife Authority.
- C80.2 Reserve C10745 should be cancelled and its area added to Reserve C22797.
- C80.3 The purpose of Reserve C14564 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the W.A. Wildlife Authority.
- C80.4 Reserve C22958 should be cancelled and its area added to Reserve C14564.
- C80.5 The W.A. Wildlife Authority should negotiate with the State Energy Commission to determine a satisfactory route for the proposed State Energy Commission line.

C81 RESERVE C25727, HARVEY

Reserve C25727, for Water Supply, vested in the Minister for Water Resources, is situated about 14 km south-east of Harvey (Figure 57).

The Reserve is largely covered by open-forest of jarrah and marri, with smaller occurrences of yarri in the gullies. An interesting feature is the presence of peppermint in several gullies.

Pines have been planted by the Forests Department in the southern part of the Reserve.

Recommendation

- C81.1 The Public Works Department, in consultation with the W.A. Wildlife Authority, should ensure that conservation of flora and fauna is given adequate consideration in the management of Reserve C25727.

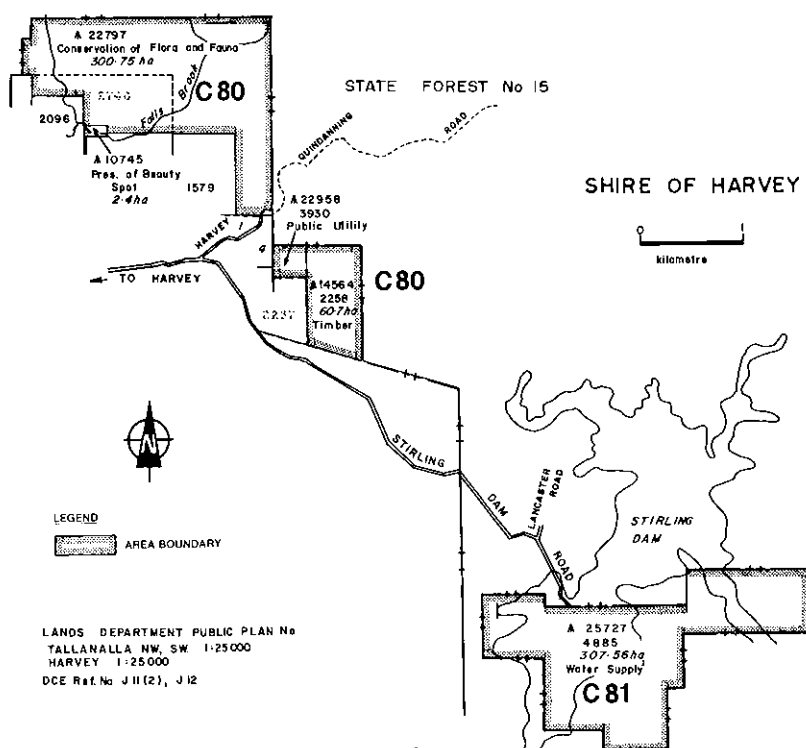


Figure 57

C82 SURFACE MANAGEMENT PRIORITY AREA (MPA 10.6)

The area comprises Surface MPA, managed by the Forests Department for the conservation of flora and fauna; and locations 935 and 2827, privately owned freehold land. It is situated about 25 km north-east of Collie (Figure 58).

The MPA's purpose is to conserve the largest area of virgin jarrah forest remaining north of the Blackwood River.

Surface MPA is among the larger reserves in State Forest. It contains lateritic uplands, which support open-forest of jarrah and marri, broad valleys and extensive sandy flats. A remarkable feature of the MPA is the extensive areas of swamp vegetation, including sedgelands, shrublands and open-woodland of banksia, associated with the valley floors. These, combined with the swamps of the adjacent Nalyerin and Trees MPAs, provide an excellent wildlife refuge. Swamp cypress and woody pear, which occur in the swamps, are uncommon and poorly represented in State Forest of the Darling Range. The MPA contains the largest remaining area of uncut jarrah forest north of the Blackwood River, logging having been restricted to the buffer zone. Dieback is so far not widespread and the entire area is under forest quarantine.

Most of Surface MPA is within the catchments of the Harris and Bingham Rivers, the northern section being within the catchments of Bell and Chalk Brooks. If a major dam is built on the Murray River or a pipehead dam on Chalk Brook, public access may be restricted by Catchment Zone regulations. There are SEC lines in the area and more are proposed. The MPA is within the Alcoa Mining Lease but has relatively low priority for bauxite mining. Due to its extremely high value for conservation and as a water resource, Alcoa should consider withholding mining indefinitely, provided that no major change in the condition of the vegetation occurs, making it unsuitable for conservation.

Recommendation

C82.1 The Forests Department, in consultation with the Metropolitan Water Board, the Public Works Department and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

C83 NALYERIN MANAGEMENT PRIORITY AREA (MPA 10.7)

Nalyerin MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 55 km east of Harvey (Figure 58).

The MPA's purpose is to conserve the flora and fauna of Lake Nalyerin.

Much of the MPA consists of lateritic uplands. Because of its variety of soils and variation of rainfall, the MPA incorporates a range of vegetation. There are extensive areas of swamp vegetation, comprising sedgelands, shrublands and open-woodlands of paperbark and swamp banksia. A significant feature is a stand of limestone marlock, a species not common in the Darling Range. The occurrence of areas of open-forest of jarrah, with understorey species including blueboy, Christmas tree and *Caustis dioica*, is significant as this particular association of species is poorly represented in System 6. The MPA includes Lake Nalyerin, a major seasonal lake which is of importance to fauna. The difficulty of access to the area, and its proximity to other MPAs, enhance its conservation value. The MPA is under forest quarantine, but dieback is restricted.

The northern section is within the Murray River Water Reserve and the southern section within the Harris River Catchment. Public access is restricted by PWD Catchment Zone regulations. In the event of a major dam being constructed on the Murray River, or a pipehead dam on Bell Brook, access will be further restricted. There are SEC lines in the area, and more are proposed. The MPA is within the Alcoa Mining Lease and has some long term potential for bauxite mining. Due to its extremely high value for conservation and as a water resource, Alcoa should consider withholding mining indefinitely, provided that no major change in the condition of the vegetation occurs, making it unsuitable for conservation.

Recommendation

C83.1 The Forests Department, in consultation with the Metropolitan Water Board and the Public Works Department, should prepare a management programme.

C84 TREES MANAGEMENT PRIORITY AREA (MPA 4.1)

The area comprises Trees MPA, managed by the Forests Department for the conservation of flora and fauna; Reserves A4555 and A7675, both for Resting Place for Travellers and Stock, and C6902, for Water, all not vested; and Locations 500, 1561, 1562, 1582, 1583, 2599, 2699, 2700, 3154, 3155, 3160, 3170, 3616, and 4178, being freehold land, owned by the PWD. It is situated about 55 km east of Harvey (Figure 58).

The MPA's purpose is to conserve a viable sample of virgin jarrah forest.

The area has a wide variety of soils, landforms and vegetation. The dominant vegetation types of the lateritic uplands consist of open-forest of jarrah and marri with understorey shrubs such as honeybush and *Hakea* species. The valleys contain vegetation of more varied structure, including sedgelands, shrublands, open-woodland of paperbark and banksia, open-forest of jarrah and marri and woodland of wandoo. The MPA is significant for its relatively undisturbed areas of uncut jarrah forest and the range of vegetation types present that are free from dieback. The area is under forest quarantine.

The significant features of the PWD property and Reserves A4555 and A7675 are the open-forest of jarrah and marri, extensive stands of wandoo, and the swamp vegetation. Addition of these lands to the MPA would increase its area by about 4500 ha. The conservation value of this and adjacent MPAs would thus be significantly increased. The PWD property was purchased to prevent further clearing, and the cleared portions are being used in partial reforestation trials.

The area is within the catchments of the Williams and Bingham Rivers. Public access is restricted by PWD Catchment Zone regulations. There are SEC lines in the area and more are proposed. The MPA may be affected by future widening or realignment of the Collie-Williams Road. It is within the Alcoa Mining Lease, and has some long term potential for bauxite mining. Due to the area's extremely high conservation value, Alcoa should consider withholding mining indefinitely, provided that no major change in the condition of the vegetation occurs, making it unsuitable for conservation.

Recommendations

- C84.1 The purposes of Reserves A4555, A7675 and C6902 should be amended to Conservation of Flora and Fauna and the Reserves should be vested in the Conservator of Forests and managed as if part of Trees Management Priority Area.
- C84.2 The freehold land, owned by the Public Works Department, should be managed as if part of Reserve A4555.
- C84.3 The Forests Department, in consultation with the Public Works Department, should prepare a management programme.

C85 STENE MANAGEMENT PRIORITY AREA (MPA 10.8)

Stene MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 40 km north-east of Collie (Figure 58).

The MPA's purpose is to conserve virgin wandoo woodland and jarrah forest of the eastern, low rainfall zone.

The area is undulating with dissected lateritic slopes and flat-floored valleys. The vegetation includes woodlands of wandoo and uncut open-forest of jarrah. Some of the woodlands of wandoo have an admixture of rock sheoak, occurring in shallow soils near granite outcrops, and jam. In poorly drained areas minor swamps also occur.

An important feature of the area is the inclusion of the eastern valley systems, which are poorly represented elsewhere in System 6, due to agricultural development. Because of its isolation, the MPA has been little disturbed although some trucks travel through it. As yet, no dieback has been recorded in the area. The conservation value of this MPA is increased by its proximity to other MPAs.

The area is within the catchments of the Williams and Bingham Rivers and public access is restricted by PWD Catchment Zone regulations. It is within the Alwest Agreement Area, but the bauxite potential has yet to be assessed in detail.

Recommendation

- C85.1 The Forests Department, in consultation with the Public Works Department, should prepare a management programme giving consideration to the provision of access to reforestation trials.

C86 DARDANUP MANAGEMENT PRIORITY AREA (MPA 4.4)

The area comprises Dardanup MPA, managed by the Forests Department for the conservation of flora and fauna, and Reserve C2029, for Quarries, not vested. It is situated about 6 km south-east of Dardanup (Figure 59).

The MPA's purpose is to conserve the northern extension of the Donnybrook Sunkland vegetation. Vegetation on the lateritic slopes and uplands of the MPA includes open-forest of jarrah and marri, with an understorey containing bull banksia, sheoak, snottygobble and woody pear. The valleys support a wide variety of vegetation including woodlands of banksia and paperbark, with typical understorey species being basket flower, black gin, semaphore sedge and blueboy. In moister areas there are woodlands of yarri, bullich and swamp banksia, with understoreys containing pineapple bush and white myrtle. Areas of low open-forest to open-forest of mountain gum, jarrah and marri, with a definite second storey of banksia species, are present on the western fringe of the MPA. This association, which is threatened by sand mining, is not represented in any other reserve in System 6. The area also contains the only extensive stands of mountain gum in System 6.

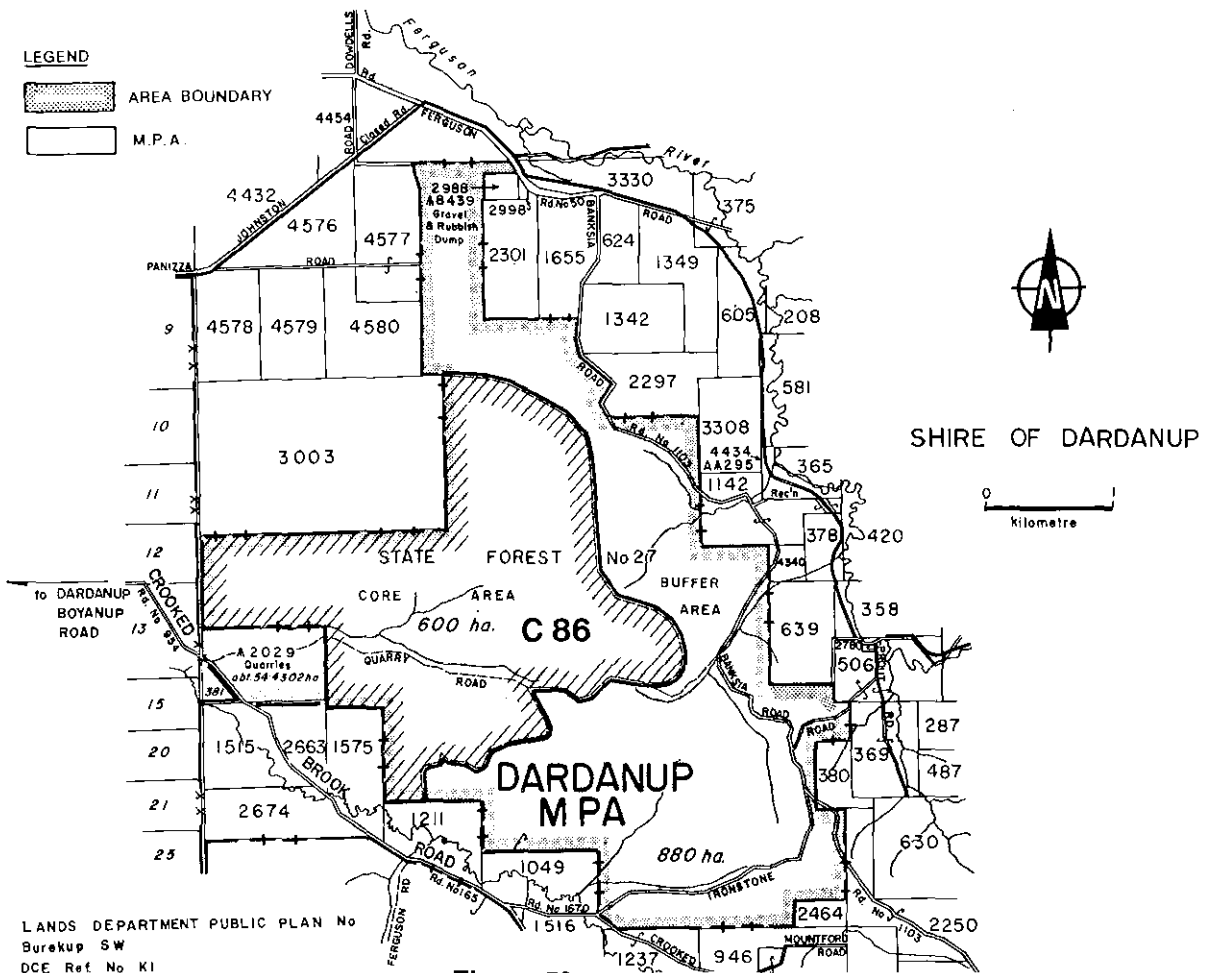
Although much of the vegetation represented in the MPA is susceptible to dieback, the area is relatively free of infection. Recreation is not significant in the MPA but may increase in the future. Planning should allow for recreation activities which will not spread dieback.

The southern extremity of the MPA abuts Crooked Brook, a potential source of water supply. A very small portion of the area may be affected by a proposed reservoir on Crooked Brook. The western third of the MPA has potential for gravel and heavy mineral sand, and there are several mineral claims.

The Dardanup Shire Council has received a proposal that Reserve C2029 should be developed as a public golf course.

Recommendation

C86.1 Reserve C2029 should be vested in the Conservator of Forests and managed as if part of Dardanup Management Priority Area.



C87 LENNARD MANAGEMENT PRIORITY AREA (MPA 4.2)

The area comprises Lennard MPA, managed by the Forests Department for the conservation of flora and fauna, and Reserve C19641, for School Site, not vested. It is situated about 30 km south of Harvey (Figure 60).

The MPA's purpose is to conserve the valleys with high quality yarri, the upland jarrah-marri forest and substantial areas of the lithic complex near Mt. Lennard.

The MPA has lateritic uplands and incised valleys. It is drained by the Collie River and carries forest of yarri, jarrah and marri. The understorey on the lateritic uplands includes banksia, snottygobble and some sheoak, and on the valley floors and on granitic outcrops it consists of shrublands of hakea and grevillea, with herblands, lichens and mosses. An outstanding feature of the area is the valley vegetation of yarri, peppermint and river banksia. Elsewhere, this association has been largely eliminated or reduced by damming of rivers, clearing for agriculture and planting of pines. Much of the area was logged before 1920. Dieback is restricted to the gullies. The MPA has high conservation value. That part of Wellington Location 51 which is on both sides of Mornington Road contains relatively undisturbed areas of jarrah and marri, with stands of bullich and yarri in the gullies.

Recreation in the area is mainly canoeing, marroning, picnicking and trail-bike riding. There are some footpaths and scenic drives. The area has also been used for army training. In future, recreation should be controlled by zoning, to reduce impact upon the vegetation, and army training should be transferred elsewhere or restricted to foot work. The Dardanup Shire Council has suggested that the boundary of the recreation area should be on the northern rather than southern bank of the Collie River, to provide full protection for the river.

The Lower Collie Valley provides a valuable recreation area for people from the Collie-Bunbury area, and its terrain, river bed and fringing vegetation are particularly attractive. The concepts of 'regional parks' and 'scenic rivers', as discussed in Chapter 5, are relevant.

The area is affected by PWD pipelines, and part could be inundated by a dam which may be built on the lower Collie River at Burekup. If the development were to be undertaken, public access will need to be controlled by Catchment Zone regulations. Realignment of the Roelands-Lake King Road may also affect the area. It is within the Alcoa Mining Lease, but has relatively low long term priority for bauxite mining.

Recommendations

- C87.1 Reserve C19641 should be vested in the Conservator of Forests and managed as if part of Lennard Management Priority Area.
- C87.2 The Forests Department, in consultation with the Public Works Department and the Department for Youth, Sport and Recreation, should prepare a management programme for recreation.

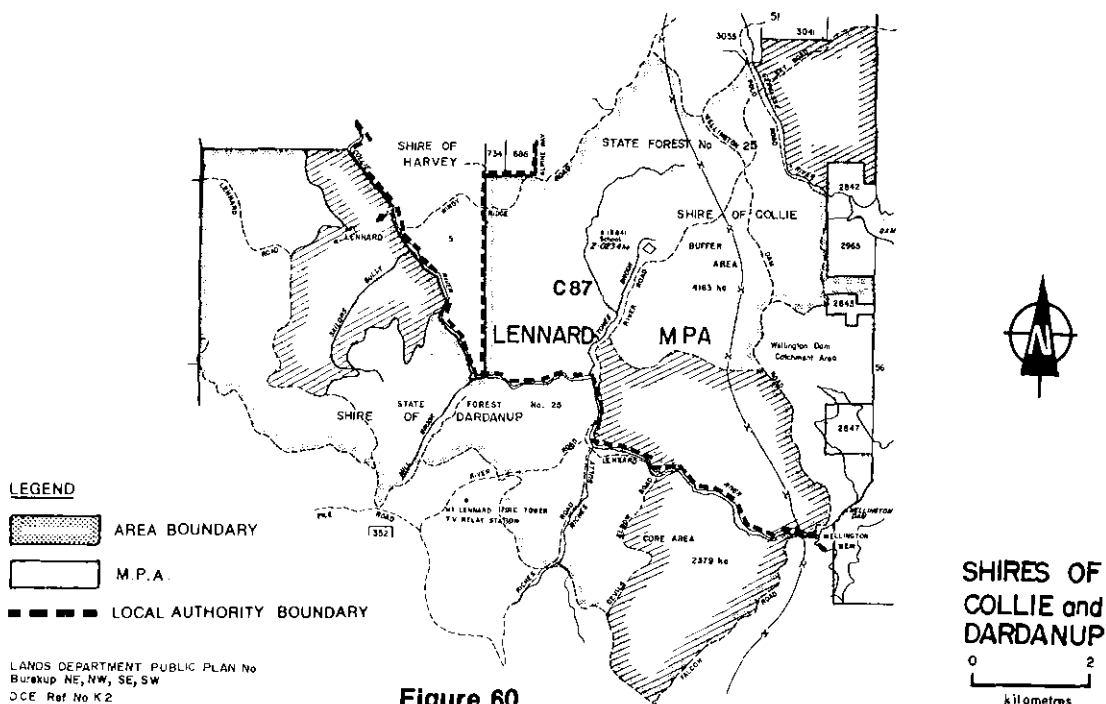


Figure 60

C88 WESTRALIA MANAGEMENT PRIORITY AREA (MPA 4.3)

The area comprises Westralia MPA, managed by the Forests Department for the conservation of flora and fauna; Reserves C6911, for Sanitary Depot, C10014, for Rifle Range, and C22690 for Native Flora, all not vested; and Wellington Location 3675, privately owned freehold land. It is situated immediately west of Collie, abutting the Collie River upstream from Wellington Dam (Figure 61).

The MPA's purpose is to conserve vegetation types, the small area of vegetation that typifies the Collie Basin and jarrah-marri-yarri forests.

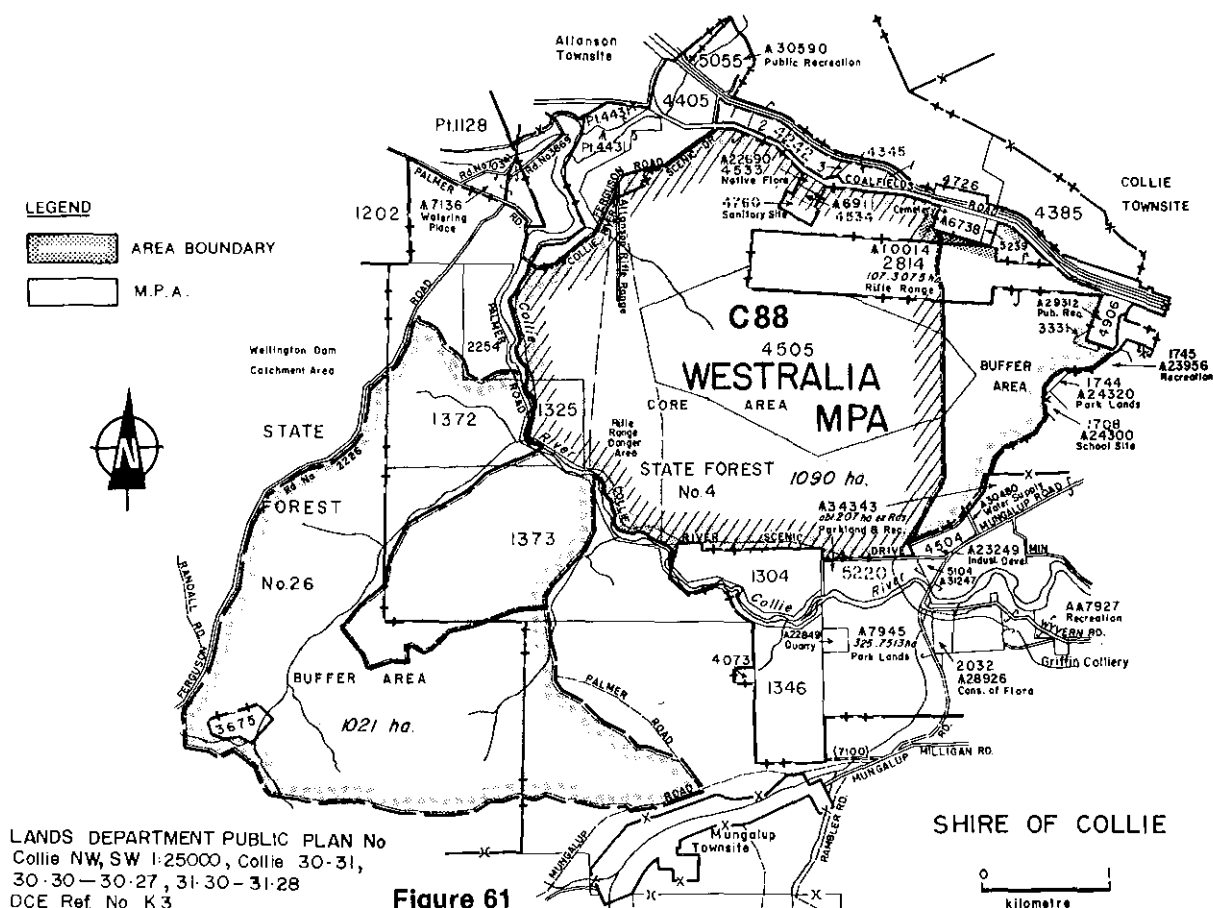
The area has lateritic uplands and incised valleys and is drained by the Collie River. The vegetation of the lateritic uplands is principally open-forest of jarrah and marri. Valley vegetation is a mixture of yarri, jarrah and marri with the banks of the Collie River supporting fringing woodland. Species rare on the Darling Plateau, such as holly-leaf banksia and woody pear, are found in the sandy northern fringe of Reserve C10014, which contains a small area of the Collie Basin.

The fringing woodland along the upper reaches of the Collie River is important since most of the valleys in this high rainfall area have been flooded for water supply or developed for agriculture. The woodland in the lower reaches of the MPA is affected by flooding of the Wellington Dam. The MPA is also valuable for recreation. Scenic drives wind through the area and picnicking and bushwalking are popular.

There are SEC lines in the area and more are proposed. The area may be affected by realignment of the Roelands - Lake King Road. It is within the Alcoa Mining Lease, but has relatively low long term potential for bauxite mining. The area also has potential for coal and is subject to several mining claims.

Recommendations

- C88.1 Reserves C6911, C10014 and C22690 should be vested in the Conservator of Forests and managed as if part of Westralia Management Priority Area.
- C88.2 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



C89 DONNYBROOK RESERVES

The area comprises Reserves C2013 and C26238, both for Timber, C7859 and C2052, both for Government Requirements, C19996, for Gravel, all not vested; C22860, for Recreation, vested in the Shire of Donnybrook-Balingup; Timber Reserve 153/25; Preston A.A. lots 30, 31 and 33, and Location 447, vacant Crown land; and Locations 430, 431 and 473, privately owned freehold land. The area is situated to the east of Donnybrook (Figure 62).

The undulating landscape of the lateritic uplands dominates the area. Their gravels and sands support open-forest of jarrah and marri, the understorey containing bull banksia, woody pear and Christmas tree. The larger, north-eastern section comprises the eastern extension of the Donnybrook Sunkland into the lower reaches of the Preston River Valley. This section is unique and warrants reservation for the Conservation of Flora and Fauna. Previous disturbances have not significantly influenced the condition of most of the area, but dieback has badly affected various sections, lowering conservation values.

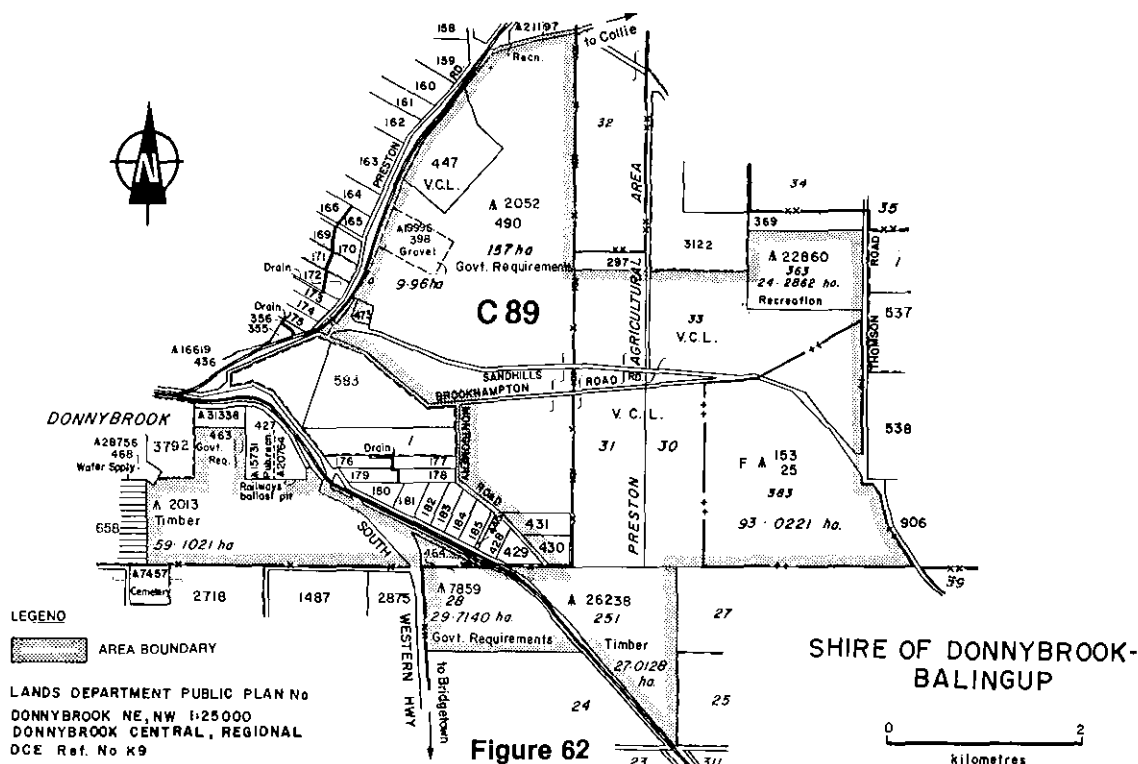
Although recreation has been restricted to localised areas, it is likely that it will increase. Owing to the special value of the north-eastern section only passive recreation such as bush walking should be allowed there. The section to the south-west of the highway, which is less significant biologically, should accommodate most of the recreation.

The area may be affected by future realignment of the Donnybrook-Kojonup Road, and future requirements for the South Western Highway.

The Donnybrook-Balingup Shire Council has proposed that a part of the area should be set aside for industrial purposes.

Recommendations

- C89.1 The purpose of Reserve C2013 should be amended to Recreation and the Reserve should be vested in the Shire of Donnybrook-Balingup.
- C89.2 Reserve C7859 should be cancelled and its area added to Reserve C2013.
- C89.3 Reserves C2052, C19996, C22860 and C26238 and Timber Reserve 153/25 should be vested in the Conservator of Forests and managed by the Forests Department for conservation of flora and fauna.
- C89.4 The vacant Crown land should be vested in the Conservator of Forests and managed by the Forests Department for conservation of flora and fauna.
- C89.5 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



C90 PRESTON MANAGEMENT PRIORITY AREA (MPA 5.1)

Preston MPA, managed by the Forests Department for the conservation of flora and fauna, is situated about 30 km south of Collie (Figure 63).

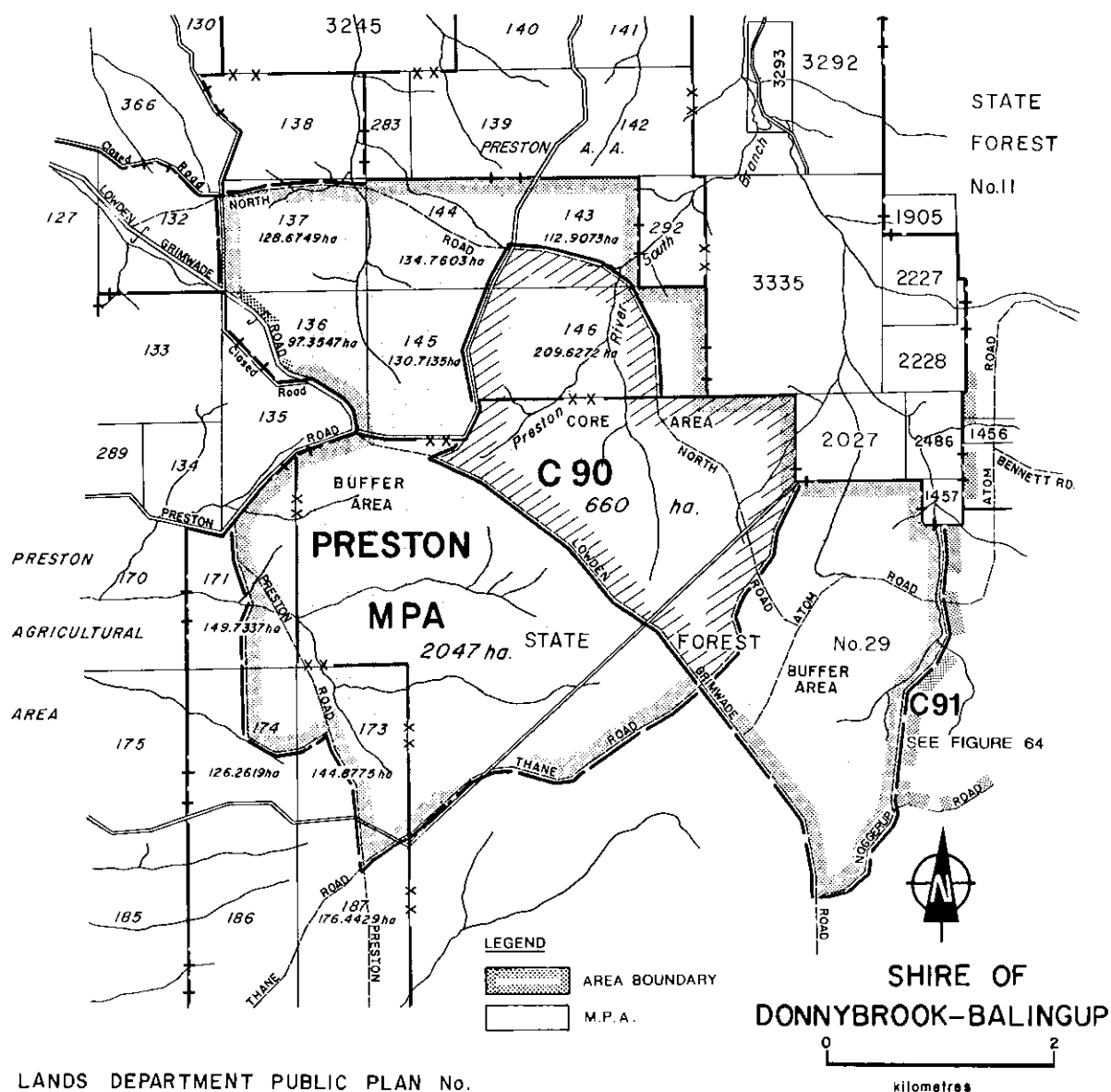
The MPA's purpose is to preserve a substantial area of high quality virgin jarrah forest.

The area is surrounded by land developed for agriculture and is drained by tributaries of the Preston River.

Most of the MPA is situated on lateritic uplands, in high rainfall areas, which support open-forest of jarrah and marri with understorey species including bull banksia, snottygobble, sheoak, tassel flower, zamia and water bush. Valley vegetation is predominantly open-forest of yarri, marri and jarrah with an admixture of peppermint and flooded gum in the moister gullies. The significant feature of the MPA is the substantial section of uncut forest of jarrah in the north-eastern section. The remainder of the MPA has been logged and regenerated. Some of the vegetation types in the area are of restricted occurrence elsewhere because of flooding of river valleys and clearing for agriculture. Some dieback has been recorded in the eastern section of the MPA, and consequently access should be limited to the periphery to minimise the spread of the disease. The MPA has been little used for recreation.

The area is within the Alcoa Mining Lease, but has relatively low long term priority for bauxite mining.

The Study endorses the present purpose of Preston Management Priority Area.



LANDS DEPARTMENT PUBLIC PLAN No.
Wilga NW, SW, 1:25 000
DCE Ref. No K8

Figure 63

C91 NOGGERUP MANAGEMENT PRIORITY AREA (MPA 5.2)

The area comprises Noggerup MPA, managed by the Forests Department for the conservation of flora and fauna, and Reserve C17114, for Railway Water Supply, not vested. It is situated about 25 km south of Collie (Figure 64).

The MPA's purpose is to preserve the high quality upland jarrah-marri forest and woodland of swamp banksia. The area has lateritic uplands and gently sloping flat-floored valleys. It is drained by tributaries of the Preston River.

Valley vegetation of the MPA is predominantly open-forest of yarri, marri and jarrah with an admixture of peppermint and flooded gum in the moister gullies. The composition of the understorey is distinctive and includes bull banksia, snottygobble, sheoak, tassel flower, zamia, bracken and water bush. On the moist, poorly drained valley floors there is woodland of swamp banksia, an important feature. There is some dieback in the valleys. Recreation activities, not significant at present, should be limited to bushwalking.

The area may be affected by future realignment of the Donnybrook-Kojonup Road. It is within the Alcoa Mining Lease but has relatively low, long term priority for bauxite mining. The area also has potential for tin and tantalite.

Recommendation

C91.1 Reserve C17114 should be vested in the Conservator of Forests and managed as if part of Noggerup Management Priority Area.

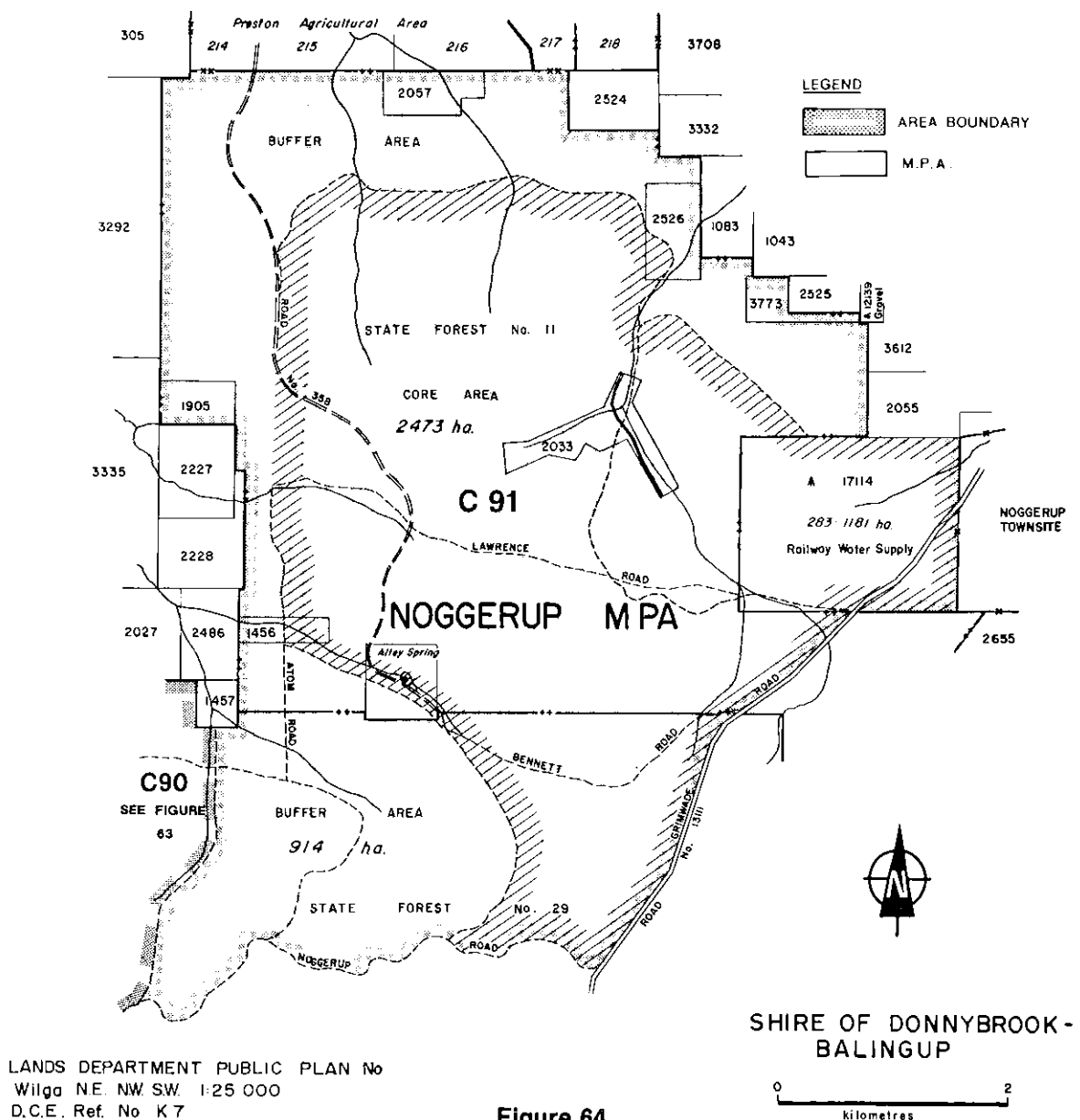


Figure 64

C92 GOONAC MANAGEMENT PRIORITY AREA (MPA 4.5)

Goonac MPA, managed by the Forests Department for the conservation of flora and fauna, consists of part of State Forest No. 26; Reserves C11683 and C12331, both for Water, not vested; Pastoral Lease 3114/419, and Special Lease 3116/6113, both included in State Forest No. 26, and Special Lease 3116/6751. It is situated about 30 km south-east of Collie (Figure 65).

The MPA's purpose is to conserve the tamar and a range of vegetation types.

The area has lateritic uplands and sloping to flat valleys. It is drained by the Collie River. The upper slopes support open-forest of jarrah and marri with understorey species that reflect the variation in soils and landforms and the low rainfall. The lower and middle slopes support open-forest of jarrah and marri with an understorey including semaphore sedge and prickly bitter-pea.

Vegetation formations in the valleys are woodland of wandoo, low woodlands of banksia and paperbark, and shrublands. White myrtle, swamp tea-tree and yarri occur on the valley floors. The dense shrubland in the moister gullies provides an important refuge for the rare tamar. Preservation of this marsupial is the main purpose of the MPA. To achieve this, management plans should prohibit recreational use of the area and be aimed at limiting the spread of dieback, which occurs in some gullies. All access routes into the MPA should be blocked.

There are SEC lines in the area, which is within the Alwest Agreement Area but has little significance for bauxite mining.

Recommendations

C92.1 Reserves C11683 and C12331 should be vested in the Conservator of Forests and managed as if part of Goonac Management Priority Area.

C92.2 Pastoral Lease 3114/419, and Special Leases 3116/6113 and 3116/6751 should not be renewed on expiry, or earlier determination.

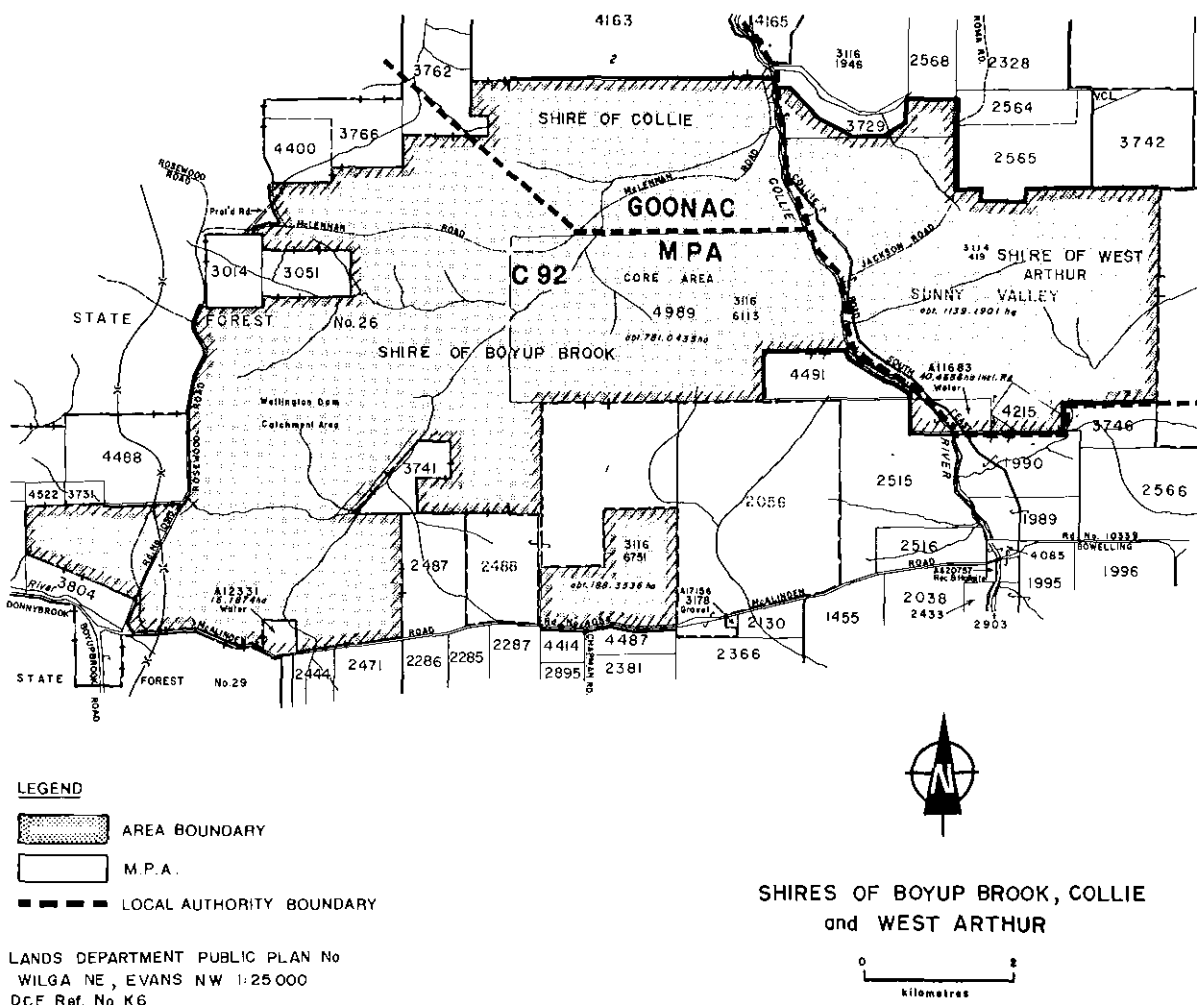


Figure 65

C93 MUJA MANAGEMENT PRIORITY AREA (MPA 4.6)

Muja MPA, managed by the Forests Department for the conservation of flora and fauna, consists of Reserve C19203, for Water, not vested; Special Lease 3116/3155, and Timber Reserve 213/25. It is situated within System 4, about 35 km south-east of Collie, adjacent to System 6 (Figure 66).

The MPA's purpose is to conserve the swamp vegetation and fauna associated with Lake Ngartiminy, especially the endangered species *Banksia meisneri*.

The area has lateritic uplands and flat-floored valleys. There is a variety of soils, landforms and vegetation which typify this eastern, lower rainfall area of the Darling Range. The vegetation includes open-forest of jarrah and marri on the lateritic uplands and in the valleys. Understorey species include prickly bitter-pea, pincushion, coneflower, semaphore sedge and the uncommon and endangered species *Casuarina thuyoides*, swamp cypress and *Banksia meisneri*. The valleys support woodlands of wandoo and banksia, and low open-forest of paperbark, with shrublands and sedgelands on the moister sites. There is a wide range of fauna associated with the swamps, especially Lake Ngartiminy which has permanent water, and a periphery of sedgelands. Recreation is presently limited to duck shooting. Access should be limited and shooting stopped except as a fauna control measure.

There are SEC lines in the area. The MPA is partly within the Alwest Agreement Area but has been excluded from current long term bauxite mining plans.

Recommendations

C93.1 Reserve C19203 should be vested in the Conservator of Forests and managed as if part of Muja Management Priority Area.

C93.2 Special Lease 3116/3155 should not be renewed on expiry, or earlier determination.

C94 BENNELAKING MANAGEMENT PRIORITY AREA (MPA 4.7)

Bennelaking MPA, managed by the Forests Department for the conservation of flora and fauna, consists of Reserve C31088, for Water Catchment Area, not vested; a temporary Water Reserve; Pastoral Lease 3114/417; and part of State Forest No. 24. It is situated within System 4, about 40 km east of Collie, adjacent to System 6 (Figure 66).

The MPA's purpose is the preservation of vegetation types which have been largely destroyed elsewhere.

The area has lateritic uplands and gently sloping to flat-floored valleys. It is drained by tributaries of the Collie River. The vegetation of the lateritic uplands consists of open-forest of jarrah and marri with an understorey including semaphore sedge and prickly bitter-pea. In the valleys, the vegetation is dominated by open-woodland of wandoo. There is a complex of swamp vegetation, on the moister sites, that ranges from shrublands to open-woodland of paperbark. Much of the swamp vegetation in the district has been destroyed by clearing and by increases in soil salinity.

The area provides a representative range of vegetation of the eastern portion of the Collie River. Such vegetation has largely been destroyed elsewhere by clearing for agriculture. No dieback has been recorded in the MPA although it is present on adjacent private properties. Recreation activities should therefore be restricted to the periphery.

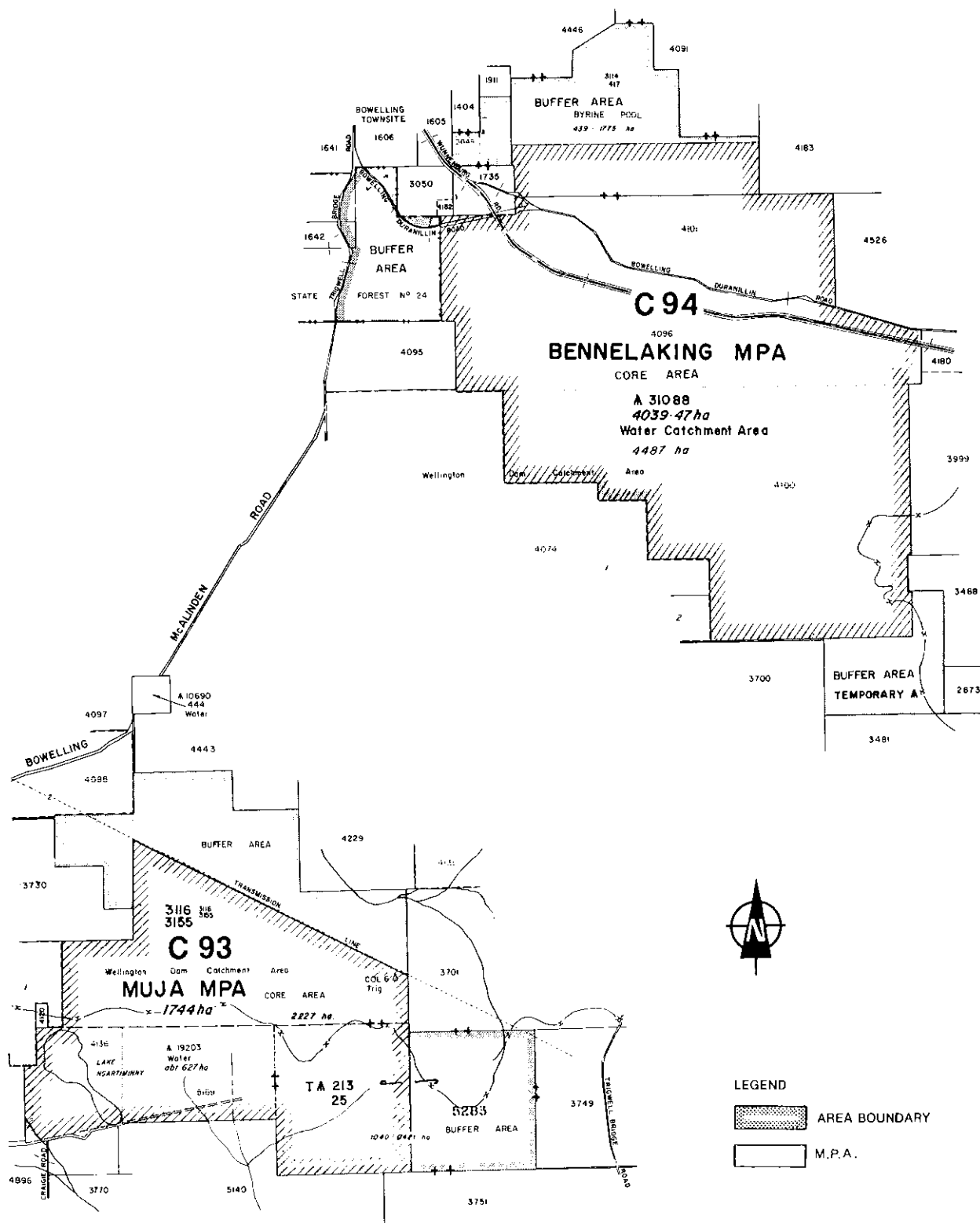
The area is within the Alwest Agreement Area, but is unlikely to be mined for bauxite.

Recommendations

C94.1 Reserve C31088 should be vested in the Conservator of Forests and managed as if part of Bennelaking Management Priority Area.

C94.2 The land in the temporary Water Reserve should be added to Reserve C31088.

C94.3 Pastoral Lease 3114/417 should not be renewed on expiry, or earlier determination.



LANDS DEPARTMENT PUBLIC PLAN No
DARKAN SW, BLACKWOOD RIVER NW,
MUJA SE 1:25 000
DCE Ref. No K4, K5

C95 MULLALYUP MANAGEMENT PRIORITY AREA (MPA 5.4)

The area comprises Mullalyup MPA, managed by the Forests Department for the conservation of flora and fauna; Location 3463 and part of Location 1666, freehold land, held in the name of the Conservator of Forests; and Locations 802, 4653, and 12784, privately owned freehold land. It is situated immediately south of Kirup (Figure 67).

The MPA's purpose is to conserve the heath on the granitic outcrops, the upland jarrah-marri forests and the blackbutt in gullies.

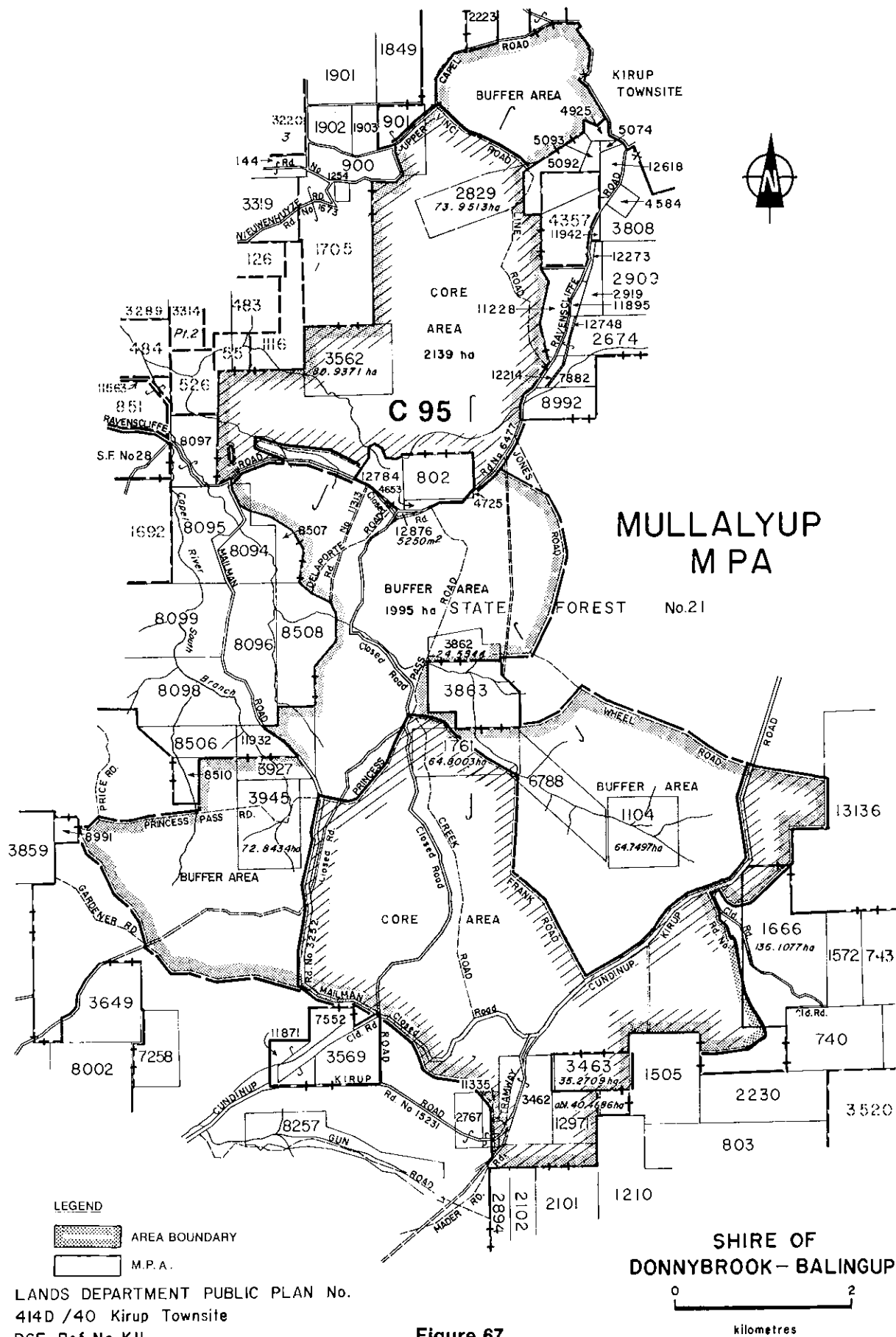
The MPA includes a range of soils, landforms and vegetation that typify the high rainfall areas of the western fringes of the Darling Range. Shallow depressions associated with lateritic surfaces occur and are significant since they are mainly confined to the central and northern part of the Range. The lateritic uplands support open-forest of jarrah and marri, with understorey species that reflect the area's high rainfall. There is a variety of vegetation, including significant extensive stands of yarri and river banksia, and areas of heath on the granitic outcrops in the eastern section. Dieback has been recorded on the fringes of the MPA.

Rapids, together with the granitic outcrops and heath, give the area aesthetic appeal. It has not been used extensively for recreation in the past, but the Bibbulmun Track passes through the north-west section and will attract more people into the area. Recreational activities which do not conflict with conservation should be allowed.

The area may be affected by future requirements for the South Western Highway. It is within the Alcoa Mining Lease, but has little significance for bauxite mining.

Recommendations

- C95.1 The freehold land, held in the name of the Conservator of Forests, should be managed as if part of Mullalyup Management Priority Area.
- C95.2 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



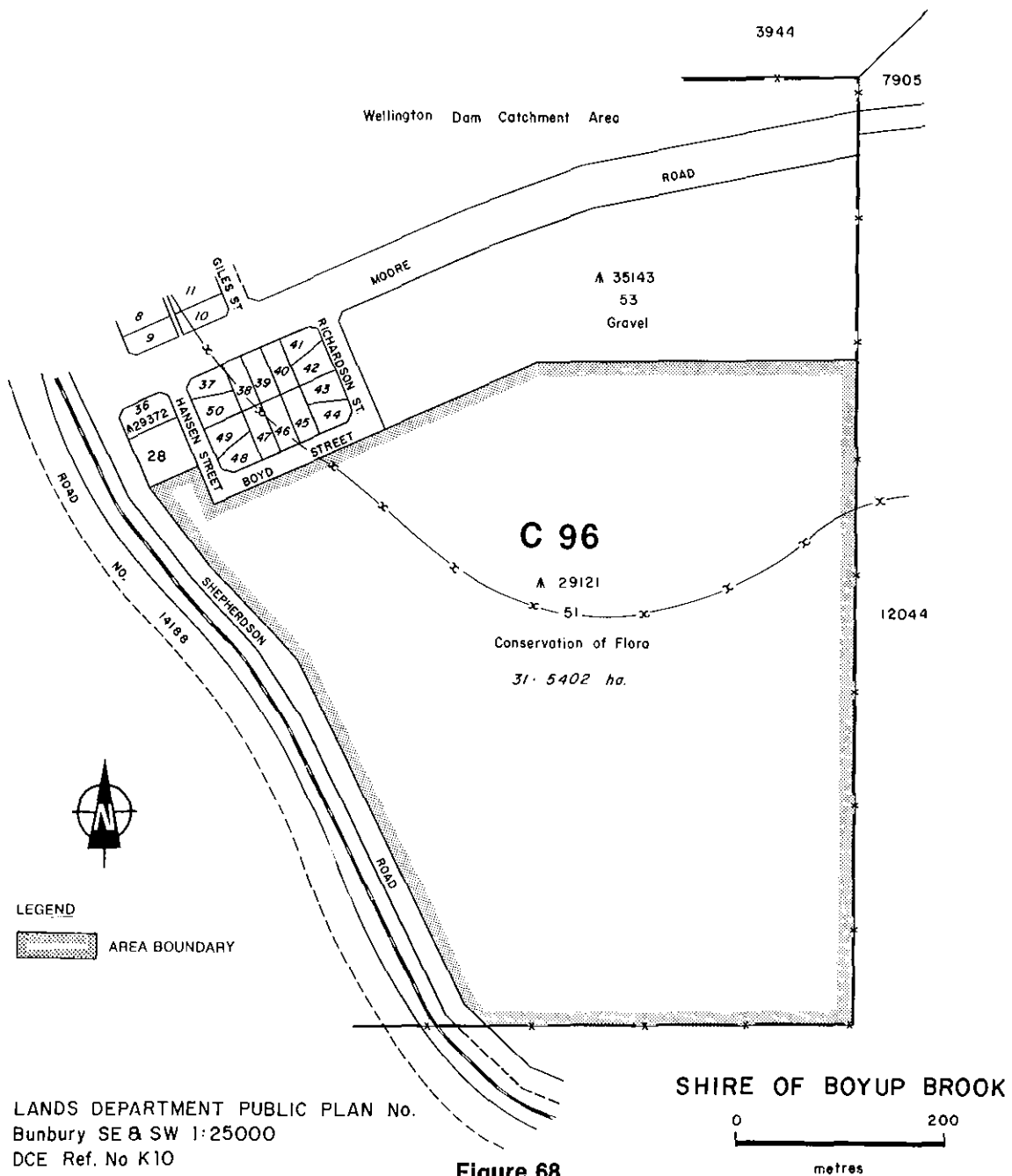
C96 RESERVE C29121, WILGA

Reserve C29121, for Conservation of Flora, not vested, is situated about 2 km south-east of Wilga (Figure 68).

The land is flat to gently undulating and mainly lateritic with some pockets of sand. The vegetation of the uplands includes open-forest of jarrah and marri with an understorey of bull banksia that also contains prickly bitter-pea and hairy flag. On the valley slopes, yarri, white myrtle, honeybush, *Dampiera alata* and *Synaphea petiolaris* are present. Flooded gum and swamp banksia occur on the valley floors. Although dieback is present, the Reserve is mostly in good condition and is valuable, despite its small size, since the characteristic valley vegetation is severely affected by dieback elsewhere.

Recommendation

C96.1 Reserve C29121 should be vested in the W.A. Wildlife Authority.



C97 ST. JOHN BROOK MANAGEMENT PRIORITY AREA (MPA 12.2)

The area comprises St. John Brook MPA, managed by the Forests Department for the conservation of flora and fauna; Reserve C13276, for Road Approach to Ford, not vested; and Wellington Locations 6881, 8979 and 9946, privately owned freehold land. It is situated about 70 km south of Bunbury (Figure 69).

The MPA's purpose is to preserve and encourage the excellent regrowth of jarrah and blackbutt along the banks of St. John Brook and to provide a habitat for rare mammals possibly living in the area.

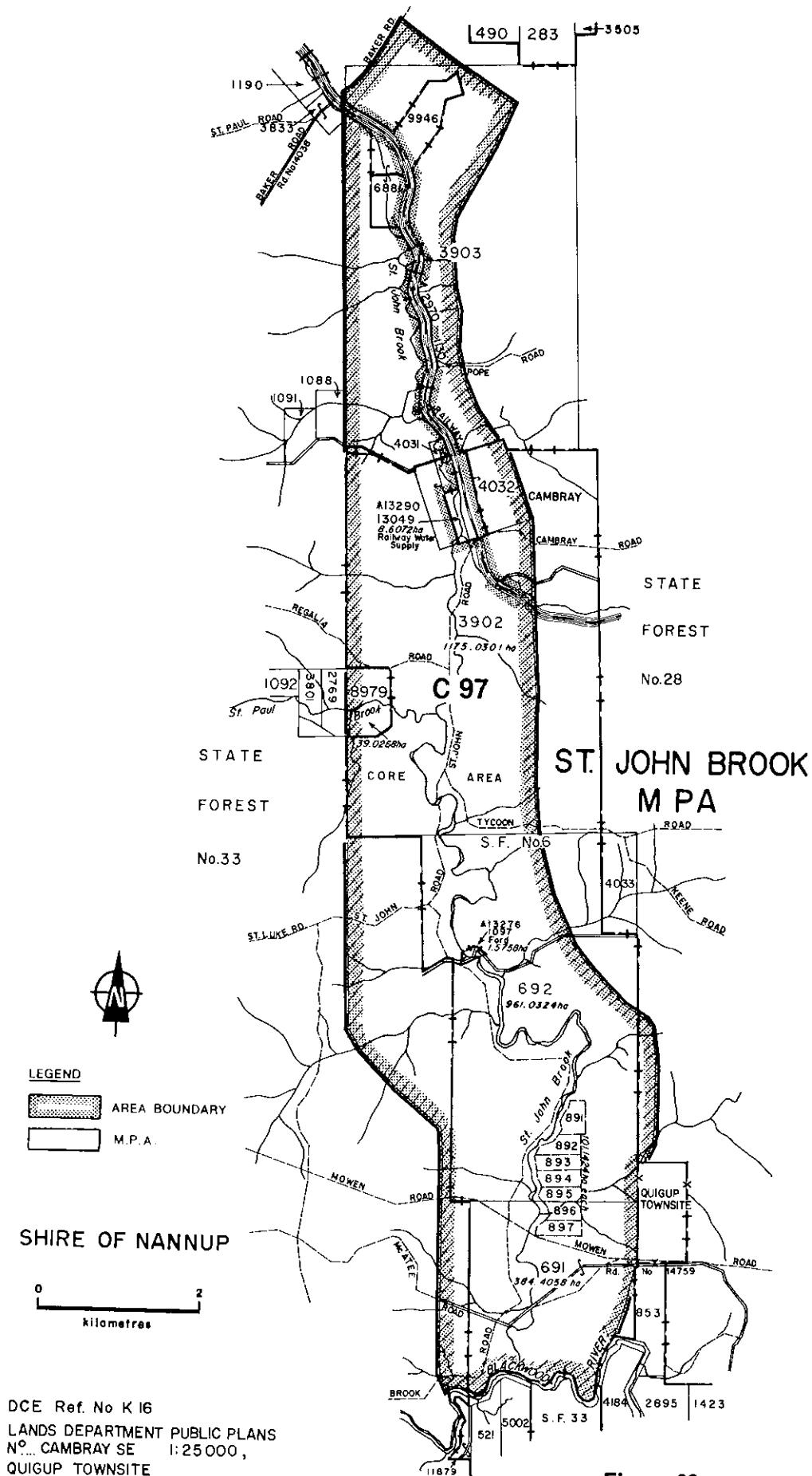
The area includes a variety of soils, landforms and vegetation that represent the Donnybrook Sunkland. Upland vegetation consists of open-forest of jarrah and marri with a well defined understorey of bull banksia, sheoak, snottygobble and woody pear. Shrub species present include koolah, drumstick isopogon, and hairy jugflower. The steeper valleys support woodland of paperbark as well as open-forest of jarrah and marri and open-woodland of *Banksia* spp. The shrub species include basket flower, semaphore sedge, white myrtle and pineapple bush. The river valleys associated with St. John Brook support a fringing woodland of flooded gum and yarri.

The MPA is valuable as an area representative of the Donnybrook Sunkland. As much of the flora is not found in the Darling Range, the region is unique floristically. Recreation in the MPA is restricted to localised areas, particularly St. John Brook and its banks. Marronning is popular in the area. Future management should only allow for recreation which will not spread dieback, since much of the MPA's vegetation is susceptible to the disease.

The MPA contains a potential dam site and the construction of a reservoir on St. John Brook may be considered in the future.

Recommendations

- C97.1 Reserve C13276 should be vested in the Conservator of Forests and managed as if part of St. John Brook Management Priority Area.
- C97.2 The Forests Department, in consultation with the Public Works Department, the Department for Youth, Sport and Recreation and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) the control of wild pigs;
 - (b) recreation activities.
- C97.3 The Forests Department should consult the Public Works Department in regard to the possible construction of a reservoir in St. John Brook Management Priority Area.



C98 RESERVES A25446 AND A3412, BLACKWOOD RIVER

The area comprises Reserve A3412, for Resting Place for Travellers and Stock, not vested; Reserve A25446, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; and part of Wellington Location 94, freehold land, held in the name of the Conservator of Forests. It is situated on the north side of the Blackwood River about 10 km south-west of Balingup (Figure 70A).

Reserve A25446 is bounded to the east by cleared land, to the north and west by pine plantations, and to the south by the Blackwood River. The land extends 3.5 km along the Blackwood River and is mostly river flats with open-forest of flooded gum, some infested with mistletoe, and paperbark. Ground vegetation is dominated by bracken. There is open-forest of jarrah, marri and some yarri on the valley slopes. The northern section is affected by grazing. The adjoining section of the Blackwood River is brackish, but Balingup Brook, which enters to the north, is comparatively fresh. To the north-east there is a seasonal fresh water swamp, one third of which is within the Reserve and the remainder in Wellington Location 94.

Reserve A3412 is situated on a bend of the Blackwood River and opposite the northern section of Reserve A25446. Vegetation includes pleasant open-woodland with much jarrah regrowth, but there is also infestation by wild oats and weed.

A loop track for vehicles leads in from the main road to a picnic and barbecue area, under the management of the Forests Department, on the banks of the river 300 m downstream from the road bridge. The area has limited value as a conservation area but is suited for recreational use and could be developed to cater for more visitors. Reserve A25446 is too small and disturbed to be of conservation value. The area has no vehicular access and would be ideal for an overnight camping site or resting place for canoeists and river travellers.

Balingup Brook is a potential source of water supply, and water levels may be affected by any dams built upstream. The area may be affected by future requirements of the Balingup-Nannup Road.

Recommendations

- C98.1 Subject to the agreement of the controlling body, the purpose of Reserve A25446 should be amended to Parkland and Recreation and the Reserve should be vested in the Conservator of Forests.
- C98.2 Reserve A3412 should be cancelled and its area added to Reserve A25446.
- C98.3 Subject to the implementation of Recommendation C98.1, the freehold land, held in the name of the Conservator of Forests, should be added to Reserve A25446.

C99 GREENBUSHES MANAGEMENT PRIORITY AREA (MPA 5.5)

Greenbushes MPA, managed by the Forests Department for the conservation of flora and fauna, consists of State Forest, Timber Reserve 155/25 and parts of Locations 947 and 2240, freehold land held in the name of the Conservator of Forests. The three sections are situated a few kilometres to the south and west of Greenbushes (Figures 70A and 70B).

The MPA's purpose is to conserve the remaining virgin jarrah forest of the Blackwood River region. The area has lateritic uplands and two major valley systems. The vegetation is dominated by open-forest of jarrah and marri with understorey species including sheoak, Wilson's grevillea, hairy jugflower, zamia, bracken and water bush. The gullies support yarri, and fringing the streams are woodlands of flooded gum and paperbark. The MPA is especially important for its areas of uncut forest of jarrah and marri which are representative of the Blackwood River region. Forest quarantine is needed to reduce the spread of dieback. Vehicle access should be limited where possible.

The area has various potential for bauxite, tin, tantalite, base metals and pegmatite minerals. It may be affected by future requirements of the South Western Highway.

The Study endorses the present purpose of Greenbushes Management Priority Area.

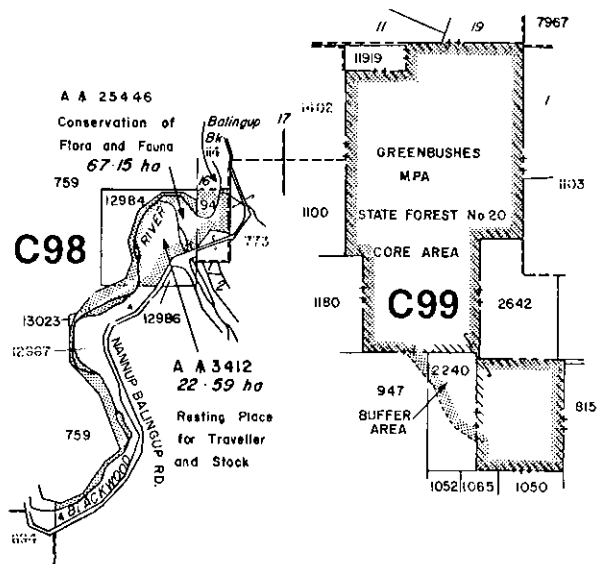
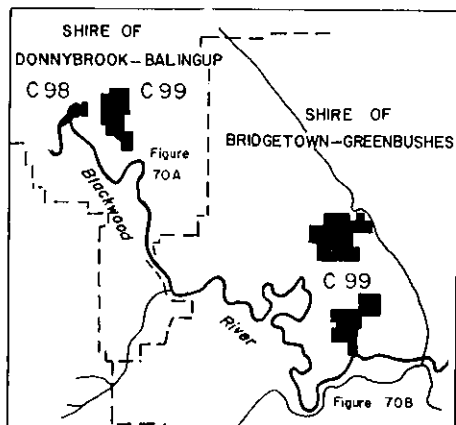
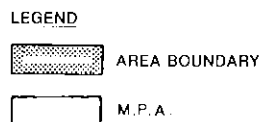


Figure 70A



LANDS DEPARTMENT PUBLIC PLAN No.
Padbury (10 000) BG 29/6-1, 6-2
Balingup NE (1:25 000)
DCE Ref. No K12 & K13

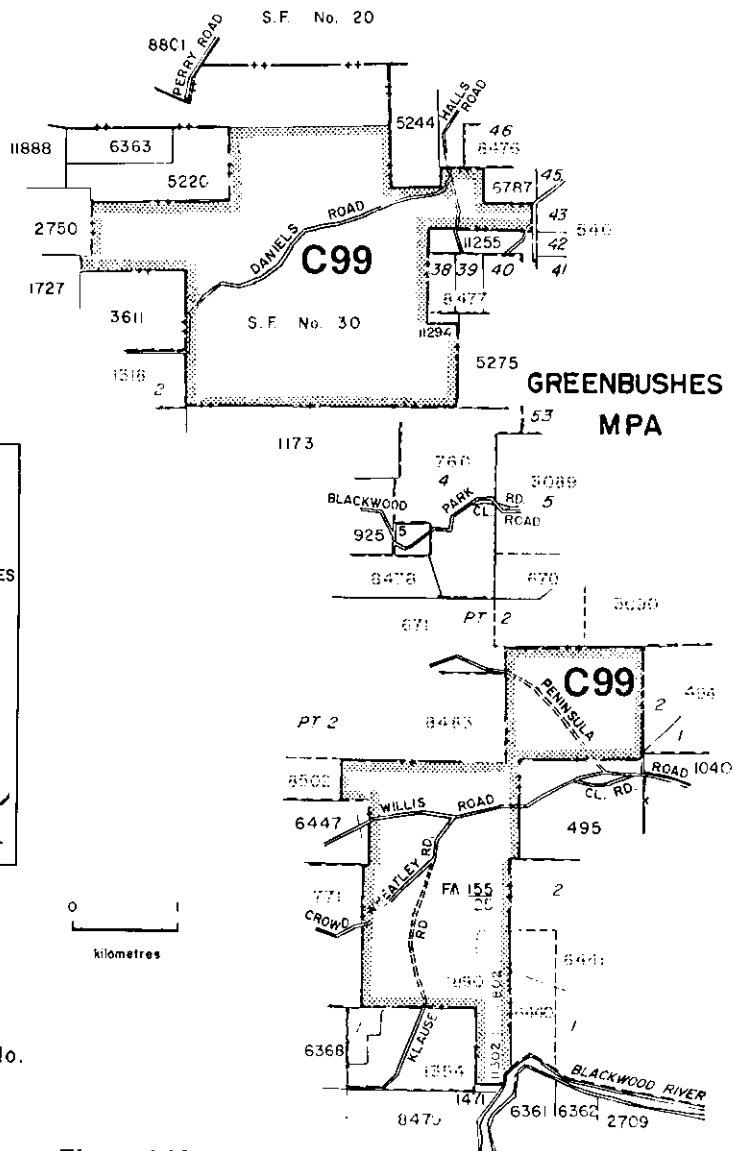


Figure 70B

C100 DALGARUP MANAGEMENT PRIORITY AREA (MPA 12.1)

Dalgarup MPA, managed by the Forests Department for the conservation of flora and fauna, is situated within System 2, about 16 km east of Nannup, adjacent to System 6 (Figure 71).

The MPA's purpose is to preserve the northernmost occurrence of karri.

The MPA has lateritic uplands and incised valleys. It is drained by tributaries of the Blackwood River. The vegetation includes open-forest of jarrah and marri on the uplands, and diverse valley vegetation, ranging from open-forest of yarri, jarrah and marri, to tall open-forest of karri. Plant species include karri-hazel, white myrtle, water bush and bracken.

The area was logged during 1930-1950. There is some dieback in gullies. Forest quarantine is needed to reduce the spread of dieback. Recreation should not be allowed in the MPA.

The Study endorses the present purpose of Dalgarup Management Priority Area.

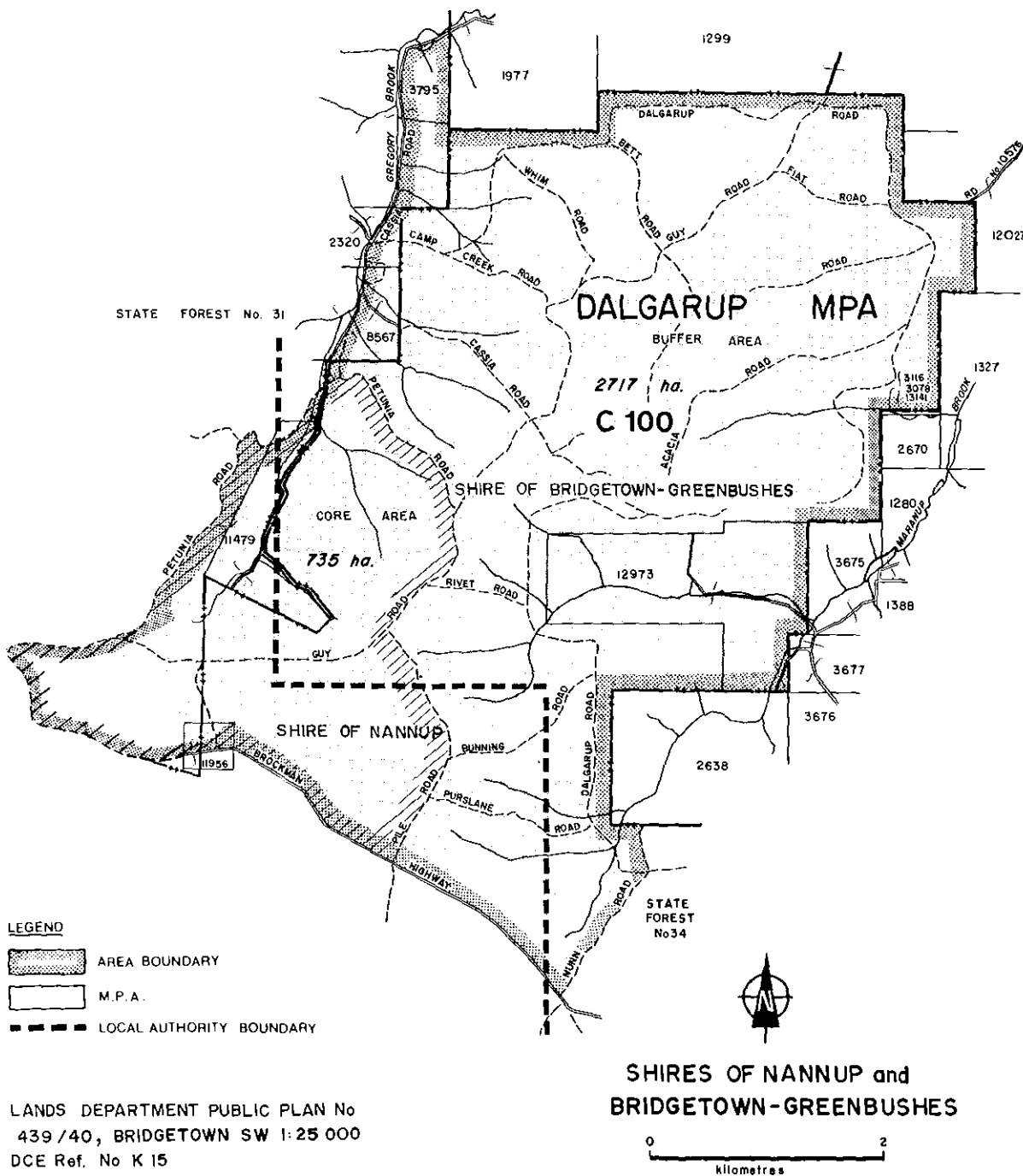


Figure 71

Nollajup MPA, managed by the Forests Department for the conservation of flora and fauna, consists of Timber Reserve 206/25, and is situated about 7 km south-west of Boyup Brook (Figure 72).

The area contains lateritic uplands and gentle valleys. The vegetation is open-forest of jarrah and marri and, on lower slopes, woodland of wandoo. The uplands understorey contains prickly bitter-pea while white myrtle is one of the shrub species on the valley slopes. There are also poorly drained depressions characterised by the occurrence of paperbark and some flooded gum.

The Study endorses the present purpose of Nollajup Management Priority Area.



Chapter 10

METROPOLITAN LOCALITIES

As indicated in Chapter 8, detailed recommendations have been developed for 108 localities within the Perth Metropolitan Region.

Figure 73 is an index map for Figures 74 to 78 inclusive, which show the distribution of the localities.

Each locality is listed below, described in the following text and indicated by a stippled boundary on Figures 79 to 169 inclusive. A common legend for the detailed maps is shown on Figure 4, Chapter 9.

Locality Number		Figure
M1	Two Rocks Open Space	79
M2	Coastal strip from Two Rocks to Burns Beach	79
M3	Yanchep National Park	80
M4	Ridges Management Priority Area (MPA 15.2)	80
M5	Yeal Nature Reserve	81
M6	Neerabup National Park	82
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M8	Wanneroo Wetlands — Eastern Chain	84A to C
M9	Melaleuca Management Priority Area (MPA 15.1)	85
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M11	Warwick Woodland	87
M12	Reserve A20091, Marangaroo	87
M13	Whiteman Park (Mussel Pool)	88
M14	Reserve C1654, Bullsbrook	89
M15	Pearce Aerodrome	89
M16	Avon Valley National Park	90
M17	Ellen Brook and Twin Swamps Wildlife Sanctuaries, Upper Swan	91
M18	Walyunga National Park	92
M19	Swan River — Guildford to Walyunga National Park	93
M20	Jane Brook	94
M21	John Forrest National Park	95
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M26	Reserves north-east of Chidlow	99
M27	Reserves north of Lake Manaring	100
M28	Reserve C14278, east of Wooroloo	101
M29	Greenmount National Park	102
M30	Reserves A1847 and C31178, Darlington	103
M31	Reserve C32727, Mundaring	104
M32	Reserves C18130 and C34103, Sawyers Valley	105
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M34	Helena Valley	107
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M36	Reserves near Karrinyup	109
M37	Carine Swamps	110
M38	Careniup Swamp, Gwelup	111
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M40	Dianella Open Space	113
M41	Bennett Brook	114
M42	Jackadder Lake, Woodlands	115
M43	Herdsmen Lake	116
M44	Swan River Backwater, South Guildford	117
M45	Hazelmere Lakes	118
M46	Swanbourne Beach and Rifle Range	119
M47	Bold Park, City Beach	120
M48	Lake Claremont	121
M49	Kings Park	122
M50	Swan River Foreshore, Maylands	123
M51	Swan River Saltmarshes, Belmont and Maylands	123

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M53	Reserve C29880, Forrestfield	125
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M56	Foreshore Reserves, Mosman Park	128
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M58	Blackwall Reach Foreshore, Bicton	130
M59	Point Resolution Foreshore, Dalkeith	131
M60	Aquatic Reserve, South Perth	132
M61	Aquatic Reserve, Attadale	133
M62	Pelican Point, Crawley	134
M63	Harry Sandon Park, Attadale	133
M64	Wireless Hill Park, Ardross	135
M65	Point Heathcote Foreshore, Applecross	136
M66	Mount Henry, Manning	137
M67	Canning River Foreshore, Salter Point to Clontarf	138
M68	Canning River, Riverton Bridge to Nicholson Road Bridge	139
M69	Kenwick Swamp	140
M70	Heathland, Wattle Grove	141
M71	Cantonment Hill, Fremantle	142
M72	Sir Frederick Samson Park, Samson	143
M73	Booragoon Lake	144
M74	Bull Creek	145
M75	Upper Canning and Southern Rivers	146A & B
M76	Mary Carroll Park, Gosnells	147
M77	Reserve C22865, Kalamunda, and Reserve C20641, Bickley	148
M78	Reserve C10601, Carmel	149
M79	Reserve C21172, Canning Mills	149
M80	Darling Scarp	150A to F
M81	Reserves C19662 and C32728, Karragullen	151
M82	Reserve C5704, Wungong	152
M83	Reserve C2457, Mundijong	153
M84	Gooralong Management Priority Area (MPA 8.4)	154
M85	Serpentine National Park	154
M86	Karnet Management Priority Area (MPA 3.8)	154
M87	Serpentine Management Priority Area (MPA 8.7)	154
M88	Land north of Keysbrook	155
M89	Woodland east of Keysbrook	155
M90	Quarantine Station and Explosives Magazine Reserve, Woodman Point	156
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M92	Cockburn Wetlands — Western Chain	157A & B
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M94	Jandakot Airport	159
M95	Forrestdale Lake	160
M96	Garden Island	161
M97	Reserve C36110, Wandi	162
M98	Reserve C31874, Casuarina	162
M99	Reserve A25886, west of Byford	162
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M101	Cape Peron, Shoalwater Bay and Warnbro Sound	163
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M104	Reserves C31102 and C33581, Leda	166
M105	Lowlands Property, west of Serpentine	167
M106	Point Kennedy	168
M107	Peelhurst, Singleton and Madora	168
M108	Goegrup Lakes	169

* Forests Department Reference Number

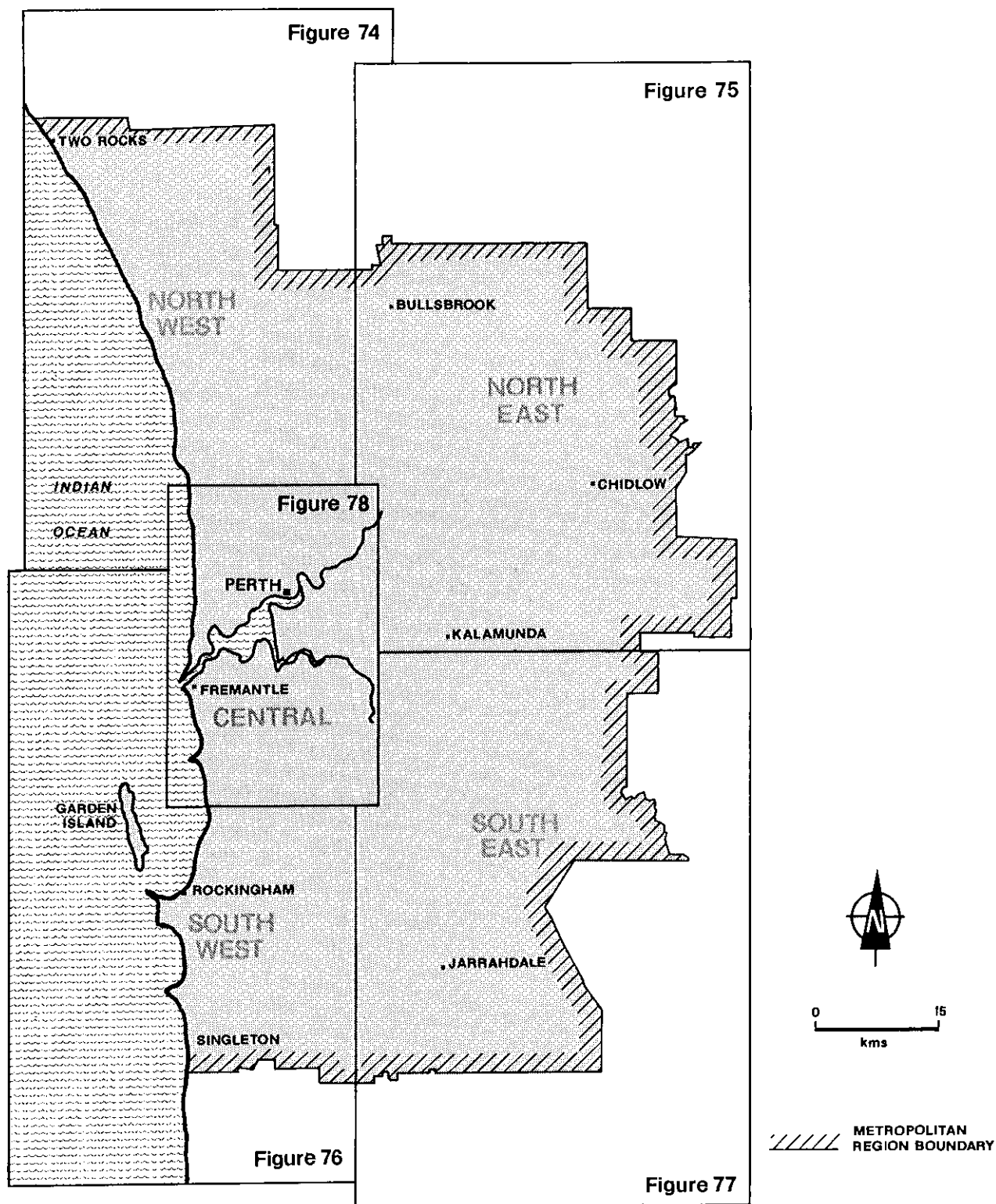


Figure 73 Index to metropolitan locality figures

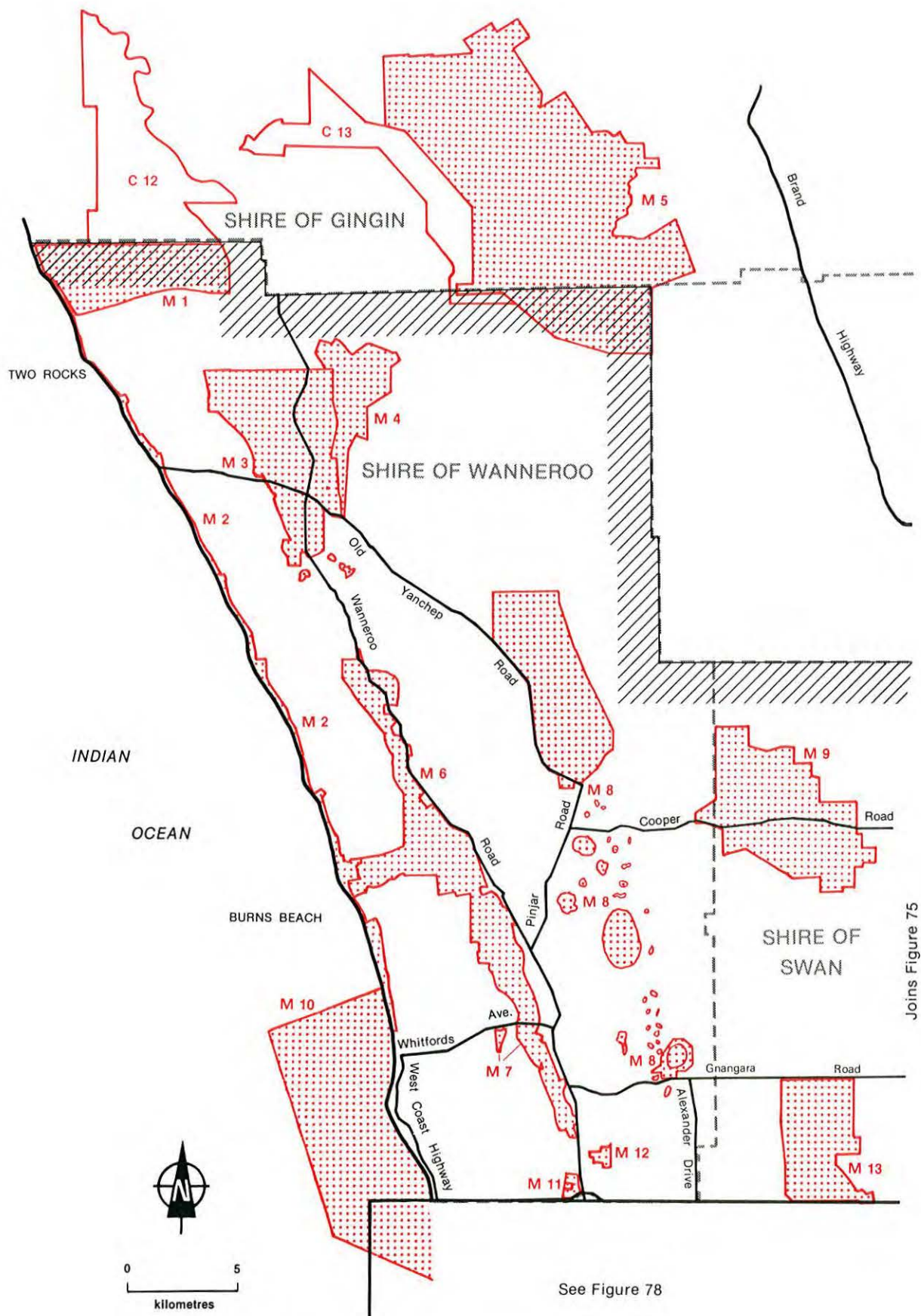
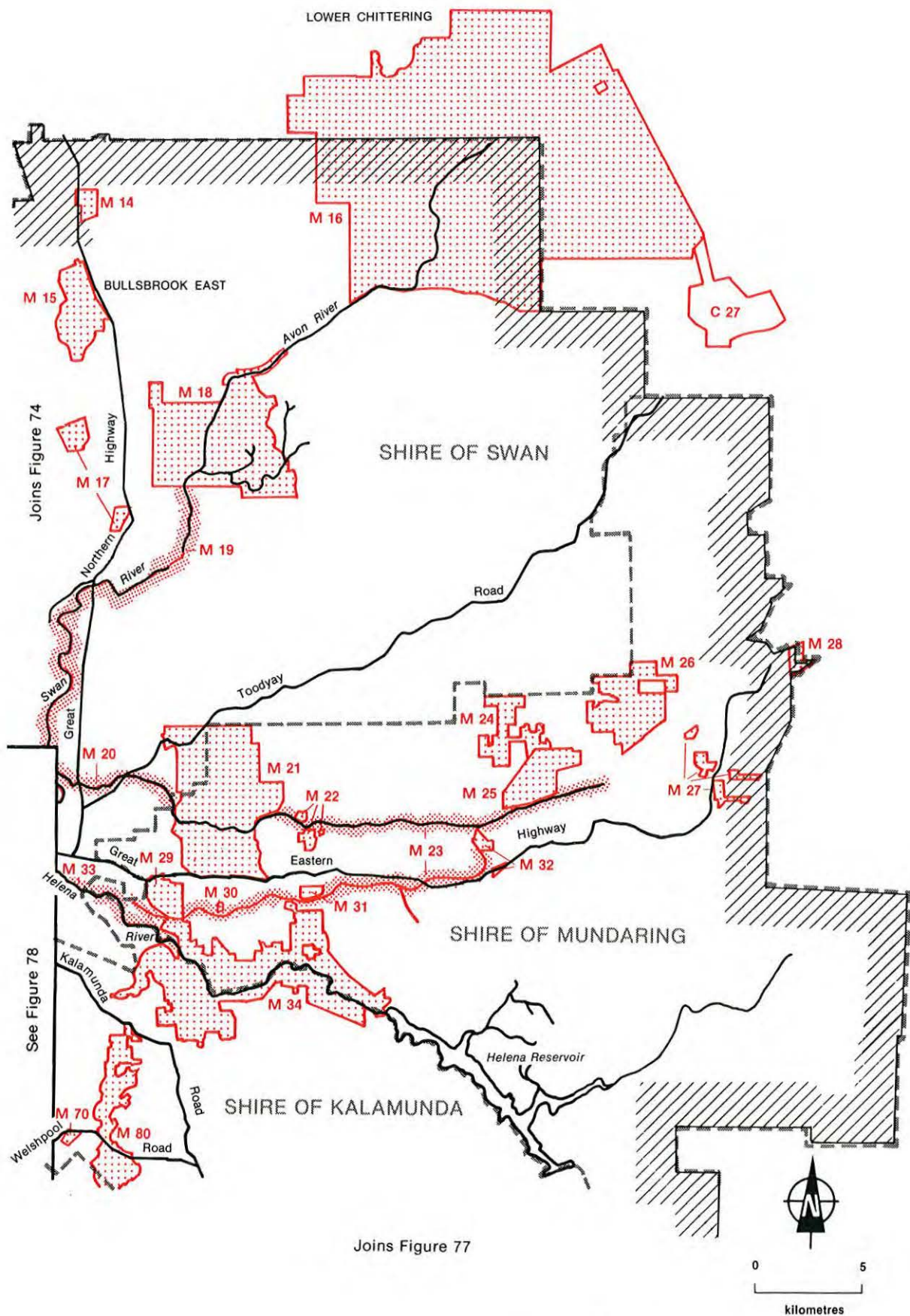
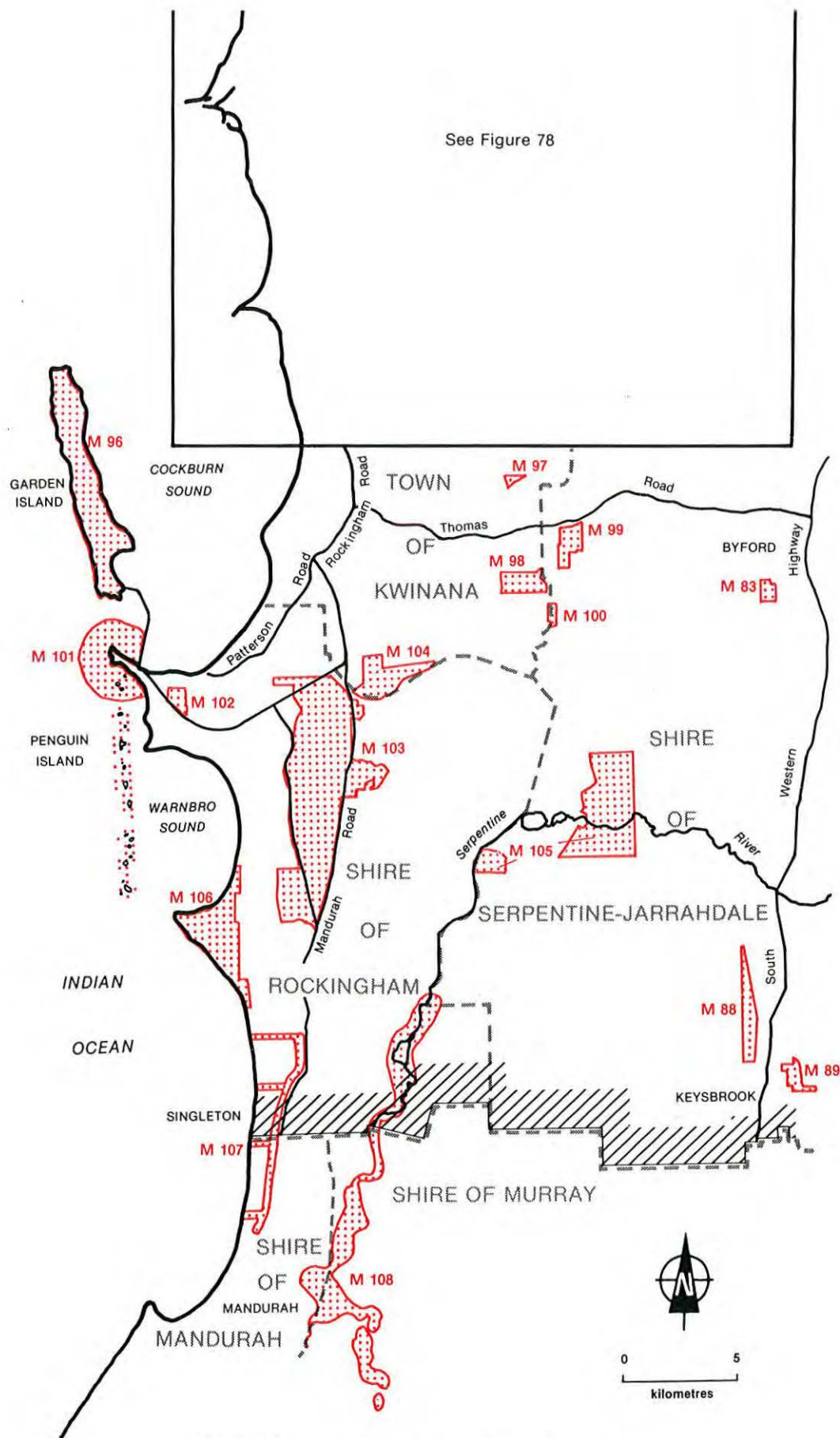


Figure 74 Metropolitan localities—north-west





Joins Figure 77

Figure 76 Metropolitan localities—south-west

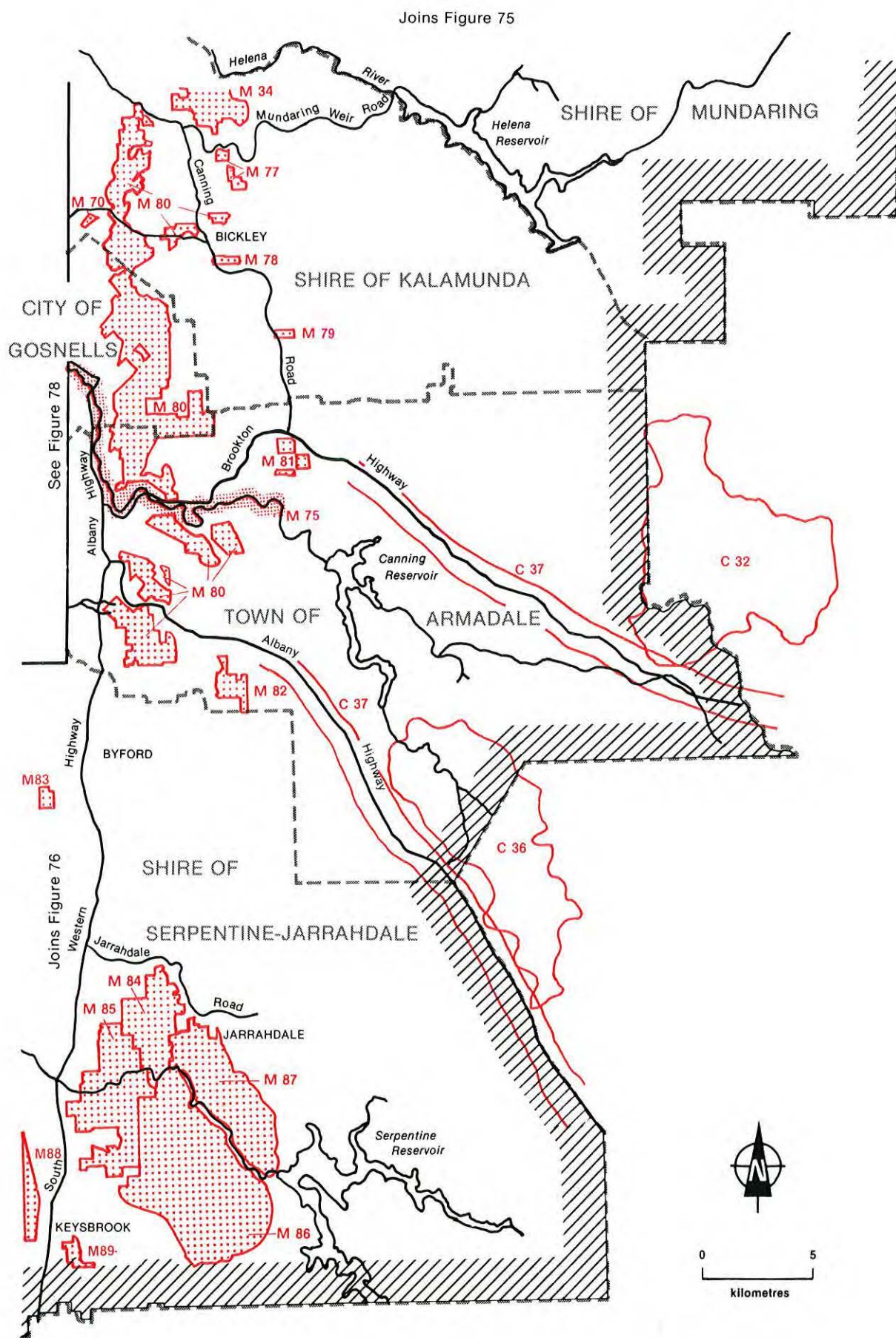


Figure 77 Metropolitan localities—south-east

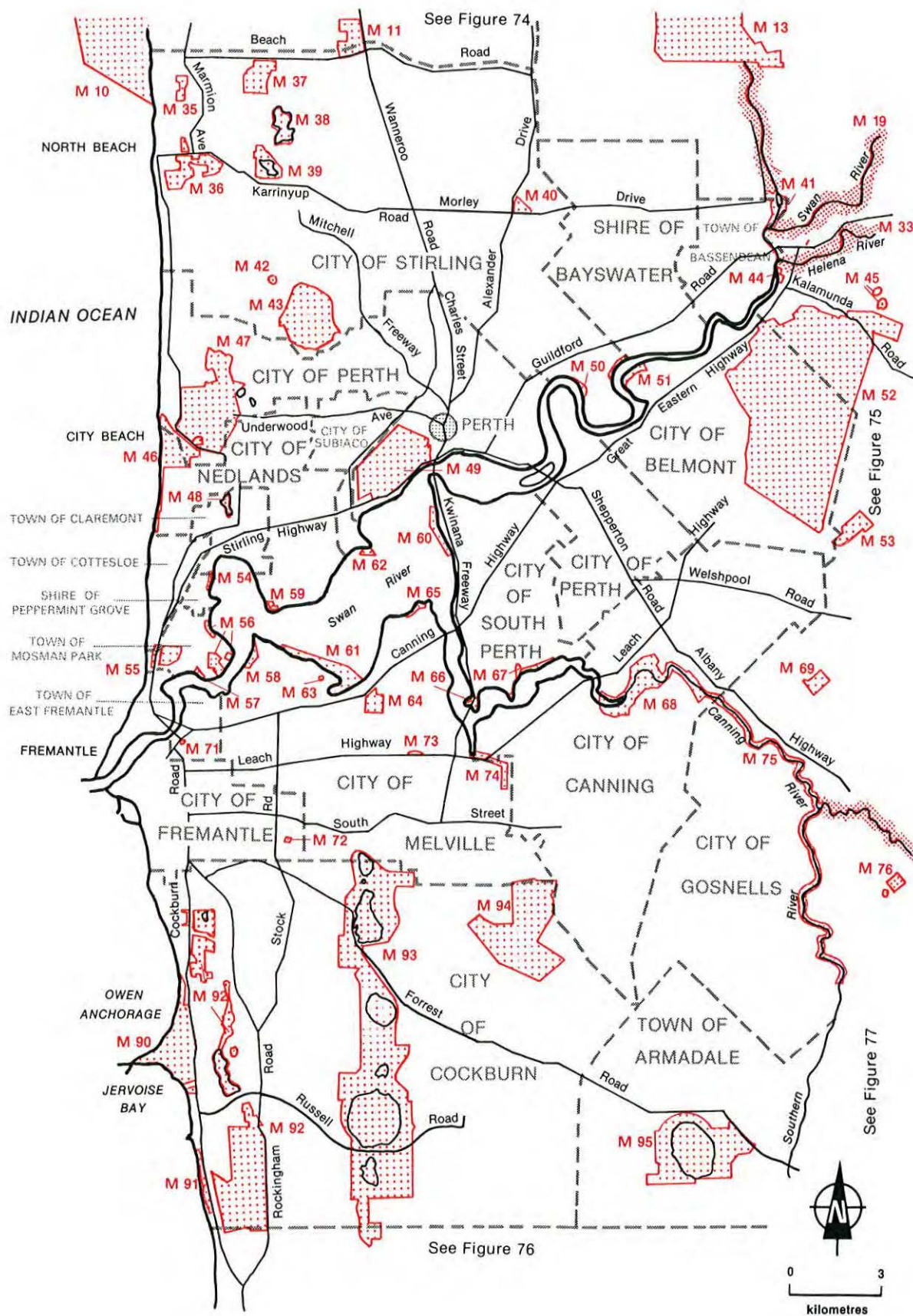


Figure 78 Inner metropolitan localities

M1 TWO ROCKS OPEN SPACE

The area comprises part of lot M1688 (Location 1370), privately owned freehold land. It is situated just north of Two Rocks (Figure 79). The MRPA's North-West Corridor Report proposes that the area should be 'reserved' in the future for Parks and Recreation under the Metropolitan Region Scheme.

The eastern part of the area carries an open-woodland of tuart, low woodland of banksia and pricklybark, and patches of woodland of limestone marlock. The hill tops are largely covered by open-heath, dominated by *Melaleuca acerosa* and cottonhead.

The large valleys and the hillsides carry open-woodland of tuart and low open-woodland of banksia. The understorey includes such species as blackboy, hakea and one-sided bottlebrush. On some of the hillsides limestone appears at the surface, and is associated with a closed-heath vegetation of blackboy, prickly moses, spider-net grevillea, couch honeypot and rough daisy-bush.

Much of the Two Rocks Open Space, especially in the east, has been affected by grazing and some of the understorey has been eliminated. However, this vegetation could probably be restored to a natural state. There is a large area of fragile vegetation, part of which requires protection.

The area is very important as a conservation and recreational buffer zone for the North-West Corridor. The fragile coastal strip, which has significant value for recreation, will need careful management. There should be provision for beaching and use of boats.

Underground water occurs beneath the coastal strip at a depth which makes it unlikely that future extraction will affect the surface environment. There are SEC lines already in the area, and future gas pipes, powerlines and service roads for the proposed industrial area at Wilbinga may also affect it. Limestone underlies the area, particularly in the east, but there are no claims yet. The area may also be affected by future industrial development to the north.

The Wannon Shire Council has proposed an extension of the area to include Locations 535, 781, 2817 and 2818, privately owned freehold land and part of State Forest No. 65.

The area has potential for water and minerals as well as for conservation. The Conservation Reserves and National Parks Committee proposed that an area of at least 1500 ha should be reserved, for the purpose of Conservation of Flora and Fauna. However, the Conservation and Land Use Committee proposed that the strategy of multiple vesting for the multiple purposes of conservation and/or recreation, water and mining should be applied to such an area.

Recommendations

- M1.1 The Metropolitan Region Planning Authority's proposal, in the North-West Corridor Report, to 'reserve' the area for Parks and Recreation under the Metropolitan Region Scheme should be endorsed.
- M2.2 The Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:
 - (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) constructing beach facilities and access ways in such a way that the fragile dunes are protected;
 - (c) the area's potential for water and minerals.

M2 COASTAL STRIP FROM TWO ROCKS TO BURNS BEACH

The area comprises Reserves C11630, for Camping, Park and Recreation, A12439 and C29694 for Recreation, part of C25061 for Recreation and Purposes Incidental Thereto, C22915, for Recreation and Parking, C32978, C35890, C33444, C33431, all for Public Recreation, C34601 for Government Requirements, all vested in the Shire of Wannon; C25997 for Recreation, C29354, C29352 for Public Recreation, C30959 and C32510, for Recreation, all not vested; and part of lots 1, 2, 4, 6 to 9, 614, 1010, 1029, M1482, M1503, M1689, M1722 (Location 1370), privately owned freehold land. It extends along the coast from Mulla-lloo to Two Rocks (Figure 79).

Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. The MRPA has recommended in its North-West Corridor Plan that an additional strip of coastal land, which is between 80 m and 1 km wide, should be 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. The coastal strip is an extremely sensitive landscape, suitable for limited usage. The area has high conservation value because of the diverse relatively undisturbed coastal environment. Although disturbed and eroded in parts, the fragile sand dunes are important wildlife habitats and contain special features such as limestone pinnacles, a fresh water swamp and the wreck of the Alkimos.

The section of the coastal strip south of Burns Beach is of special importance because of its diverse and rare vegetation, and relatively undisturbed condition. The picturesque limestone sea cliffs carry some unusual species, one being *Frankenia pauciflora*, and the cliff tops carry closed-heath, including *Spyridium globulosum*, rats' tails and quandong. Further south between breaks in the limestone, there are sandy beaches behind which the foredunes support typical species including *Tetragonia decumbens*, *Cakile maritima* and spinifex. Inland from the cliffs there is open-scrub containing parrot bush, acacia and *Scaevola crassifolia* with patches of closed-scrub of acacia. Beyond the scrub low woodland of slender banksia and Menzies' banksia occurs. The understorey is dominated by zamia, blackboy and prickly moses.

The coastal strip is a major recreational resource, of regional significance. Access to the coastline should be by roads which run perpendicular to the coast, rather than parallel to it.

There are MWB sewerage and drainage works in the area which may be affected by future MWB works, a proposed regional road, and the construction of boat launching and other recreational facilities. The area south of Burns Beach has potential for sand and limestone, and there are existing mineral claims for limestone.

The Environmental Protection Authority has appointed a Coastal Resource Planner and coastal planning Committee to develop management guidelines for the Western Australian coast.

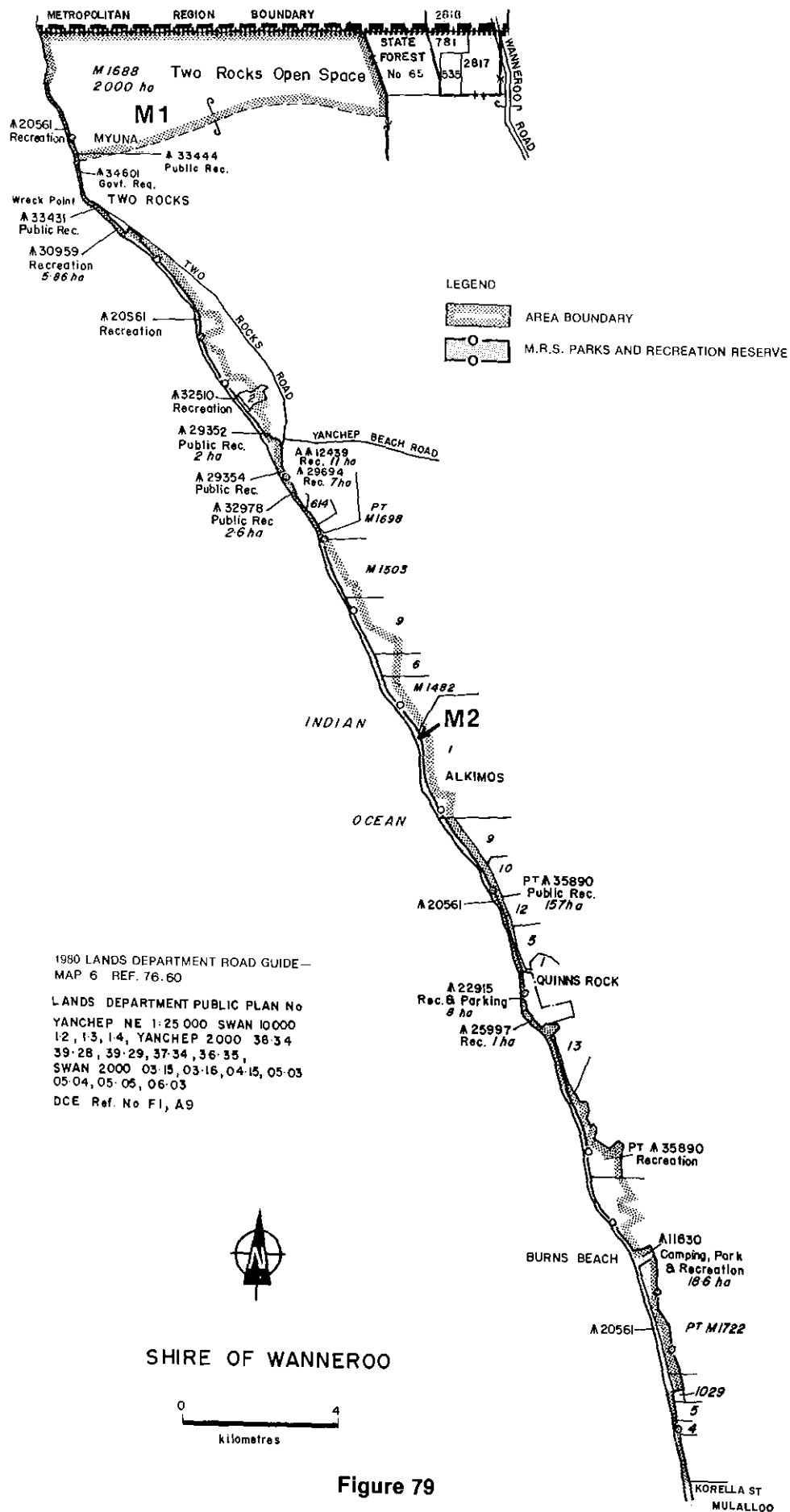
The Wanneroo Shire Council has proposed that a continuous coastal strip, at least 400 m wide, should be reserved and that coastal planning policies should apply to a 1 km wide coastal zone.

Recommendation

M2.1 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

Consideration should be given to:

- (a) preventing vehicular access;
- (b) preventing erosion;
- (c) providing adequate car parks, boat ramps, life-saving stations, with fenced pedestrian access ways to the ocean;
- (d) recreation activities which are compatible with conservation of flora and fauna.



M3 YANCHEP NATIONAL PARK

The area comprises Reserve A9868, for Protection and Preservation of Caves and Flora, and for Health and Pleasure Resort, vested in the National Parks Authority; lot 1 (Location 1370), part of lots 3 and 4 (Location 2751), part of Location 2751 and part of lots M1502, M1503 and M1689, privately owned freehold land. It is situated about 50 km north of Perth (Figure 80). Most of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. A southern extension to the existing 'reserved' land is proposed in the MRPA's North-West Corridor Report.

The area is noteworthy for a series of wetlands. Loch McNess, the biggest, is a large permanent lake. It is fringed with closed-sedgeland, the wetter sections carrying clubrush and jointed twig rush and the shallower sections carrying sedge meadows dominated by bare twig rush. In adjacent areas there is low open-forest of swamp paperbark with some flooded gum. Beyond this there is low woodland of swamp banksia. To the north and west of Loch McNess there are areas of open-forest and woodland of tuart, and to the east and south there are woodlands of mixed tuart and jarrah with a few patches of marri. Black duck and grey teal breed on Loch McNess.

Yonderup Lake is south of Loch McNess. It contains fern and sedge interrupted by paperbark and flooded gum. In the central and north-eastern parts of the wetlands there is an area of open water.

Wilgarup Lake is south of Yonderup Lake. Most of it is a seasonally inundated wetland, and it is densely covered with sedge and paperbark making it inaccessible to most water-birds. The surrounding vegetation consists of relatively undisturbed eucalypt woodland with stands of paperbark along the western and central areas of the lake. Associated with the eucalypt woodland, mainly in the north, is low woodland of banksia containing some sheoak and pricklybark. Throughout the Park there are limestone outcrops, whose vegetation consists of closed-scrub and closed- or open-heath, which includes parrot bush, spider-net grevillea, blackboy and chenille honeymyrtle. There are occasional pockets of low woodland of limestone marlock.

In the north-west of the Park, mainly in Swan Location 7953, there is an area of sand dunes, mainly covered by open-heath of melaleuca with an occasional yellow-tail flower. There are a few patches of closed-heath of rigid wattle, and in the valleys there is some low woodland of slender banksia and tree smokebush, with some large blackboys in the understorey.

Pipidinny Swamp lies to the south-west of Wilgarup Lake. Most of the swamp has been drained. Meadows of fern and grass occur in the north-eastern part, and this gives way to partially cleared bushland which extends to Wanneroo Road. A buffer zone is formed by a ridge line along the western side, beyond which trail-bike tracks are evident.

Beonaddy Swamp has been largely drained and is used for small agricultural holdings. The south-western portion is seasonally inundated, and carries stands of eucalypt and paperbark. The groundstorey has been removed. The north-eastern portion has been partially or totally cleared and is used for grazing and for market gardening.

The North-West Corridor Report proposes that Pipidinny Swamp and Beonaddy Swamp should become part of an Open Space linkage between Yanchep and Neerabup National Parks.

There are more than a hundred limestone caves in the Park. Two of them, Crystal Cave and Yonderup Cave, are open to guided tours and are popular with the public. Sometimes over one thousand people visit in one day. The headwaters of the underground streams that feed the caves lie 3 to 10 km east of the Park. Concern has been expressed that road works along the Yanchep Road might upset the hydrology of the area.

Yanchep National Park is by far the most frequently visited National Park in Western Australia, with close to two thousand cars visiting on a peak day. Visitor impact is therefore very high, especially for such a small area, and already a comparatively large proportion of Yanchep National Park has been changed from its natural state to provide facilities for visitors. With the major growth of the Metropolitan Region being channelled into areas north of Perth, visitor demand can be expected to increase substantially. It is clear that the Park will be unable to sustain this use unless more bush is added to it; even so, restrictions may have to be placed on numbers of visitors. For these reasons, it is recommended that the land to the north and south of Swan Location 7953 should be added to the Park. The inclusion of these areas would enlarge the small area of dune vegetation in that section of the Park. The concept of a 'regional park' as discussed in Chapter 5 is relevant to that portion of the Park which is most heavily used for recreation.

There are SEC lines in the area and proposals have been made for gas pipelines and construction of a major road, involving extension of the Mitchell Freeway on the west of the Park. There is an MRD marl pit in Pipidinny Swamp.

Mindarie Lake is almost completely drained for agricultural purposes, but a small pool of water remains. Coogee Spring has been drained, and subdivided into rural holdings. There is still open water in the southern portion of the wetland. The concept of a 'conservation buffer zone' as discussed in Chapter 5, is relevant to Mindarie Lake and Coogee Spring.

Recommendations

- M3.1 The Metropolitan Region Planning Authority's proposal to 'reserve' additional land for Parks and Recreation under the Metropolitan Region Scheme, should be endorsed.
- M3.2 The National Parks Authority and the Forests Department should negotiate on the management of the adjoining areas of Yanchep National Park and Ridges Management Priority Area (M4) with a view to relieving the visitor pressure on the National Park.
- M3.3 The Main Roads Department in consultation with the Metropolitan Region Planning Authority should consider realigning the proposed extension of the Mitchell Freeway further west, so as to retain as much as possible of Swan Location 7953 within the National Park, and to add a significant area adjoining that Location to the National Park.
- M3.4 The National Parks Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- maintaining habitats for water-birds;
 - providing buffer zones at least 30 m wide around the wetlands.

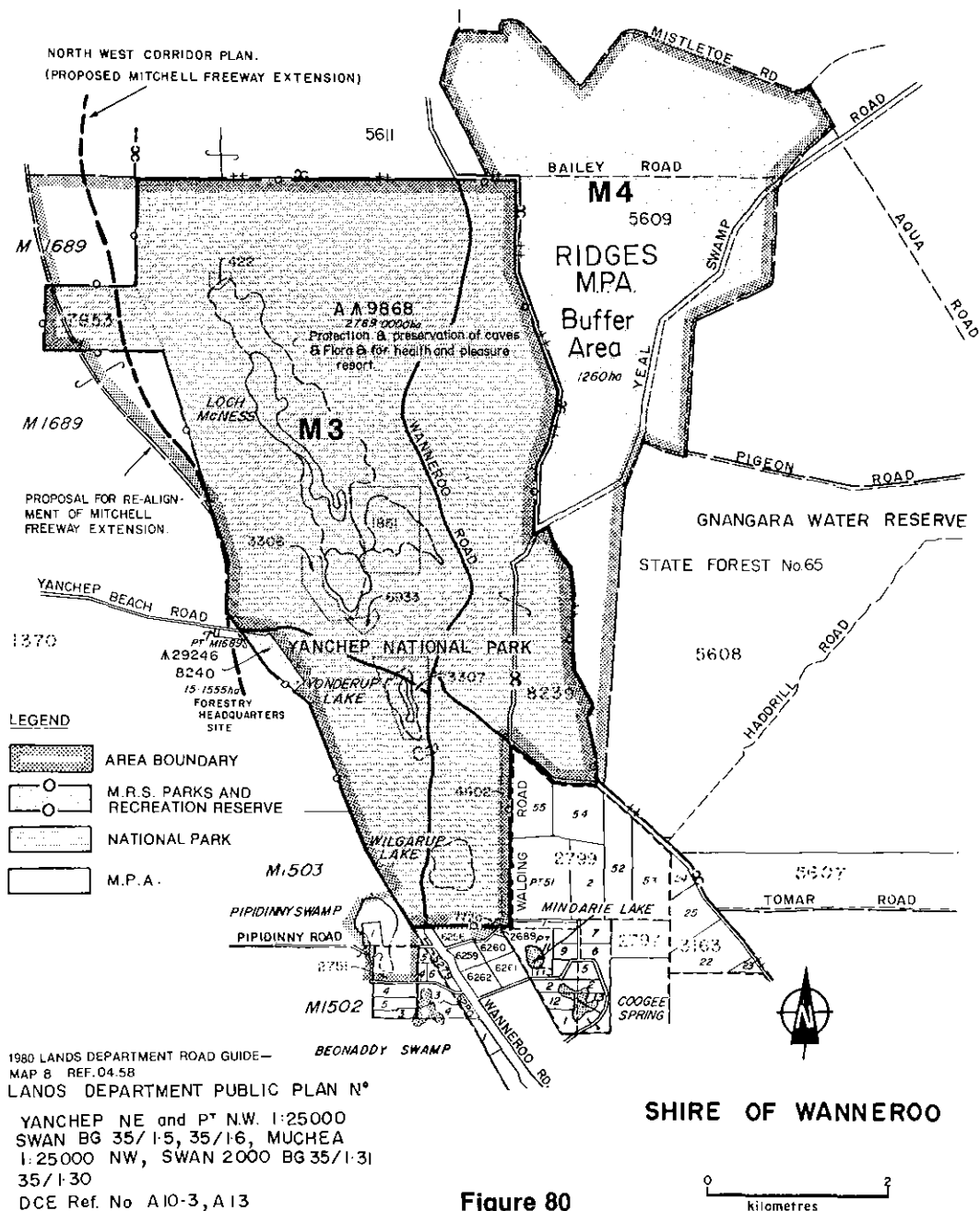


Figure 80

M4 RIDGES MANAGEMENT PRIORITY AREA (MPA 15.2)

Ridges MPA comprises part of State Forest No. 65 and is managed by the Forests Department for conservation of flora and fauna. It is situated about 50 km north of Perth, and adjoins Yanchep National Park (Figure 80).

The MPA's purpose is to supplement and buffer the Yanchep National Park (M3).

Ridges MPA resembles Caraban MPA (C12) and the western portion of Wabbling MPA (C13). It consists of high sand ridges with a core of coastal limestone, interspersed with broad sandy flats and swampy depressions. There is little surface run-off. The cover ranges from heath and scrub on limestone outcrops, through woodland of banksia and eucalyptus, to shrubland and sedgeland in swamps. In lower lying areas low woodland of paperbark and holly-leaf banksia occurs.

The MPA includes stands of jarrah which have been partly logged. However the impact has been low. As yet, no dieback has been recorded. Access to the area is by the relatively rough Yeal Swamp Road, and there has been little recreational use of the MPA so far.

Ridges MPA is within the Gnangara Water Reserve and close to the proposed line of groundwater extraction wells. It is also within the proposed Underground Water Pollution Control Area and Public Water Supply Area. It may be affected by groundwater extraction in the future and Catchment Zone regulations restricting public access.

The whole area has limestone potential and is affected by a number of claims for this mineral. There has been some localised extraction of limestone for road construction and portions of the MPA are affected by mining leases. If about 5 ha are set aside for limestone extraction, pressure for mining limestone in nearby conservation reserves will be eased. There is a MRD marl pit in Pipidinnny Swamp.

The jarrah in this section of State Forest is significant as comparatively little occurs in Yanchep National Park and most of that is mixed with tuart or marri.

Recommendations

- M4.1 The Forests Department and the National Parks Authority should prepare a joint management programme for the adjoining areas of Ridges Management Priority Area and the Yanchep National park, giving consideration to:
- (a) relieving the increasing visitor pressure on Yanchep National Park;
 - (b) setting aside an area of about 5 ha for limestone extraction.
- M4.2 An area of Ridges MPA that adjoins pine plantations should be managed by the Forests Department as a buffer strip, its width to be determined by the Forests Department in consultation with the National Parks Authority.

M5 YEAL NATURE RESERVE

The area comprises Reserves C31241, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; and C33784, for Government Requirements, not vested; Location 8011 (Gingin Airfield), owned by the Commonwealth of Australia; and vacant Crown land. It is situated about 10 km west of Gingin (Figure 81).

Gingin Airfield has vegetation which ranges from low open-forest and low woodland of banksia and pricklybark to low woodland of paperbark.

The section north-west of the airfield has deep pale grey sands with low woodland of banksia, Christmas tree and pricklybark with some stands of jarrah and marri and a varied understorey which includes telegraph sedge and silky bloodflower. On moister sands and peats there is closed-forest of paperbark, with some flooded gum and an understorey of species including sedge. North of the airfield there is woodland and open-woodland of marri, and low woodland of paperbark and swamp banksia with some holly-leaf banksia. The understoreys carry pea plant and white myrtle, and include closed-scrub of wattle. South of the airfield there is a swamp area, and to the east of this is woodland of jarrah and marri, with a second storey of sheoak and bull banksia, and a varied understorey. There is a series of high dunes in the south-eastern section of the area, and the adjacent Commonwealth Bombing Range.

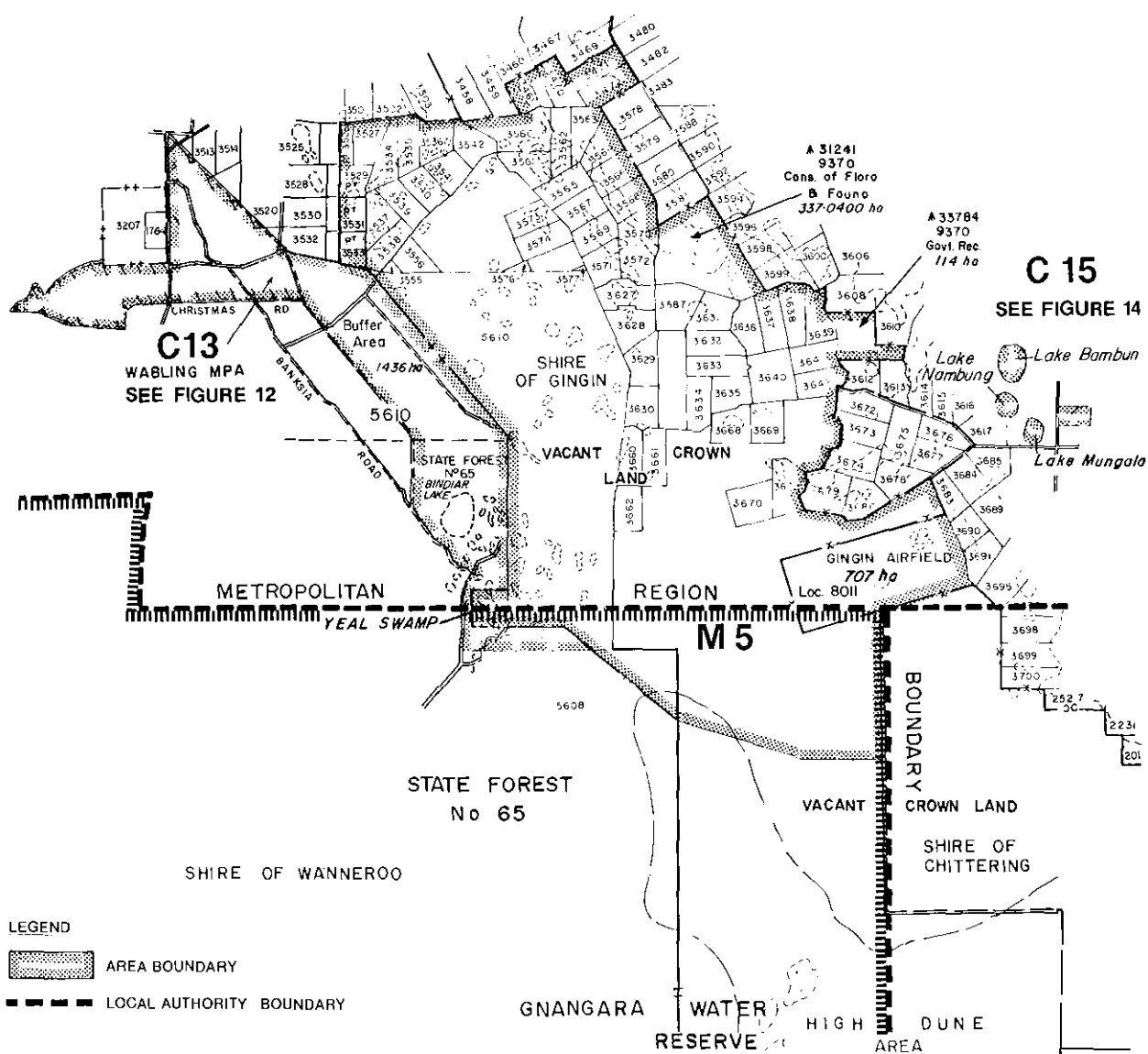
The whole of the proposed Yeal Nature Reserve has very high conservation value. It contains the northernmost extension of jarrah on the Coastal Plain. Because of its vegetation and soil formations, the area is of great scientific interest and is well worth preserving.

Yeal Swamp and Reserves C31241 and C33784 lie within the Gnangara Water Reserve, and within the proposed Underground Water Pollution Control Area and Public Water Supply Area. Reserve C31241 is within the Gingin Brook Catchment, and Reserve C33784 is within the Ellen Brook Catchment. Water levels are likely to be affected by proposed groundwater extraction.

There are SEC lines and a gas pipeline in the area and future gas and powerlines and road construction may also affect it. There are numerous mineral claims in the area. Mining for diatomite in Yeal Swamp has been approved by the W.A. Wildlife Authority under strict conditions. This would deepen the swamp and possibly minimise the effects of groundwater extraction. The adjacent Commonwealth Bombing Range has not been cleared of unexploded ordnance, so that public access is restricted.

Recommendations

- M5.1 Reserve C31241 should be classified as Class A.
- M5.2 Reserve C33784 should be cancelled and its area, together with the vacant Crown land, should be declared a Class C Reserve, for Conservation of Flora and Fauna, Water, and Mining, vested jointly in the Ministers for Conservation and Environment, Water Resources, and Mines.
- M5.3 The Geological Survey of Western Australia should give a high priority to the early evaluation of the mineral potential of Reserve C33784 and the vacant Crown land.
- M5.4 The Commonwealth of Australia should retain, where possible, uncleared areas within Gingin Airfield.



LANDS DEPARTMENT PUBLIC PLAN NO
GINGIN 40 SHTS 1,2,3,4, MOORE RIVER NW
SWAN 1:10000 BG 35/3.5
DCE Ref. No A8, A10-2, A11, A15,

SHIRES OF GINGIN, WANNEROO and CHITTERING

Figure 81

M6 NEERABUP NATIONAL PARK

The area comprises part of Reserve A27575, for National Park, and A24581, for Sanctuary for Fauna, both vested in the National Parks Authority; C33608, for Government Requirements, vested in the SEC; C21771, for Sanitary Site, not vested; part of Reserve C34537, for Water Supply, vested in the Minister for Water Resources; part of Reserve C35890, for Recreation, vested in the Shire of Wanneroo; Reserve C8398 for Access to Lake Nowergup, not vested; lot 4 and part of lots 1, 2 and 5 (Location 1149), part of Location 1708, lots 12 and 14 (Location 998), lots 18 and 29 and part of lots 2 and 17 (Location 1370), and lot 11 and part of lot 9 (proposed as a caravan park) of Location 107, all privately owned freehold land (Figure 82).

Much of the area has been 'reserved' by the MRPA for Parks and Recreation under the Metropolitan Region Scheme. In its North-West Corridor Report, the MRPA proposed extensions to the south-east, linking Neerabup National Park with the Joondalup Region Open Space, and to the south-west, linking the National Park to a proposed coastal reserve.

The vegetation in Neerabup National Park north of Quinns Road is low woodland and open-woodland of sheoak, banksia, Christmas tree and pricklybark. There are a few patches of jarrah and one of tuart. The very diverse understorey includes hakea, scrub sheoak, one-sided bottlebrush and prickly moses. Most of the heath is on an extensive area of limestone hills lying west of Wanneroo Road and includes wattle, cockies' tongues and blackboy. Reserve A24581 contains Lake Nowergup, the western part of which is fringed with jointed twig rush. Bulrushes occur around the lake's northern shore. Bordering the sedgeland is a woodland of flooded gum and swamp banksia. There is some low open-forest of swamp paperbark but only patches of it remain in the eastern section which is mostly cleared freehold land used for intensive agriculture. The eastern and northern banks of the lake contain isolated pockets of seasonally inundated land which form an ideal habitat for wading birds.

The vegetation in the National Park south of Quinns Road is mainly woodland of jarrah, associated with sheoak and banksia.

Lake Neerabup is an elongated lake basin with a north-south orientation, bounded to the east and west by limestone ridges.

Areas of permanent water along the western side of the lake basin are fringed with paperbark and sedge. Low-lying land elsewhere in the portion which is subject to seasonal inundation, shows signs of cultivation and has been invaded by bulrush (*Typha*). The lake has conservation value because of the variety of habitats it offers.

To the east of the lake, land has been acquired by the Crown to protect three important sites. These are Orchestra Shell Cave, Murray Cave, which contains palaeontological remains representative of the local ecosystem, and the remains of one of Perth's earliest lime pits and kilns. The W.A. Museum will be responsible for the cave and the area immediately around its mouth. Appropriate vesting for the remaining land has not yet been determined.

Recreational pressure on the area is likely to increase as urban growth continues. The area forms a continuous north-south strip of open space and will be readily accessible to many residents of the North-West Corridor. The recreational opportunities which the area offers include picnicking, walking and nature study.

The area's importance as a remnant of the natural landscape will increase. The entire area is highly visible to motorists using Wanneroo Road. Carabooda Lake and Lake Neerabup, to the east of Wanneroo Road, have considerable landscape value, the view covering a mixture of natural and modified wetlands with surrounding rural properties.

To the south-west of the Park there is a 300 ha piece of land, the Metropolitan Region Planning Authority's proposed Burns Beach-Mindarie Open Space (portion of Swan Location 1370), which joins the National Park to the Indian Ocean via a proposed coastal reserve. The land is mostly uncleared. Its addition would enhance the Park as a study area, since the Burns Beach-Mindarie strip would provide a transect of vegetation from the ocean to the Park.

The concept of a 'regional park', as discussed in Chapter 5 is relevant to the area. The National Park was originally set aside as a Stock Route, which accounts for its long narrow shape. The shape makes management difficult, since no part of the Park is far from its border and outside activities. In addition, the development of recreational facilities is made difficult because a considerable amount of development at any one place could virtually cut the Park into two, as could major east-west roads. The addition of the areas to the south and south-west of the Park would result in a reasonably large, more regularly shaped area in which facilities for recreation could be developed without destroying its essential character. It would also mean that the various ecosystems in the region were better represented within Parks and Recreation 'reserves'. A National Park should be an area of outstanding natural qualities and beauty, large enough to withstand recreational use and to remain unaffected by incompatible neighbouring land uses. Even with the proposed additions, Neerabup National Park does not meet these criteria.

Another relevant concept discussed in Chapter 5 is that of a 'conservation buffer zone'. This could apply to the privately owned land surrounding Carabooda Lake and Lake Neerabup, if the open water and fringing vegetation were set aside as reserves under the Land Act or for Parks and Recreation under the Metropolitan Region Scheme.

Neerabup National Park is close to the proposed Underground Water Pollution Control and Public Water Supply Areas. The coastal strip is a potential source of groundwater supply, but groundwater extraction processes will probably affect water levels. There are SEC lines in the area which may be affected by proposed water mains and gas pipelines, and by the proposed Neerabup reservoir. There are proposals to adjust the boundaries of the Park to allow the Mitchell Freeway to run along its western boundary, and in one place it is proposed to build the Freeway within the Park. There is known to be high grade limestone and a number of mineral claims within the proposed south-eastern extension to the Park, which also has potential for water. The Conservation and Land Use Committee proposed that the strategy of multiple vesting for the multiple purposes of conservation and/or recreation, water and mining should be applied to that land.

Recommendations

- M6.1 The area within the stippled boundary should be considered as a potential regional park.
- M6.2 The Metropolitan Regional Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.
- M6.3 The National Parks Authority, in consultation with the Metropolitan Region Planning Authority and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) protecting wetlands and areas of high conservation value;
 - (b) ensuring that recreation activities are compatible with the conservation of flora and fauna.
- M6.4 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority, to include representatives from appropriate authorities and interested parties.
- M6.5 The Metropolitan Region Planning Authority should consider the detailed siting of the proposed primary highways in the area, and the proposed extension to the Mitchell Freeway, with a view to minimising the impact on the area, possibly by reducing the number of primary highways from two to one.
- M6.6 Any future Land Act Reserves should include Water as a purpose.

M7 LAKES JOONDALUP AND GOOLLELAL

The area comprises Reserves A31048, for Recreation and Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority and the Shire of Wanneroo; A21708, for Protection of Flora and Fauna, not vested; and Wanneroo Estate lots 7 and 8, owned by the MRPA, (**Lake Joondalup**); Reserves C28544 and C34617, for Recreation, C32768, C33204, C33206 and C35577, for Public Recreation, and part of Reserve C834 for Camping and Recreation, all vested in the Shire of Wanneroo; C30809, for Research and Conservation of Flora and Fauna, vested in the Minister for Fisheries and Wildlife; and C21176, for Forestry Purposes (Pine Seed Orchard), vested in the Conservator of Forests; and lots 9 and 51 (Perthshire Location 107), part of lot 2 (Perthshire Location 106), lot 1 (Perthshire Location 101), lot 1 (Perthshire Location 108), part of Perthshire Location 109, Locations 2369 and 2512, lots 30 and 7 (Location 3154), part of Location 1513, part of lots 3 and 4, lots 73 and 505 (Wanneroo Estate lot 10), lot 34 (Wanneroo Estate lot 11), lot 25 (Wanneroo Estate lot 12), lot 4 (Wanneroo Estate lot 13), lots 34 and 35 (Wanneroo Estate lot 14), lots 20 and 22, 28, 29 (Location 1034) and lot 2 (Location 3211), all owned by the MRPA; part of Locations 9809 and 2734, part of Perthshire Location 110, lot 36 (Wanneroo Estate lot 15), lots 1, 7, 8 (Wanneroo Estate lot 16), lot 26 (Wanneroo Estate lot 12), Locations 2701 and 2595, lots 31 and 40 (Location 6078), part of Location 3211, lots 23, 24, 25 (Location 1034), privately owned freehold land; part of lease MT67, and vacant Crown land (**land surrounding Lake Joondalup**); and lots 6, 9 to 14, 23, 26, 29, 30, 37 to 40, 42 to 46, 48 to 56, 58 to 62, 64, 65, 69, 70, 72, 73, 74, 76, 80 to 82 (Perthshire Location 103), lot 15 (Perthshire Location 114) and part of Perthshire Location 114, lots 1, 2, 18 to 20 (Location 587), lots 9, 10, 25, 50 and part of lots 5 to 8 and 24 (Location 709), lots 16, 17, 21, 22 and part of lot 100 (Location E1), freehold land mainly owned by the MRPA (**Lake Goollelal and surrounding land**) (Figure 83). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The area is situated within Perth's North-West Corridor, immediately west of Wanneroo Road, about 6 km inland from the sea. It extends for a length of approximately 24 km, and its width averages about 1 km.

Lake Joondalup is a large fresh water lake. The waters are densely populated with benthic stoneworts. In the lake and near its edge are beds of sedge, which are replaced by *Typha orientalis* in disturbed areas, and the fringing sedge is bordered by woodlands of paperbark. Flooded gum is common in places. The wetland vegetation is surrounded by open-forest and woodland of tuart, marri, jarrah and banksia, but much of this has been cleared.

Lake Joondalup is outstanding for the number and variety of water-birds it supports, which include species rare elsewhere in the metropolitan area e.g. the straw-necked ibis and white ibis. Many hundreds of birds of different species use the lake as a summer drought refuge.

Beenyup and Wallubuenup Swamps and Lake Goollelal lie to the south of Lake Joondalup, and drain into it.

A small part of Reserve C30809 contains buildings (the Wildlife Research Centre), roads and yards but most of it is in a natural state. The vegetation is mixed woodland of tuart, jarrah and banksia. Brush wallaby and brush possum occur on the Reserve, together with reptiles, including the race-horse goanna, and a number of bird species. The Reserve contains vegetation types that are being increasingly cleared as urbanisation proceeds in this part of Perth.

Recreational pressure on Lakes Joondalup and Goollelal is likely to increase as urban growth in the North-West Corridor continues. The area forms a continuous north-south strip of open space, and will be readily accessible to many residents of the Corridor. The recreational opportunities which the area offers include picnicking, walking, nature study and aquatic activities such as canoeing. There is a rowing course in the Joondalup area.

As urban growth continues, the area's importance as a remnant of the natural landscape will increase. Already Lake Joondalup is the most significant landscape feature in the Joondalup area. The concept of a 'regional park', as discussed in Chapter 5 is relevant to the area.

The Town Planning Department has prepared a design concept for the area comprising Lake Joondalup, Beenyup and Wallubuenup Swamps and Lake Goollelal. The design concept, adopted in principle by the MRPA, provides for the recreational use of Lake Goollelal and the management of the swamps and Lake Joondalup for conservation. Due to the complex management problems the Metropolitan Region Planning Authority's Region Open Space Management Committee is developing a management programme in conjunction with other bodies, including the W.A. Wildlife Authority, Forests Department, Joondalup Corporation, MWB and the Shire of Wanneroo, taking account of the need for both conservation and recreation.

The water levels in the Joondalup and Goollelal Lakes area will be affected by storm water drainage inflow and may be affected by private and MWB groundwater extraction. There are existing MWB works, and the area will be affected by proposed MWB works. There are also SEC lines. There have been applications to extract limestone on the eastern side of Lake Neerabup and pressures for subdivision for rural residential lots at the northern end and the eastern side of the lake.

Recommendations

- M7.1 The area within the stippled boundary, not including Reserve C30809, should be considered as a potential regional park.
- M7.2 The Metropolitan Region Planning Authority, in consultation with the W.A. Wildlife Authority, the Wanneroo Shire Council and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- (a) protecting wetlands and areas of high conservation value;
 - (b) ensuring that recreation activities are compatible with the conservation of flora and fauna;
 - (c) recreation being a priority use for Lake Goollelal;
 - (d) conservation of flora and fauna being the priority use for Lake Joondalup and the other wetlands.
- M7.3 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority, to include representatives of appropriate authorities and interested parties.
- M7.4 Subject to the agreement of the controlling body, Water should be added to the purpose of Reserve A31048.
- M7.5 The Forests Department should retain access to that area now occupied by Reserve C21176 for collection of seed from the pine seed orchard.
- M7.6 Any future Land Act Reserves should include Water as a purpose.

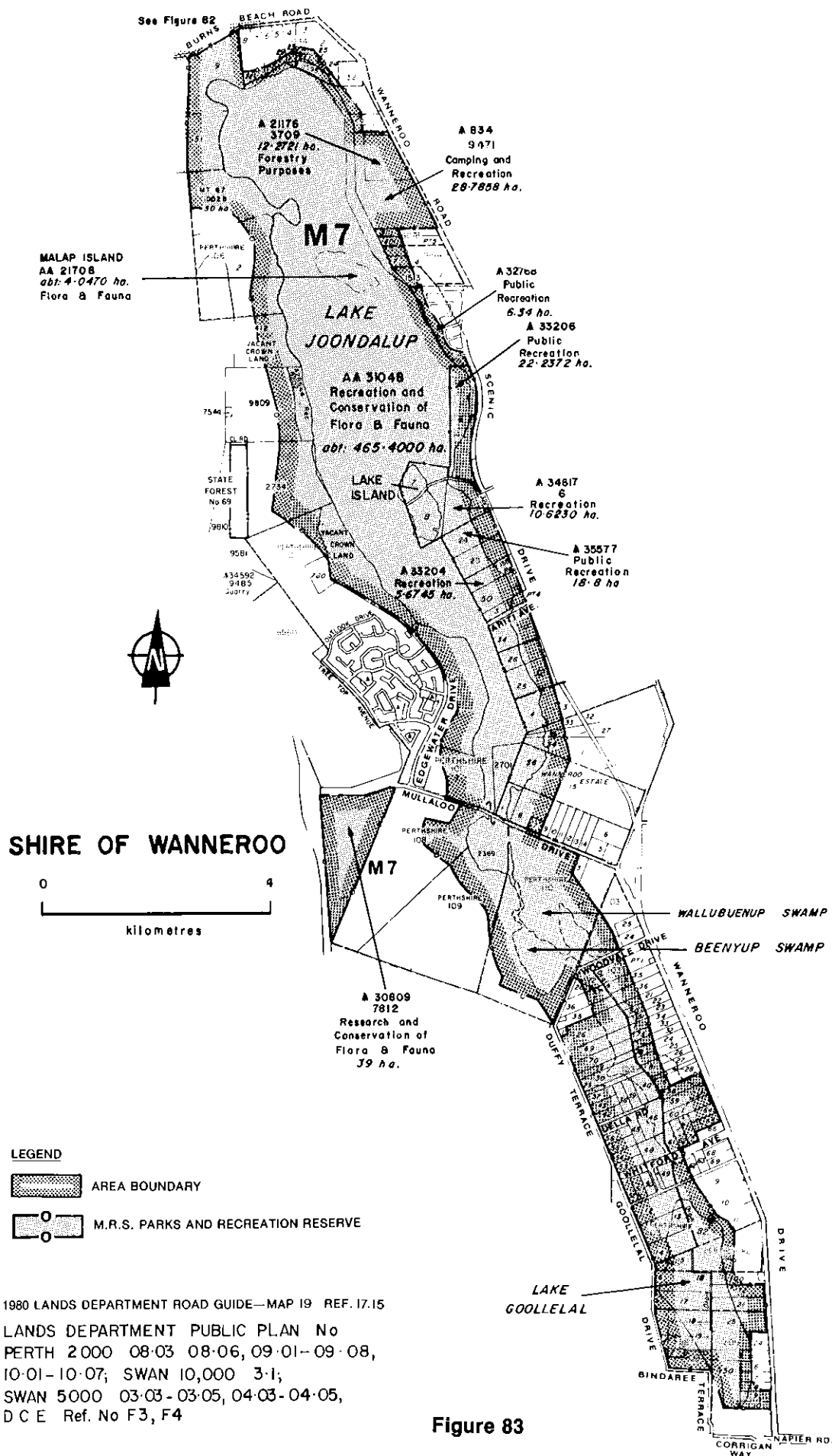


Figure 83

M8 WANNEROO WETLANDS — EASTERN CHAIN

The area comprises Reserve C11598, for Recreation, vested in the Shire of Wanneroo; Locations 1640, 1653, 1747, 1804, 1896, 1897, 1963 to 1981, 2493, 2494, 2694, 2696 to 2698, 2702, 2703, 2923, 4135, 5454, 5455, part of Locations 2692 and 2928, lots 1, 3 to 7 of Location 1678, lots 1 and 3 of Location 1852, lots 2, 50 and 51 of Location 4134 (**Lake Pinjar**); part of Reserve C36496, for Public Recreation, not vested; lots 48 and 49 of Location 1540 (**Lake Adams**); part of Locations 1481, 1581, 1582, 1673, 1734, 2316, 3144, 3191 and 5373 (**swamps south and east of Lake Adams**); part of lots 1 to 7, 38 and 39 (Location 1816), part of lots 1 and 2 (Location 8), part of lots 9 to 11 (Location 2081), part of Locations 1133, 1395, 1646, 1658, 1818, privately owned freehold land; and a foreshore reserve which is Crown land (**Mariginiup Lake and Little Mariginiup Lake**); part of Locations 1734, 1787 and 1856 (**wetlands north of Jandabup Lake**); Reserves C7349, for Conservation of Fauna, vested in the Minister for Fisheries and Wildlife; C33193, for Public Recreation, vested in the Shire of Wanneroo; part of Reserve C15054, for Public Utility, not vested; part of lots 1 to 10 (Location 1654), part of lots 11 to 14 (Location 1686), part of lot 30 (Location 1635), part of lot 17 (Location 1935), part of Locations 1383, 1504, 1655, 1713, 1787, 3310 and 5205, privately owned freehold land (**Jandabup Lake**); part of Locations 672, 740, 774, 934, 1811, 2383 to 2385, 2451, 2482 and 2829; and Reserve C8162, for Water, under the control of the Shire of Wanneroo (**Badgerup Lake and Little Badgerup Lake**); part of Reserve C27466, for Recreation, vested in the Shire of Wanneroo; part of lots 1 to 3 (Location 1526), part of lots 11 to 13 (Location 1511), part of lots 24 and 25 (Location 1794), part of lots 5 to 7 (Perthshire Location 104), part of Perthshire Location 104, and part of Location 1735 (**wetlands near Lenzo Road**); part of lots 2, 4 and 5 (Location 1224), part of lot 47 (Location 2470) and part of Location 1803 (**Snake Swamp**); Reserves C8399, C27278 and C27279, all for Recreation, vested in the Shire of Wanneroo; part of Perthshire Location 104, part of lot 5 (Location 2488), Location 883 and part of Locations 887, 970 and 1494, privately owned freehold land (**Gnangara Lake**); part of lots 1, 3, 4, 7 and 9 (Location 1237) (**wetland south-west of Gnangara Lake**).

The area comprises a chain of wetlands about 24 km long, which passes a few kilometres east of Wanneroo (Figures 84A, 84B and 84C). Emu Swamp has been 'reserved' and other land in the area has been recommended for possible 'reserves' for Parks and Recreation under the Metropolitan Region Scheme.

Several concepts discussed in Chapter 5 are relevant: 'regional parks', 'pathway systems' and 'conservation buffer zones'. The last concept would be most applicable where adjacent privately held land is adversely affecting a lake's conservation value.

Lake Pinjar

Almost all of this lake (see Figure 84A) is privately owned. Major modifications have been made to the shoreline and littoral zone. The remnants of the original vegetation include jarrah, marri, pricklybark, banksia, sheoak, Christmas tree and blackboy on higher ground, and flooded gum and paperbark close to the water. Reservation of a strip of land across Lake Pinjar may be a valuable way of representing the interesting sand dune formations, named lunettes, which occur in the area.

Lake Adams

The original extent of the lake (see Figure 84B) is indicated by a few scattered remnants of the fringing flooded gums. A fall in water level has been aggravated by groundwater extraction and the pine plantation to the north. The owners have undertaken a project to increase the lake's value as a landscape feature and a summer refuge for water-birds, by clearing some reed beds, to provide open water.

A section of the area surrounding the lake (Reserve C36496) is used for equestrian trails and the Wanneroo Shire Council plans to set aside the western part (lot 49) for conservation.

Swamps south and east of Lake Adams

These swamps are located in freehold land and are subject to seasonal inundation. Surrounding vegetation has been substantially cleared and although the area is dissected by tracks no agricultural use is apparent at present. The swamps may attract water-fowl when inundated.

Mariginiup Lake and Little Mariginiup Lake

Mariginiup Lake is a semi-permanent fresh water lake. It is fringed with sedgeland of jointed twig rush, *Baumea juncea* and *Eleocharis sphacelata*, and the surrounding vegetation includes the shrub *Leptospermum ellipticum* and patches of flooded gum and swamp paperbark.

It offers summer refuge for water-birds, including teal and pink-eared and black duck. Although the surrounding areas involving small agricultural holdings have been disturbed the lake still has conservation value.

Little Mariginiup Lake is a seasonal swamp with reed beds in the western half and market gardens to the east. It is surrounded by cleared land which is freehold.

Wetlands north of Jandabup Lake

The wetlands contain open water with emergent reeds. The southern lake has a smaller reed zone. Most of the surrounding area has been cleared but the lakes provide nesting and feeding areas for the birds at certain times of the year.

Jandabup Lake

Jandabup Lake is the largest body of open fresh water in the Shire of Wanneroo and is an important drought refuge for water-birds. The lake supports a variety of dabbling and wading species, including white ibis and black duck. The fringing vegetation, which includes extensive reed beds, sedgelands and remnant flooded gum and swamp paperbark, extends into freehold land. The eastern side of the lake is seasonally inundated and is used for intensive horticulture; the western side is subject to seasonal flooding and has mostly been cleared. Four plant communities occur here which are inadequately represented elsewhere.

Almost all of this lake is privately owned. Major modifications have been made to the shoreline and littoral zone. In April 1978 a large, deep channel was dredged in the south-eastern littoral area. The W.A. Museum has recommended that more of the littoral area be acquired and managed to provide varying water depths and habitats for wildlife.

There are MWB groundwater bores and Forests Department pine plantations to the east of the lake. Some horticulture takes place on the lake margins, and areas on the north-east and north-west have recently been subdivided for hobby farms.

While water extraction for public use is carefully monitored, there is some concern that increasing private use of groundwater may affect the lake.

Badgerup Lake and Little Badgerup Lake

Badgerup Lake and Little Badgerup Lake (see Figure 84C) contain extensive beds of bulrush, and two exotic water plants: water hyacinth and *Polygonum attenuatum*. There are large areas of the native sedge *Scirpus proliifer* in Badgerup Lake and a good stand of swamp paperbark at the southern end of Little Badgerup Lake. Trees have been almost entirely lost from the foreshores and fringes of Badgerup Lake. This area provides a relatively undisturbed breeding habitat for water-birds.

The conservation value of the lakes has diminished following the establishment of exotic species of water-plants, but the lakes could be used as a feature within parkland, compatible with conservation of flora and fauna.

Wetlands near Lenzo Road

These semi-permanent wetlands lie in a wide area of low sandy hills. Extensive grazing and market gardening have reduced the natural vegetation to a few trees around the fringes of the semi-permanent and seasonal swamps, which serve as water-bird refuges.

The wetlands have potential for parkland development, in conjunction with rural use of the surrounding land.

Snake Swamp

Snake Swamp is the largest of several seasonal swamps and winter-wet depressions south of Gnangara Road. The area has been intensively grazed, and the surrounding woodland is very disturbed. If permanent water is maintained by pumping or deepening, the swamp could contribute to the landscape of a recreational area.

Gnangara Lake

Gnangara Lake is a large open fresh water lake which has permanent water except in periods of drought. There has been considerable modification of the foreshore and the lake has been partly developed to cater for active recreation. Part of the eastern foreshore retains its natural vegetation of eucalypt, acacia and banksia. Sedges are found in the northern and southern portions of the lake. There is an area of mudflats exposed for part of the year which supports some species of water-birds. The fringing vegetation, which is in good condition, should be included in the existing reserve and managed for conservation of flora and fauna and recreation.

Wetland south-west of Gnangara Lake

The wetland is a small area of open water, partly bounded by sedges. The water is sufficiently deep to support dabbling water-birds, including black duck.

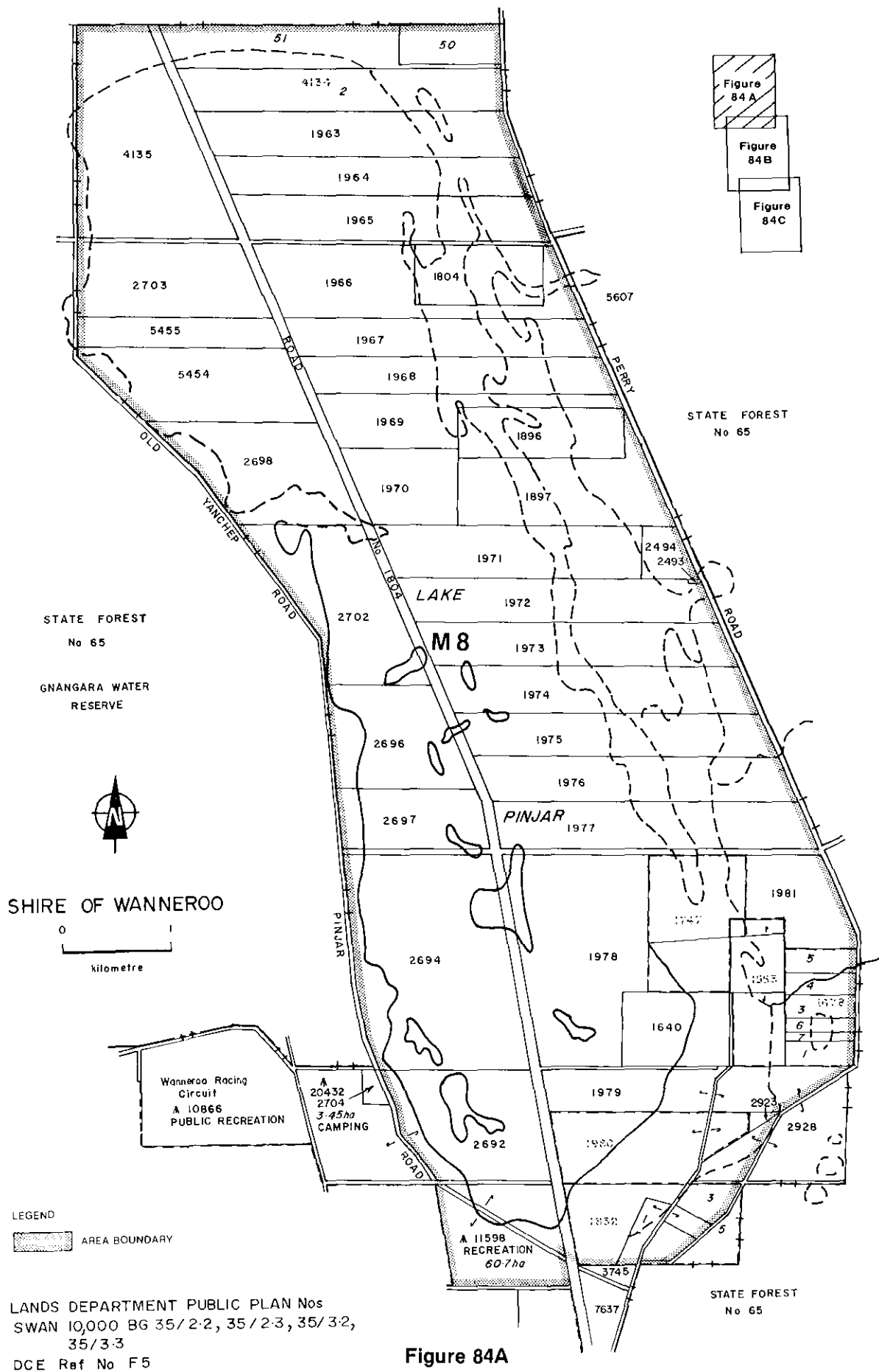
With the exception of Lake Pinjar, Mariginiup Lake and part of Little Mariginiup Lake, the area is

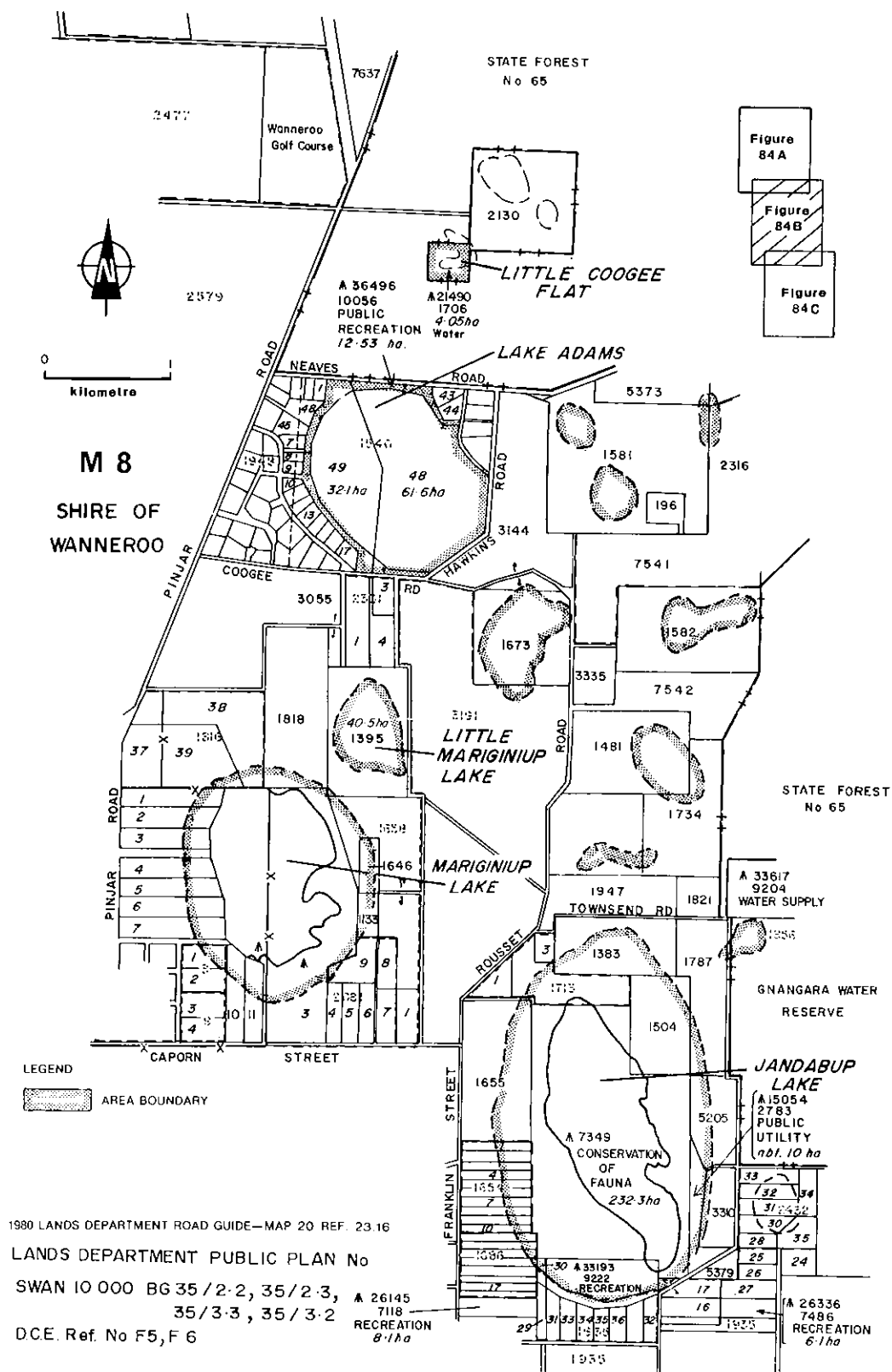
within the Wanneroo Groundwater Pollution Control Area. The lakes may be affected by organic pollution due to drainage from surrounding septic tanks. The MWB is investigating this. Private and MWB groundwater extraction and forestry activities are likely to affect lake levels and the area may be affected in the future by sewerage and drainage works. Various mineral claims affect the area, which has potential for extraction of diatomaceous earth, peat and sand. Mineral claims affect Lake Jandabup, Little Badgerup Lake, Lake Mariginiup and Gngangara Lake. Mining in part of Gngangara Lake has been approved by the Mines Department. Deepening of the lake below the water table may increase its conservation value as summer refuge for water-birds.

The Conservation and Land Use Committee proposed that the strategy of multiple vesting for the multiple purposes of conservation and/or recreation, water and mining should be applied to Lakes Badgerup, Gngangara, Jandabup, Little Badgerup, Little Mariginiup and Mariginiup and their margins, and to the wetlands near Lenzo Road.

Recommendations

- M8.1 The area within the stippled boundary, shown on Figures 84B and C, should be considered as a potential regional park.
- M8.2 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme according to the following order of priorities: Jandabup Lake, wetlands north of Jandabup Lake, Mariginiup Lake, Little Mariginiup Lake, Gngangara Lake, wetland south-west of Gngangara Lake, Badgerup Lake and Little Badgerup Lake, wetlands near Lenzo Road, Snake Swamp, Lake Adams, swamps south of Lake Adams, and Lake Pinjar.
- M8.3 The Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) conservation of flora and fauna being the priority use for Lakes Jandabup, Mariginiup and Little Mariginiup;
 - (b) recreation being a priority use for Lake Gngangara;
 - (c) incorporating Badgerup and Little Badgerup Lakes, Lake Adams, swamps south and east of Lake Adams, wetlands north of Jandabup Lake, wetlands near Lenzo Road, and the wetland south-west of Gngangara Lake as part of parkland, for recreation and as a refuge for water-birds;
 - (d) controlling exotic water-plants;
 - (e) the area's potential for water and minerals;
 - (f) in the case of Lake Gngangara:
 - (i) controlling access to prevent erosion of the foreshore, by replanning access roads and amenities;
 - (ii) permitting only passive recreation in areas where fringing vegetation is of high quality;
 - (iii) encouraging the growth and regeneration of vegetation on the eroded foreshores;
 - (iv) protecting fringing vegetation from effects of mining, and rehabilitating the lake after mining.
- M8.4 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority to include representatives of appropriate authorities and interested parties.





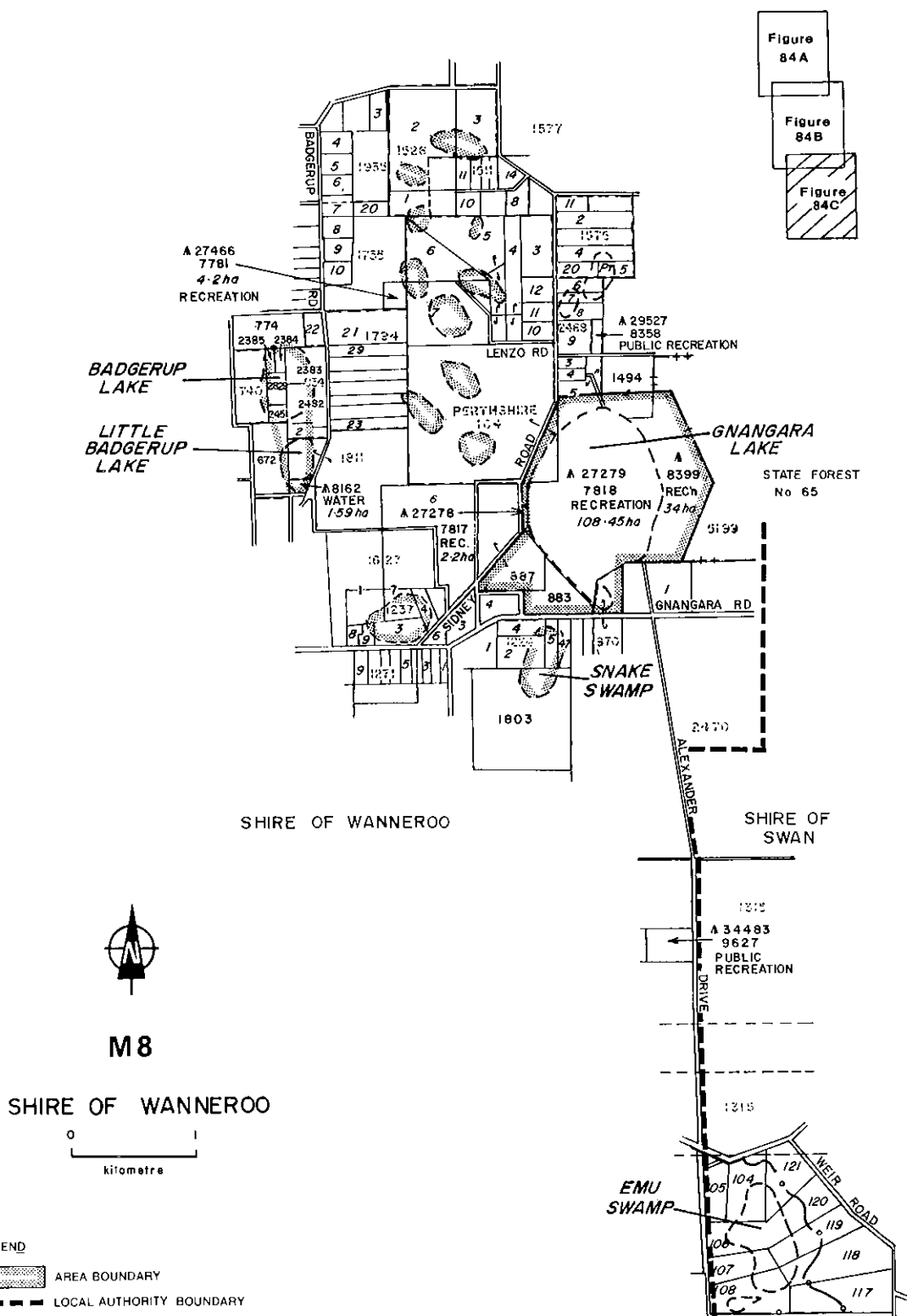


Figure 84C

M9 MELALEUCA MANAGEMENT PRIORITY AREA (MPA 15.1)

The area comprises Melaleuca MPA, managed by the Forests Department for conservation of flora and fauna, and Location 1497, privately owned freehold land. It is situated about 40 km north-east of Perth (Figure 85).

The MPA's purpose is to conserve the coastal site vegetation types which are characteristic of the Bassendean Dune System. The landform consists of low dunes interspersed with shallow lakes and swampy depressions. Most of the area is covered by low woodland or low open-forest of banksia, and low-lying permanent swamps are dominated by paperbark and white myrtle.

There is a very wide variety of fauna. Bird species are numerous because of the wide range of habitats available, the swamp complexes being particularly important. The swamp skink lizard, rare elsewhere on the Swan Coastal Plain, is common in Melaleuca MPA.

The area is relatively undisturbed except for a few tracks. At the moment recreational pressure is low, but will probably increase as the population expands in the northern suburbs of Perth.

The MPA is within the Gnangara Water Reserve, and the proposed Underground Water Pollution Control and Public Water Supply Areas. The eastern section is within the Ellen Brook Catchment. MWB Catchment Zone regulations may affect access in the future. MWB groundwater extraction will affect water levels but the Forests Department has been consulted during planning. There is a gas pipeline reserve in the area and the future gas pipeline from the North-West Shelf may follow this. A future high pressure gas pipeline along Neaves Road is also planned. The MPA has potential for silica and peat, and there are some existing mineral claims. There is an SEC line in the MPA.

Recommendation

M9.1 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- (a) only allowing recreation activities which are compatible with the conservation of flora and fauna, and then only in the proximity of Neaves Road, which should remain the sole means of vehicular access;
- (b) confining mining of peat to plantation areas;
- (c) continuing to encourage field studies by the Naturalists' Club.

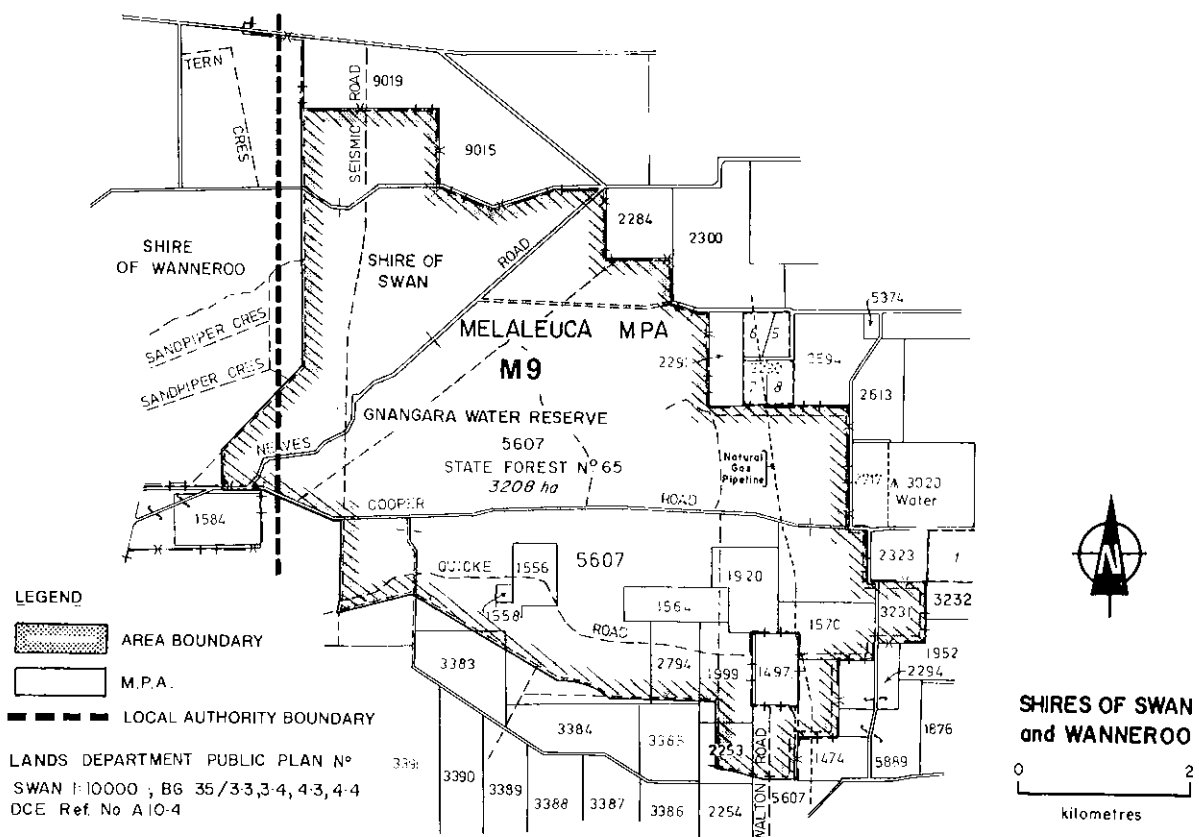


Figure 85

M10 OFFSHORE REEFS — OCEAN REEF TO TRIGG

The area is bounded by the coast and includes an offshore reef which protects a series of smaller reefs. It is centred on Whitfords, about 22 km north-west of Perth (Figure 86).

The reefs are biologically rich and are unsurpassed locally as an underwater spectacle. Because the reefs have been heavily exploited, and as the area has educational value, it is considered essential that they be reserved and protected to conserve the marine communities, including the rare cowrie shell which is much sought by collectors. The area could be protected by allowing only line fishing.

The area is affected by an MWB sewerage outfall and a boat ramp at Whitfords.

The Wanneroo Shire Council has suggested that reefs should be protected from Fremantle to Moore River, and that similar reserves should be established at Alkimos (5 km radius) and Wreck Point (4.5 km radius).

Recommendations

- M10.1 The Environmental Protection Authority should commission a study of the Sorrento-Mullaloo reefs with the aim of recommending the establishment of an Aquatic Reserve.
- M10.2 Marine life should be conserved through revision of regulations to prevent any fishing except by line.

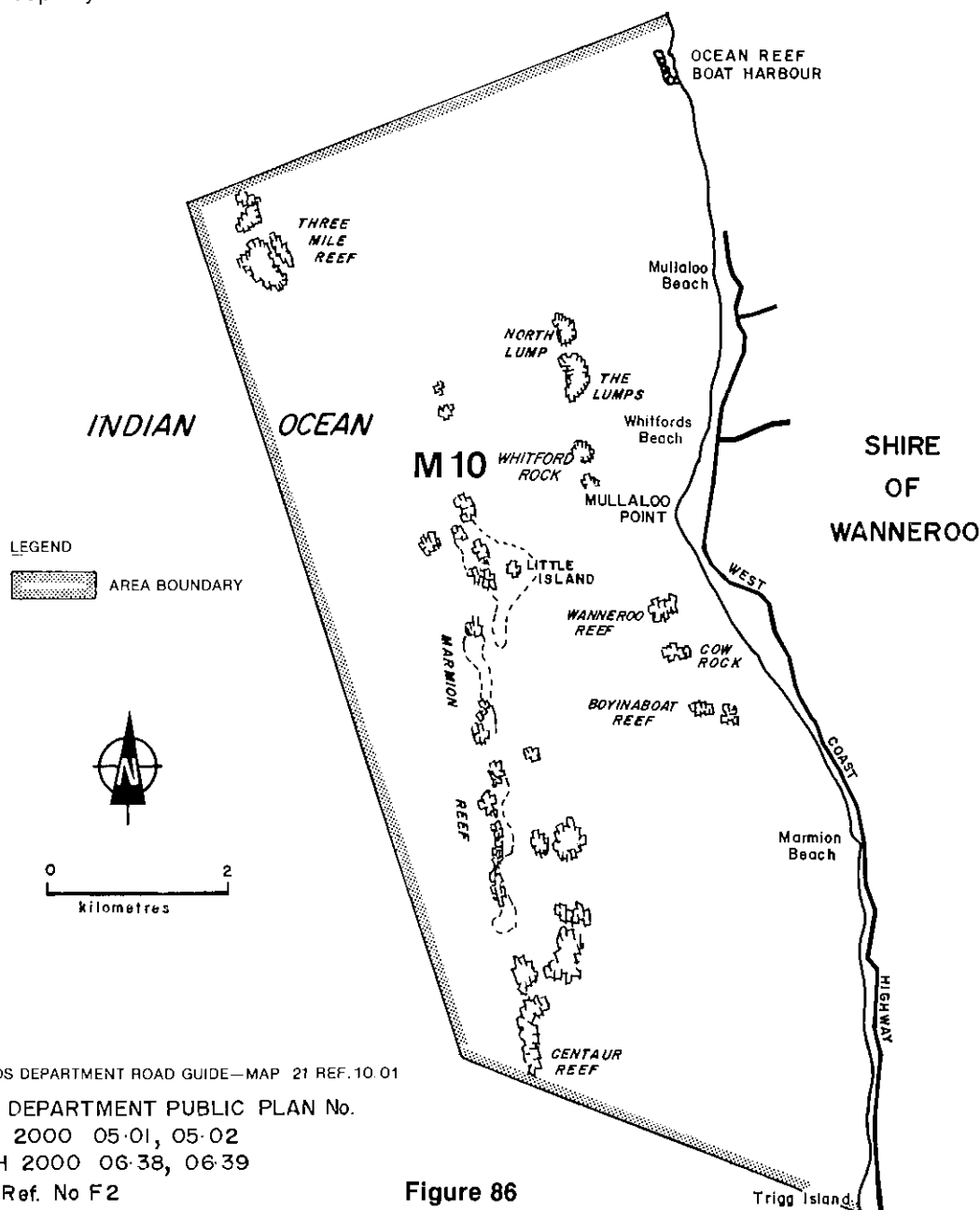


Figure 86

M11 WARWICK WOODLAND

The area comprises lot 1 and part of lot 145 (Location 1315), freehold land owned by the MRPA. It is situated west of Wanneroo Road and south of Warwick Road (Figure 87). It is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme and will be developed for active recreation.

The vegetation consists of woodland of jarrah with a few marri, and an understorey of banksia. There is a diverse groundstorey which includes blackboy, telegraph sedge and bacon-and-eggs. There is evidence that the whole area was burnt five or six years ago. The vegetation should be protected from burning and other disturbances.

Private groundwater extraction may affect water levels, and the area may be affected by proposed sewerage works.

Recommendation

M11.1 The Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment should consider encouraging the growth and regeneration of local indigenous vegetation.

M12 RESERVE A20091, MARANGAROO

Reserve A20091, for Parkland and Recreation, not vested, is situated east of Wanneroo Road and north of Warwick Road in the suburb of Marangaroo (Figure 87).

The soil is mostly yellow sand, and it supports open-woodland of jarrah, with an understorey of banksia and the occasional sheoak. The groundstorey carries many species, including blueboy, Star-of-Bethlehem, bristly cottonhead and bacon-and-eggs.

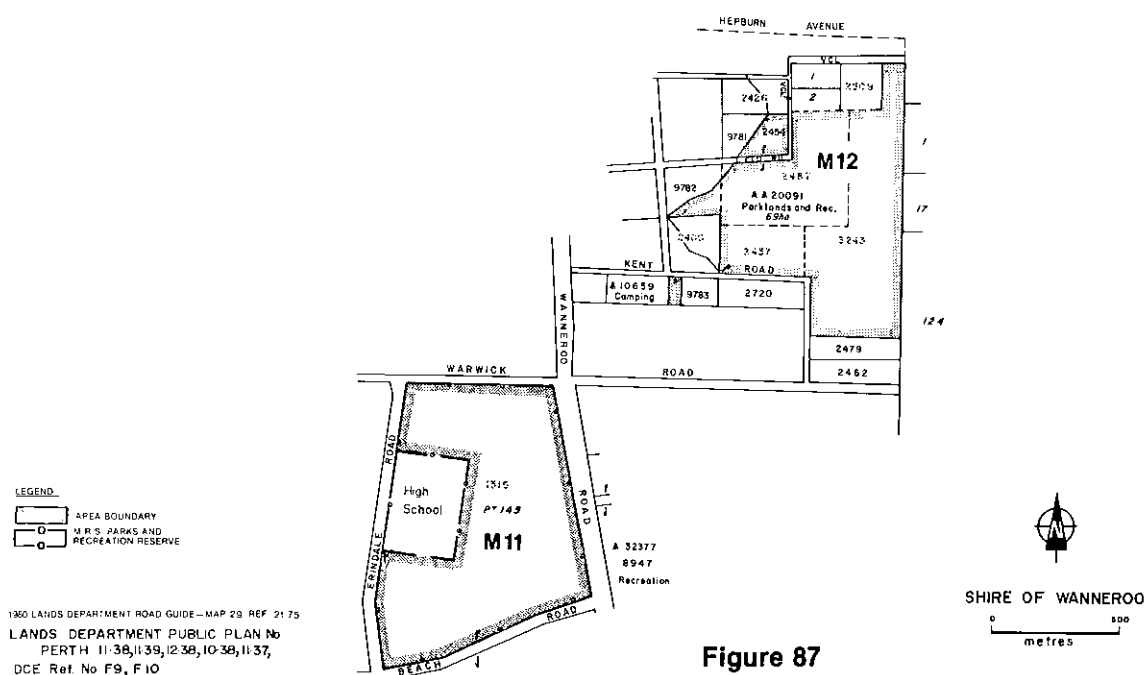
In the extreme western portion of the Reserve there is higher ground of yellowish-brown sand. It is vegetated with woodland and open-woodland of tuart, with less banksia and more sheoak. The understorey is noticeably different from the remainder of the Reserve.

The whole Reserve has been burnt in recent years, and has also been affected by timber cutting and rubbish dumping, the latter particularly in the east where car bodies line tracks into the Reserve. However the Reserve has retained a good diversity of plant species and there appears to be little invasion of weeds.

Private water extraction may have adverse effects on groundwater levels and the area may be affected by future MWB sewerage works.

Recommendation

M12.1 The purpose of Reserve A20091 should be amended to Parkland and the Reserve should be vested in the Shire of Wanneroo.



M13 WHITEMAN PARK (MUSSEL POOL)

The area comprises part of lot 5 (Location 2515 and E1), lot 4 (Locations 2515, 2516, and E1), part of Location 2516 and E1, lots 254 to 257, 298 to 304 (Location 1315), lots 127, 128, 258 to 262, 263, 295 to 297 and 314 to 317 (Locations 1315 and G), lots 264, 265, 293, 294 (Location 1315), lots 130, 266, 267, 289 to 292 (Locations 1315 and H), lots 268 to 275, 282 to 288, 139, 140 and part of lots 329 and 330 (Location H), lots 590, 603, 604 and 617 (Location I), freehold land owned by the MRPA; and lot 54 (Location G) and part of lot 331 (Location I), privately owned freehold land. It is situated around the upper section of Bennett Brook, about 6 km north of Bassendean (Figure 88). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme, and the area is included in the MRPA's Improvement Plan No. 8.

The area supports open-woodland of marri and jarrah, with a second storey of slender banksia, Menzies' banksia and holly-leaf banksia. The understorey includes *Jacksonia floribunda* and *Hibbertia hypericoides*. Sections which are seasonally flooded carry low woodland or open-woodland of paperbark, with an understorey containing *Leptospermum ellipticum*, *Astartea fascicularis* and the rare orchid, babe-in-a-cradle. Horse Swamp and the creek which contains Mussel Pool carry swamp vegetation, which varies from low woodland of paperbark to low closed-forest of paperbark and flooded gum. The understorey comprises dense sedge with occasional shrubs.

Five native mammals, including the extremely rare ashy-grey mouse and seventy bird species, including the painted quail, which is rare on the Coastal Plain, have been recorded in the area. There are twenty-five reptile species, including the most northerly occurrence of a sub-species of goanna, and a number of native fish. The conservation value of the area is high because of the occurrence of wetlands and uncommon flora and fauna.

The area is currently being studied by the MRPA, which is developing a long term management strategy plan for Whiteman Park. The southern portion of the area around Mussel Pool has been developed as a picnic area. The MRPA is continuing to develop and manage the area, to cater for the recreational needs of people from a large area.

The concept of a 'regional park', as discussed in Chapter 5, is relevant to Whiteman Park.

The area is partly within the existing Mirrabooka Public Water Supply and Underground Water Pollution Control Areas and partly within a proposed extension of these areas. MWB groundwater extraction from the Gngara Mound may have adverse effects on water levels. The area may be affected by proposed realignments of the Great Northern Highway and Lord Street. The area is affected by existing roads.

Recommendations

M13.1 The Environmental Protection Authority should endorse the Metropolitan Region Planning Authority's management programme.

M13.2 Any future Land Act Reserves should include Water as a purpose.

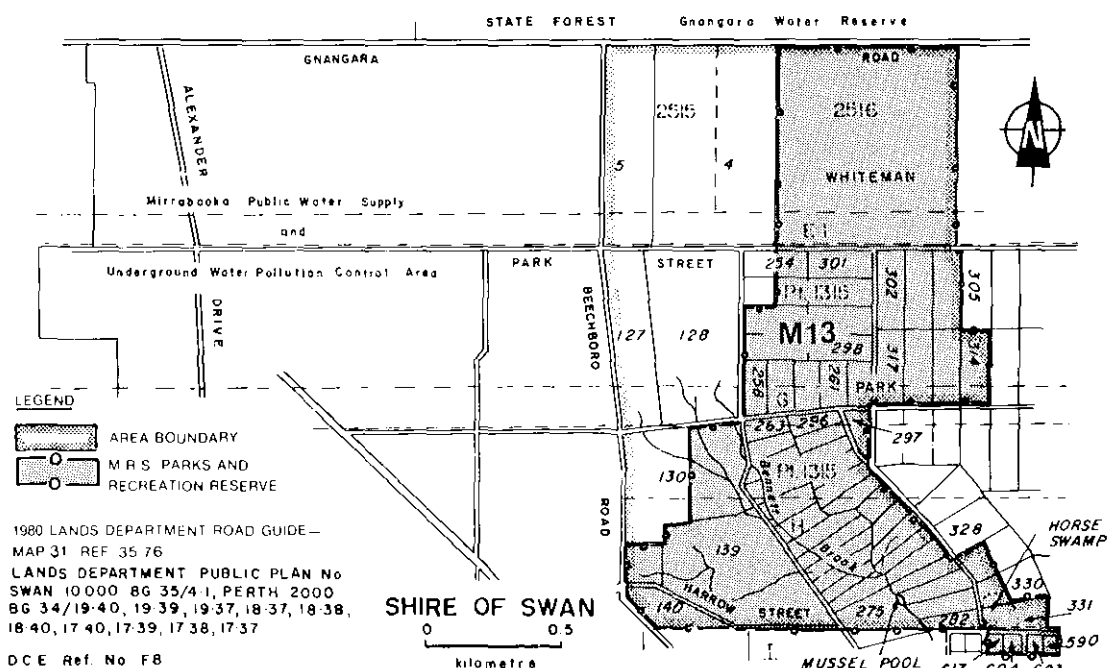


Figure 88

M14 RESERVE C1654, BULLSBROOK

Reserve C1654, for Travellers and Stock Purposes, not vested, is situated to the east of the Great Northern Highway just north of Bullsbrook (Figure 89).

The north-west corner contains a low swamp flat and some gentle sandy rises. The wettest part carries tall closed-heath of *Melaleuca viminea* with emergent swamp paperbarks. Some open, slightly saline areas carry tall and low heath of paperbark species with emergent swamp cypress. The shrub storey includes mountain kunzea and pepper-and-salt, herbs and sedges, with samphire in more saline areas. Woodland of Moonah paperbark and banksia occurs on sandy soils in the south of the Reserve. The swamp vegetation is unusual and no similar example is known in other conservation reserves. The broombush honeymyrtle, which occurs here, is unusual because it is widespread in the wheatbelt but rare on the Coastal Plain and not known from any other swamp habitat.

The Reserve is within the Ellen Brook Catchment, a potential source of water supply. It may be affected by a pipehead dam on Ellen Brook near its confluence with the Swan River. Public access would be restricted to some extent by Catchment Zone regulations. The reserve may be affected by reconstruction of the Great Northern Highway. It has potential for heavy mineral beach sands and refractory minerals, and is affected by mineral claims.

Recommendations

- M14.1 The purpose of Reserve C1654 should be amended to Conservation of Flora and Fauna, and Mining, and the Reserve should be vested jointly in the Ministers for Fisheries and Wildlife, and Mines.
- M14.2 The Geological Survey of Western Australia should give a high priority to an early evaluation of the mineral potential of Reserve C1654.

M15 PEARCE AERODROME

The area comprises parts of Locations 91, 1336 and 1337, owned by the Commonwealth of Australia. It is situated at Bullsbrook (Figure 89).

The northern section carries open-forest of marri, wandoo and jarrah, with woodland of wandoo, and some flooded gum and swamp paperbark. In the southern and eastern sections there is a mixture of low open-forest of sheoak and open-woodland of marri, wandoo and jarrah, with a closed-scrub of paperbark. The western section includes a low open-forest of swamp sheoak and closed-scrub of paperbark, a vegetation complex which is poorly represented in existing or proposed conservation reserves.

The area is within the Ellen Brook Catchment. Future MWB groundwater extraction could affect water levels, and public access would be restricted by Catchment Zone regulations. There are SEC lines in the area, which may be affected by future realignment of the Great Northern Highway.

Recommendation

- M15.1 The Commonwealth of Australia should retain, where possible, uncleared areas within Pearce Aerodrome.

M16 AVON VALLEY NATIONAL PARK

The area comprises Reserves A30191, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; A30192, for National Park, vested in the National Parks Authority; A30193, for Timber, vested in the Conservator of Forests; C7429 to C7435 inclusive and C7438, for Trigonometric Site, all not vested; Avon Location 28217 and lot M1392, vacant Crown land; and Avon Locations 150, 579, 580, 929 and 28315, and lots M1451 and M1517 (Avon Location 1352), privately owned freehold land. It is situated about 50 km north-east of Perth (Figure 90).

The sides of the Avon Valley slope steeply from the undulating plateau, which is about 200 m above the river level. The area is undulating, with soil types including lateritic sands, loams and gravels. The vegetation consists primarily of open-forest of jarrah and marri on the uplands and open-woodland of wandoo in the valleys and on the slopes. The occurrence of wandoo in the major valleys is significant, since it is normally restricted to the low rainfall areas in the east and north of the Darling Range. The river valley forms the division between the drier northern forest dominated by wandoo and the southern forest dominated by jarrah. Flooded gum occurs along the river banks.

Another significant feature is the great diversity and quality of relatively undisturbed flora in the Avon Valley. In many other major river valley systems in System 6 the plant communities have been destroyed either by agricultural development or by flooding as a result of dam construction.

Reserve A30193 contains the fringed lily, *Thysanotus anceps*, a rare species found only in a few localities in the Darling Range north-east of Perth. The Reserve is used to some extent by off-road vehicles and this activity should not be completely excluded in the future.

Reserve A30191 has populations of *Conostylis* and hybrid *Eucalyptus* spp. which are of substantial research interest, and the Reserve appears to be a significant refuge for some of the large number of species endemic to the region. It is potentially valuable for environmental education purposes, complementing the recreational opportunities offered within the existing National Park. The Department of Fisheries and Wildlife has prepared a draft management plan for the Reserve, considering fire protection, public use and research.

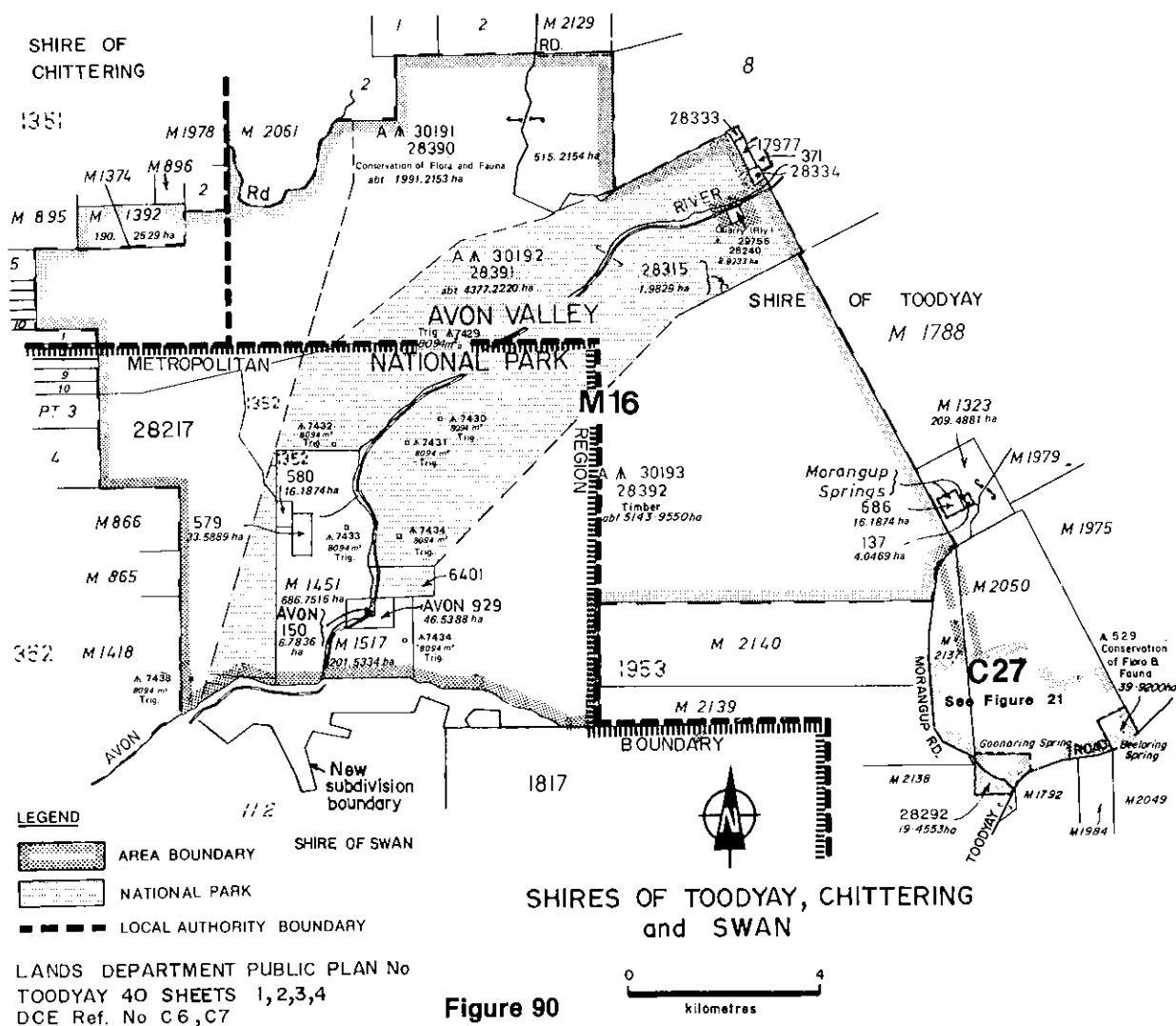
The area is partly within the Red Swamp Brook and Brockman River catchments, both potential sources of water supply. A storage dam may be built on the Brockman River near its confluence with the Avon River and the same applies to the Red Swamp Brook. Public access would be controlled to some extent by Catchment Zone regulations. The area may be affected by MRD gravel extraction requirements. Lot M1517 has potential for quartz, and the western portion of lot M1451 has potential for bauxite. The area is partly within both the Alcoa Mining Lease and the Pacminex Agreement Area. The potential for bauxite is low and Pacminex has no plans for mining in the area.

Extension of the National Park, as proposed, would simplify the management of the area considerably. The privately owned land restricts public access to the National Park and increases the difficulties of management, including fire protection and controls. The area's potential for conservation and passive recreation would be enhanced if road access was limited, fire breaks and tracks built and controlled burning instituted.

Due to its conservation value and scenic qualities, the concepts of 'regional park' and 'scenic river', as discussed in Chapter 5 are relevant to the Avon Valley National Park.

Recommendations

- M16.1 Subject to the agreement of the controlling body, Reserve A30191 should be cancelled and its area added to Reserve A30192.
- M16.2 Reserves C7429 to C7435 inclusive, and C7438 should be cancelled and their respective areas added to Reserve A30192.
- M16.3 Subject to a management agreement between the Forests Department and the National Parks Authority catering for off-road vehicles in the area, Reserve A30193 should be cancelled and its area added to Reserve A30192.
- M16.4 The vacant Crown land should be declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and Mining, vested jointly in the Ministers for Fisheries and Wildlife, and Mines.
- M16.5 The Geological Survey of Western Australia should give a high priority to an early evaluation of the mineral potential of the vacant Crown land.
- M16.6 The National Parks Authority, in consultation with the Forests Department and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) limiting vehicular access, given that off-road vehicles should be catered for in the area;
 - (b) increasing fire protection and instituting a programme of controlled burning.



M17 ELLEN BROOK AND TWIN SWAMPS WILDLIFE SANCTUARIES, UPPER SWAN

The area comprises Reserves A27620 and A27621, for the Preservation of Fauna (short-necked tortoise, *Pseudemydura umbrina*), both vested in the W.A. Wildlife Authority. The Reserves are situated about 4 km and 7 km north of Upper Swan (Figure 91).

Reserve A27620 (Ellen Brook Wildlife Sanctuary) has clay soil, with numerous depressions which fill with water during winter and spring. These depressions carry shrubland of robin redbreast bush, sedges and aquatic species including *Chara australis* and *Hydrocotyle lemnoides*. The higher ground between the depressions carries shrubs including *Acacia saligna*, swishbush and stinkwood, annuals such as *Drosera gigantea*, *Neurachne alopecuroides*, and at least fourteen species of orchid. Ellen Brook itself is fringed with flooded gum and swamp paperbark. The land to the north has been cleared and carries mostly exotic plants, but these are yielding to native species.

Reserve A27621 (Twin Swamps Wildlife Sanctuary) contains low stable sandhills, with swamps in the eastern and southern section. The north-western section is uniformly low-lying. The swamps are dominated by paperbark and swamp banksia, and contain aquatic species including *Triglochin acuta* and *Ruppia maritima*. The sandhills are covered with low woodland of banksia species, with some marri, pricklybark, Christmas tree and sheoak, an understorey including *Jacksonia furcellata* and zamia, and a groundcover of spreading plants, including *Phlebocarya ciliata*, *Dasypogon bromeliaefolius* and cottonheads. The low-lying section is covered by shrubland of *Regelia ciliata*, with blueboy, golden kangaroo paw and banksia.

The western swamp (short-necked) tortoise is unique. It is restricted to a small part of the System 6 region. It has no close relatives amongst other Australian tortoises and is adapted to a specialised habitat. During winter and spring the tortoises live in the swamps, and during the summer they sleep in natural tunnels at Reserve A27620 and in deep leaf litter or under fallen branches at Reserve

A27621. Since 1963 the tortoise population of the latter Reserve has declined from about one hundred and fifty to fewer than twenty-five, probably due to the low rainfall during recent winters and to predation by dogs and foxes. Numbers at the other Reserve have remained constant at between ten and twenty-five. However, the present low numbers give rise to fears for the survival of the short-necked tortoise species.

Apart from their value in protecting the tortoise, the Reserves have very high conservation value. They are particularly rich in aquatic plants. *Hydrocotyle lemnoides* is not known to occur elsewhere. There are four other rare plants, and many species of orchid, lily and trigger plant. The swamps also contain a wide variety of invertebrates, including the shield shrimp which is found nowhere else in Perth. Reserve A27620 contains a wide variety of native fish, including the big-mouthed goby, the Swan River goby and the western minnow.

The Reserves are within the Ellen Brook Catchment, a potential source of water supply. Public access could be restricted to some extent by Catchment Zone regulations. The area adjacent to Reserve A27620 contains a major clay deposit, and extractive industries will object if they are prevented from gaining access to this deposit. However, groundwater extraction and natural rainfall variations, as well as extraction of clay and changes in land use adjacent to the Reserves, may lower the water levels in the swamps. Lowering of the water tables would adversely affect the breeding habitat of the tortoises.

The concept of 'conservation buffer zones', as discussed in Chapter 5, is relevant to this area.

Recommendations

- M17.1 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of adjacent freehold land.
- M17.2 The responsible authorities should consult the Environmental Protection Authority at the planning stage of any proposed works, clay extraction or other activities which may affect Reserves A27620 and A27621.

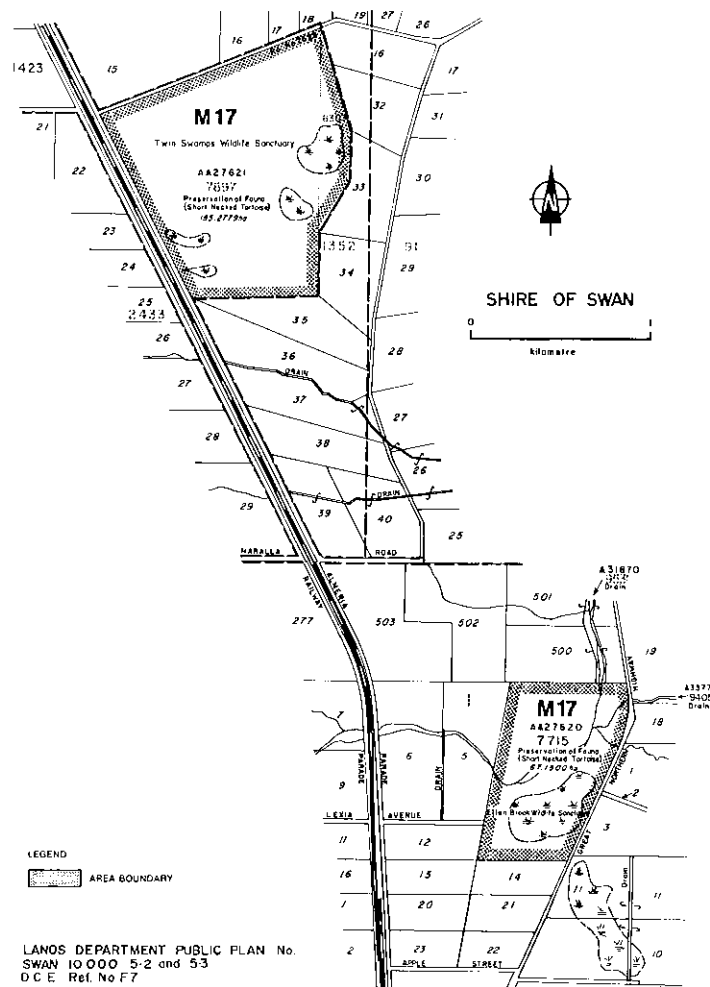


Figure 91

M18 WALYUNGA NATIONAL PARK

The area comprises Reserve A2065, for National Park, vested in the National Parks Authority; part of Swan Locations 2 and 1316, controlled and managed as National Park; Reserves C26864 and C26865 for Recreation, vested in the Shire of Swan; and lots 1, 119 to 123 (Location 1316), part of lot 9 (Location 1316), part of lot 6 (Location 1340), and part of lot 7 (Location 1341), all privately owned freehold land. It is situated about 40 km north-east of Perth (Figure 92). Part of the area is 'reserved' by the MRPA for Parks and Recreation under the Metropolitan Region Scheme.

The National Park lies along the Darling Scarp and is deeply dissected by the Swan River. At its highest point it is 250 m above sea level, dropping very steeply to 30 m at the river. Wooroloo Brook, in a deep valley, joins the Swan River in the Park. These landforms are very picturesque.

The Park is covered with woodland and open-forest and also contains granite outcrops. Jarrah is most common on the lateritic uplands, associated with marri on deeper soils. The understorey is characterised by Wilson's grevillea and hairy jugflower. Wandoo replaces marri and jarrah on the valley slopes, while flooded gum occurs along the river banks. Surprisingly, there are also pockets of flooded gum, presumably sustained by seepage, on some slopes high above the valley floor. Shallow soils in the Park, especially around the granite outcrops, support examples of the rich Darling Scarp flora, with heath being common.

Because it is small, the Park is very vulnerable to external influences. Fortunately, extensive clearing has been limited to the northern portion. It is important from the point of view of recreation that the Park should be expanded, because it is very popular and under increasing pressure from visitors. The park system as a whole would be improved if it were to be linked to the Avon Valley National Park, which is about 15 km to the north-east. This link could follow the Swan and Avon Valley and would be important for both conservation and recreation. Such additional land may possibly be obtained through the planning process.

The Park's main attraction is the river, which contains several sets of rapids, and its steep-sided valley. The river is heavily used by canoeists in winter.

The concepts of 'regional parks' and 'scenic rivers', as discussed in Chapter 5 of this Report, are relevant to Walyunga National Park.

The area is partly within the Ellen Brook Catchment, a potential source of water supply. It may be affected by a possible storage dam on Ellen Brook near its confluence with the Avon River, and by MWB dam structures. Public access would be restricted to some extent by Catchment Zone regulations. The area is partly within both the Alcoa Mining Lease and the Pacminex Agreement Area. However, the potential for bauxite is low and Pacminex has no plans for mining the area.

Recommendations

- M18.1 The National Parks Authority, in consultation with the Department of Conservation and Environment, the Geological Survey of Western Australia and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- M18.2 If the privately owned freehold land to the east of Walyunga National Park is acquired, it should be declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and Mining, vested jointly in the Ministers for Conservation and Environment, and Mines.
- M18.3 Subject to the agreement of the controlling body, Reserves C26864 and C26865 should be cancelled and their respective areas added to the Reserve set up if Recommendation M18.2 is implemented.

Several concepts discussed in this Report are relevant: 'pathway systems' (Chapter 5), 'riverine linear parks' (Chapter 6), and 'conservation buffer zones' (Chapter 5). The last concept is applicable since activities on privately owned land adjacent to the river may have adverse effects on the area's value as open space.

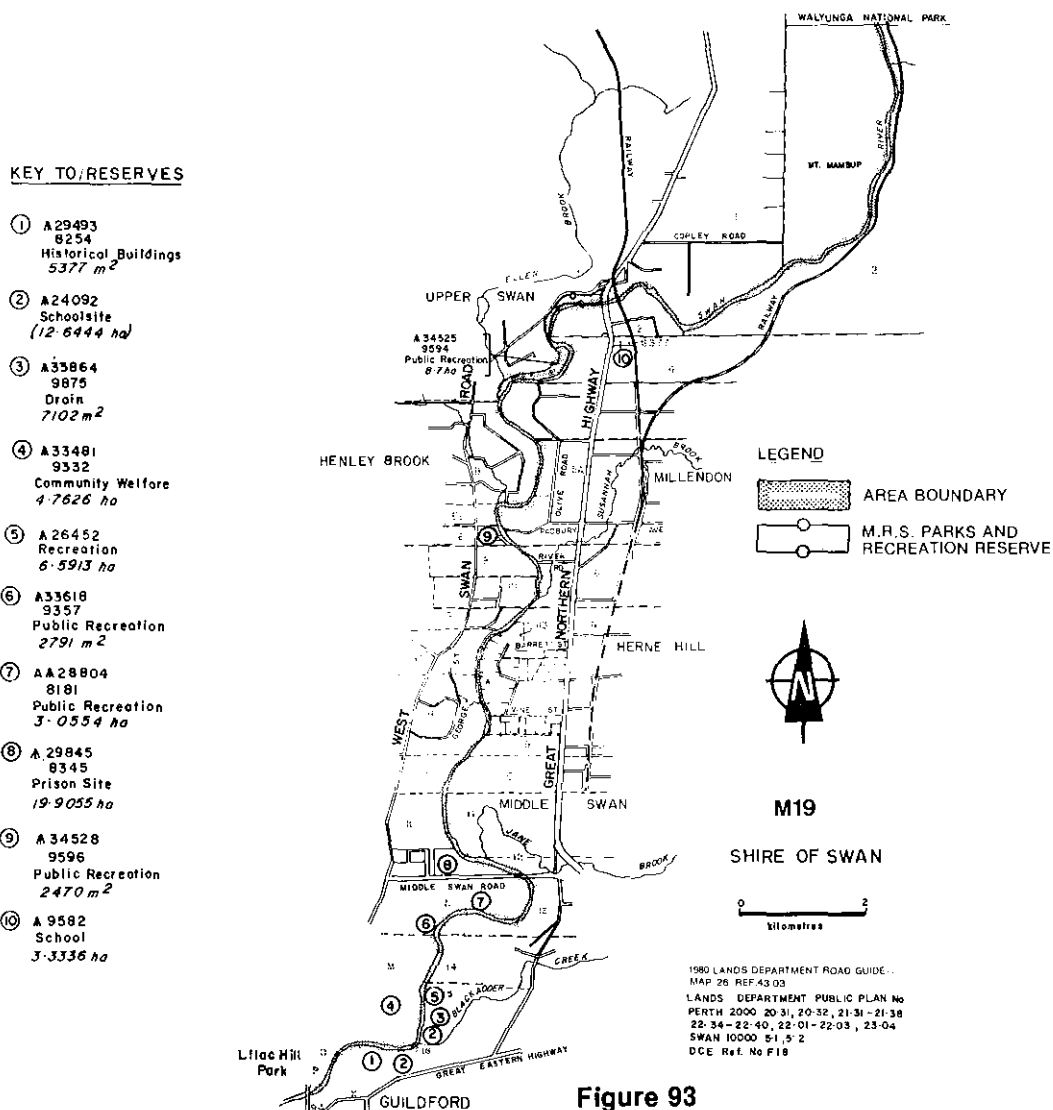
There are sewerage and drainage works and SEC lines in the area, which may be further affected by proposed sewerage and drainage works and private groundwater extraction. The area has potential for clay, loam and sand, but there are no existing claims.

Recommendations

M19.1 In the preparation of any management programme, at the appropriate time, the Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment and other authorities, should give consideration to:

- (a) encouraging the growth and regeneration of local indigenous flora;
- (b) only allowing recreation activities which are compatible with the conservation of flora and fauna;
- (c) providing pathways along the river banks;
- (d) restricting vehicle access;
- (e) providing launching facilities and parking space for canoeists and removing those fences which are a hazard to canoeists;
- (f) controlling access of stock to the river;
- (g) the area's potential for clay, loam and sand.

M19.2 Any future Land Act Reserve should include Water as a purpose.



M20 JANE BROOK

The area comprises part of Reserve C780, for Public Purposes, not vested; part of lots 1 to 6, 14 to 16, 54 to 56 (Location 1160), part of lots 1 to 10 (Location 1114), part of lots 23 and 24 (Location 13) and part of Locations 11, 12, 13, 147, 194, 201, 207, 293, 1253, 8526, privately owned freehold land. It is situated between John Forrest National Park and the Swan River (Figure 94).

The natural vegetation is limited to trees fringing the banks. Flooded gum is common and in places there are many seedlings. Near Middle Swan Road there are stands of *Grevillea glabrata*. Some swamp sheoak occurs near the confluence with the Swan River, and there are paperbarks upstream.

The area may be affected by a proposed dam on Jane Brook, and an associated pipeline. There are existing SEC lines. The area has potential for clay, loam and sand, but there are no existing claims. There is pressure for subdivision.

Blackadder and Woodbridge Creeks, several kilometres to the south of Jane Brook, have been identified by the MRPA as being suitable for future 'reservation' for Parks and Recreation under Metropolitan Region Scheme. The Blackadder Creek wetland contains stands of paperbark and has significant conservation value.

Several concepts discussed in this Report are relevant: 'pathways systems' (Chapter 5), 'riverine linear parks' (Chapter 6), and 'conservation buffer zones' (Chapter 5). The last concept is applicable since activities on privately owned land adjacent to the river may have adverse effects on the area's value as open space.

Recommendation

M20.1 In the preparation of any management programme, at the appropriate time the Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment and other authorities, should give consideration to:

- (a) encouraging the growth and regeneration of local indigenous flora;
- (b) only allowing recreation activities which are compatible with the conservation of flora and fauna;
- (c) providing pathways along the river banks;
- (d) restricting vehicle access;
- (e) the area's potential for clay, loam and sand.

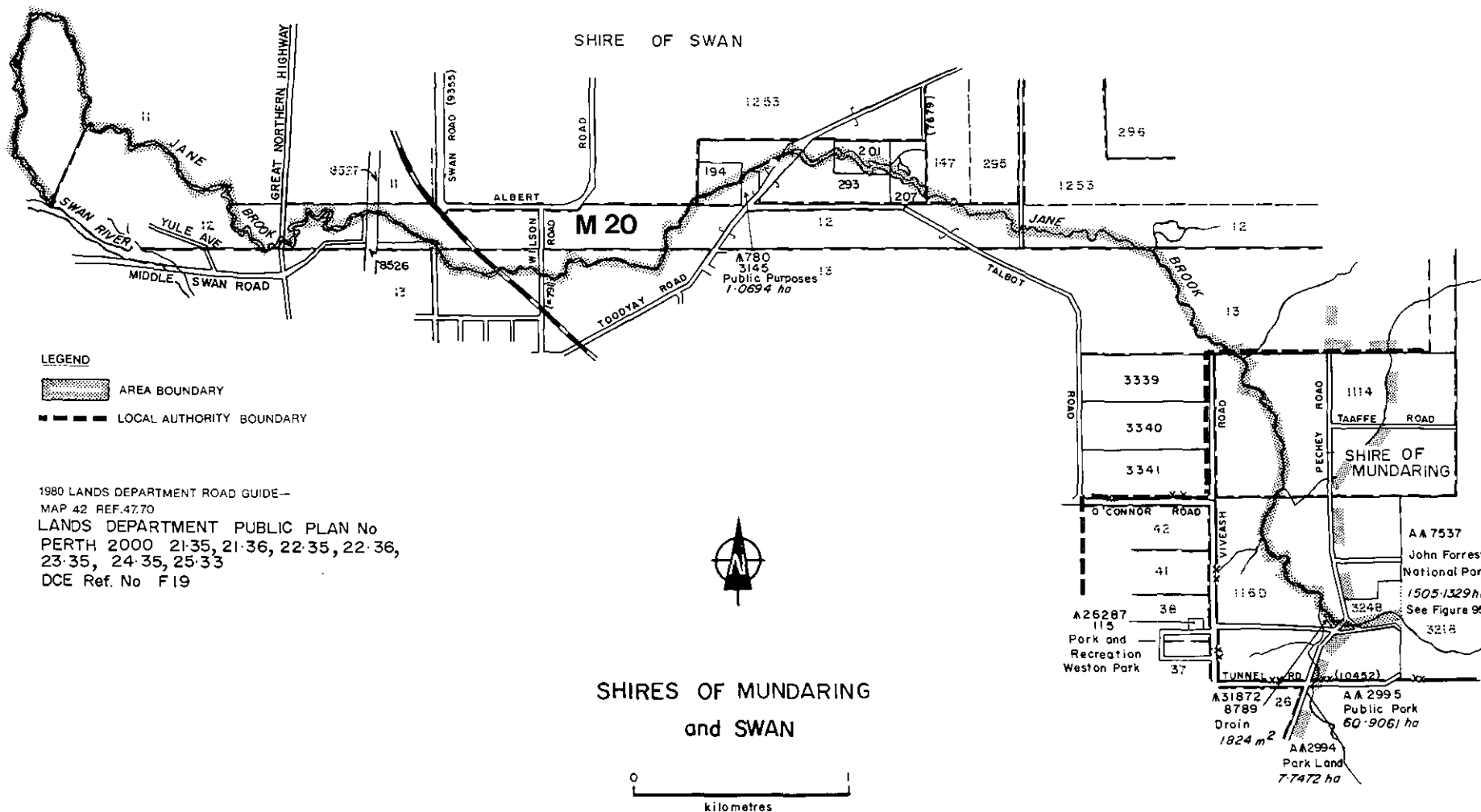


Figure 94

M21 JOHN FORREST NATIONAL PARK

The area comprises Reserves A7537, for National Park and Native Game, and A8164, for National Park, both vested in the National Parks Authority; and A11396, for Educational Endowment, not vested; part of lot 13, all of lots 14 to 16, 19 to 21 (Location 1114), lot 22 (Location 13), lot 1 and 80 (Location 1310), lots 2, 3, 5 and 6 (Location 1253), lots 20 to 24, 27 to 30 (Location 1160), freehold land, owned by the MRPA; and part of lot 11 (Location 1114), privately owned freehold land. It is situated to the north of the Great Eastern Highway, about 25 km east of Perth (Figure 95). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme, as part of a system of 'reserved' land extending through Greenmount to Helena Valley (M34).

The existing National Park carries open-forest and woodland of jarrah and marri. Wandoo predominates in doleritic soil along the Darling Scarp, but the Scarp flora is poorly represented. There is some dieback.

The proposed extension to the north of the Park is dissected by several winter creeks, including Jane Brook. It carries jarrah, marri and wandoo, but more importantly, extensive areas of Scarp vegetation around granite outcrops. Species present include *Acacia ostenii*, *Calothamnus rupestris* and *Darwinia thymeloides*. Some of these plants are restricted to the Perth area and are poorly represented in existing reserves. There is also a good stand of rock sheoak on Red Hill.

The Park is currently used intensively for recreation, especially in the vicinity of the kiosk and car parks, and along Jane Brook between the two main sets of waterfalls.

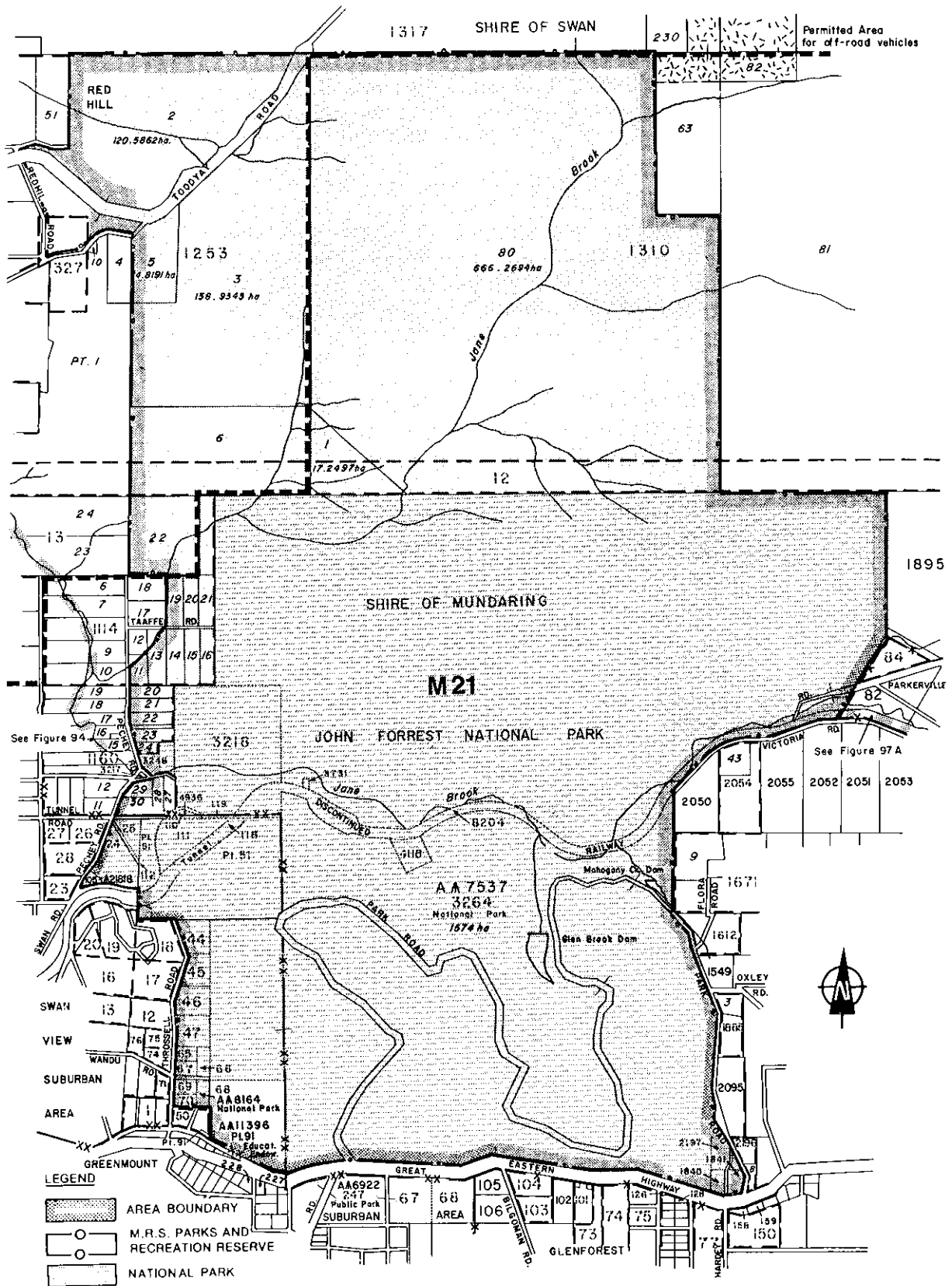
The remainder of the Park is used for such activities as horse riding and orienteering. A permitted area for the use of off-road vehicles adjoins the proposed extension to the National Park at its north-east corner. It consists of disused clay pits.

The concept of a 'regional park', as discussed in Chapter 5, is relevant to the existing Park. The proposed extension would complement the existing Park by providing an area of conservation value with little current recreation use.

The area is within the Jane Brook Catchment. The MWB has preliminary plans for a small pipehead dam on Jane Brook, which would supply water to the Mirrabooka Treatment Plant. Public access would be restricted by Catchment Zone regulations. The environmental effects of this proposed dam should be examined before a decision is made to proceed, since some of the restricted Scarp flora would be destroyed if flooded. There are SEC lines in the area which may be affected by major improvement to the Toodyay Road. There are clay deposits on lot 63 of Location 1317, which adjoins the northern boundary of the area.

Recommendations

- M21.1 Subject to the agreement of the controlling body, Reserves A8164 and A11396 should be cancelled and their respective areas added to Reserve A7537.
- M21.2 The land owned by the Metropolitan Region Planning Authority should be managed as if part of the National Park.
- M21.3 The National Parks Authority, in consultation with the Metropolitan Region Planning Authority and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- M21.4 Any future Land Act Reserves should include Water as a purpose.



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 43 REF. 53 66
 LANDS DEPARTMENT PUBLIC PLAN No
 Perth 2000 25-30, 25-32, 25-33, 25-34, 25-35
 Mundaring N.W. 1:25000 M 82-4, M 98-4, M 114-4,
 M 115-4, M 117-4, M 148-4, M 132-4
 DCE Ref. No. E1

SHIRES OF MUNDARING AND SWAN

Figure 95

0 1
 kilometres

M22 RESERVES A12453 AND C12085, PARKERVILLE

The area comprises Reserves A12453, for Parklands and Recreation, and C12085, for Education Endowment, both not vested. It is situated in Parkerville, to the east of John Forrest National Park (Figure 96).

Reserve A12453 lies on a steep hillside and contains an interesting granite outcrop surrounded by open-forest of jarrah and marri. The Reserve should be retained as an area for passive recreation and education, and should be managed to conserve much of the natural vegetation. Reserve C12085 contains typical jarrah forest.

Reserve A12453 is within the Jane Brook Catchment and Reserve C12085 within the Mahogany Creek Catchment, both potential sources of water supply. They may be affected by a future pipehead dam to be constructed just below the confluence of Jane Brook and Mahogany Creek.

The Mundaring Shire Council has proposed that Reserves C14163, for Parkland, not vested, and C27431, for Gravel, vested in the Shire of Mundaring, should be included in Reserve C12085.

In the event of subdivision between Alexandra and Brooking Roads, a Local Open Space linkage should be provided from Reserve C12085 to Reserves C32484 (M23) and A12453.

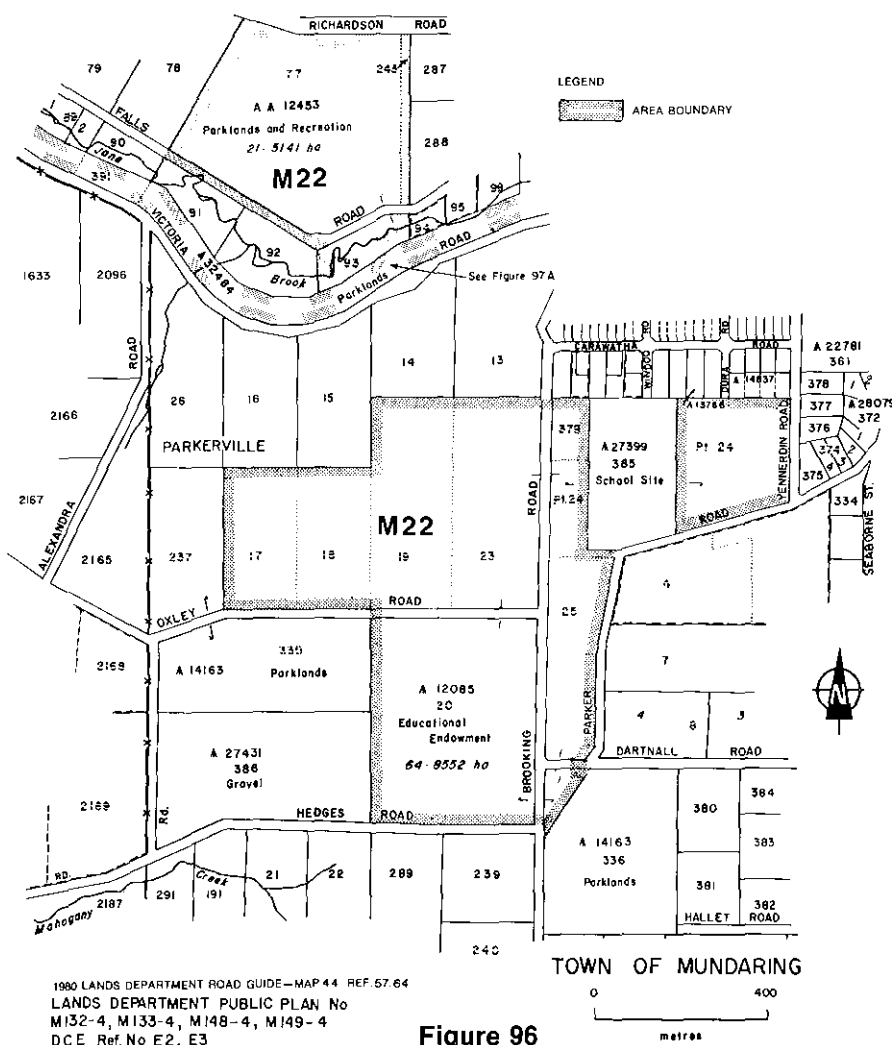
Recommendations

M22.1 Reserve A12453 should be vested in the Shire of Mundaring.

M22.2 Reserve C12085 should be cancelled and its area added to Reserve A12453.

M22.3 The Mundaring Shire Council should prepare a management programme, giving consideration to:

- (a) encouraging the growth and regeneration of local indigenous flora;
- (b) only allowing recreation activities which are compatible with the conservation of flora and fauna.



M23 RESERVES ALONG DISUSED RAILWAYS — MIDLAND TO CHIDLOW

The area comprises Reserves C31196, C32436, C32483 and C32484, for Parklands, all vested in the Shire of Mundaring. The Reserves contain sections of disused railways between Midland and Chidlow, via Parkerville, and between Midland and Mount Helena, via Glen Forrest. Together they form a continuous linear park (Figures 97A and 97B).

Remnants of the indigenous vegetation survive and should be retained wherever possible. Any revegetation in the area should involve only indigenous species, so as to maintain the 'Hills' character of these long corridors. The reserves are important, and will become more so, for passive recreation activities such as walking and horse riding.

Portions of the area are within the Lower Helena River and the Jane Brook Catchments which are existing and potential sources of water supply respectively.

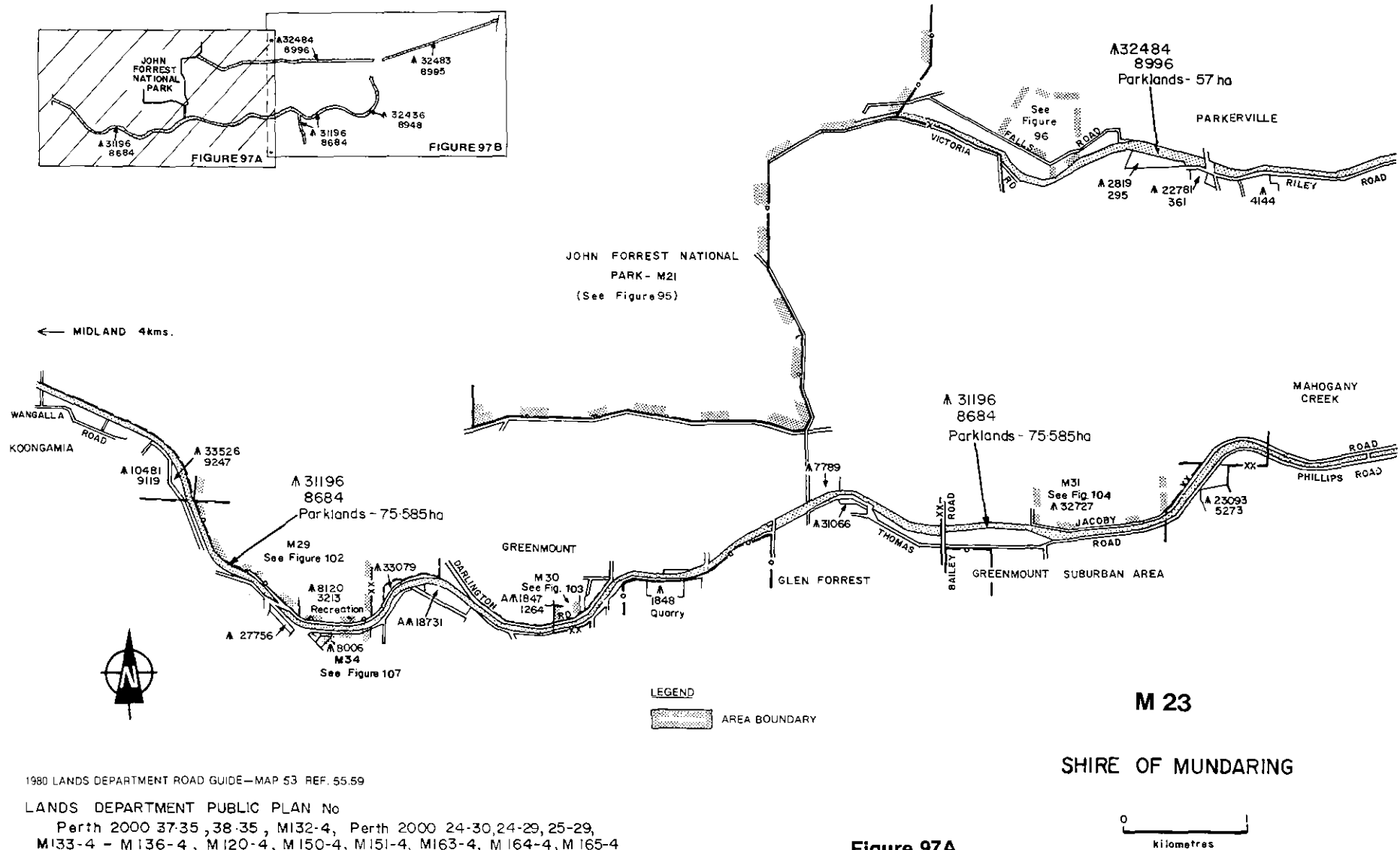
The concept of a 'pathway system', as discussed in Chapter 5, is relevant.

The Mundaring Shire Council has proposed that Reserves C23499, for Gravel, and C19709, for Educational Purposes, both not vested, should be included in the area.

Recommendations

M23.1 Reserves C32436, C32483 and C32484 should be cancelled and their respective areas added to Reserve C31196.

M23.2 The Mundaring Shire Council should prepare a management programme, giving consideration to encouraging the growth and regeneration of local indigenous flora.



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 53 REF. 55.59

LANDS DEPARTMENT PUBLIC PLAN No

Perth 2000 37.35, 38.35, M132-4, Perth 2000 24-30, 24-29, 25-29,
M133-4 - M136-4, M120-4, M150-4, M151-4, M163-4, M164-4, M165-4
DCE Ref. No E4(1)

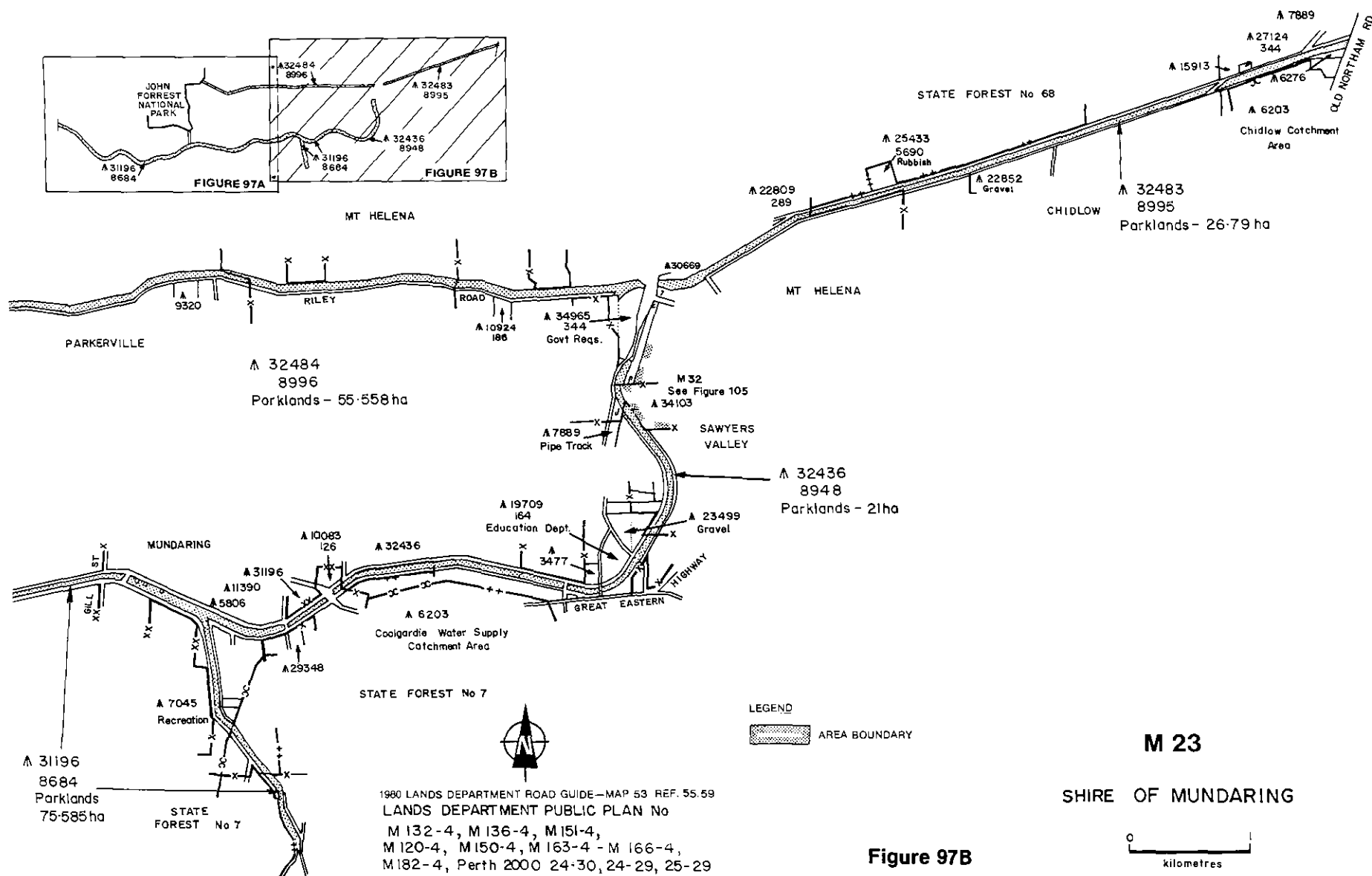
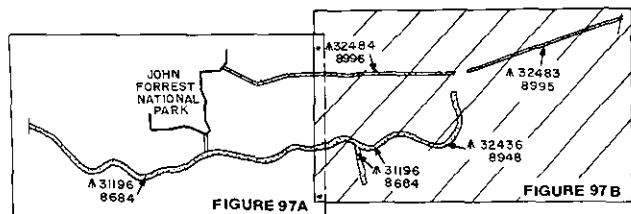


Figure 97B

M24 RESERVES NORTH-WEST OF CHIDLOW

The area comprises Reserves C29269, for Parkland and Recreation, vested in the Shire of Mundaring; C18924, for Timber, not vested; and the western section of Reserve C4967, for Timber, not vested. It is situated about 4 km north-west of Chidlow (Figure 98). The MRP has indicated that the area might be considered suitable for Parks and Recreation 'reserves' under the Metropolitan Region Scheme.

Reserve C29269 is gently undulating and contains yellow-brown sand mixed with gravel. The dominant vegetation is open-forest of jarrah and marri, with some bull banksia. Shrub species include white myrtle, buttercup and hairy jugflower. There has been some disturbance through tree felling but the vegetation is otherwise in good condition.

The western portion of Reserve C4967 is gently undulating and partly dissected by seasonal creeks. The vegetation is open-forest of jarrah and marri with some bull banksia, sheoak, parrot bush and snottygobble. There has been some disturbance due to tracks and tree felling, but the vegetation is generally in good condition.

The concept of a 'regional park', as discussed in Chapter 5, may be relevant, especially if seen in conjunction with Lake Leschenaultia (M25).

The area is within the Wooroloo Brook Catchment, a potential source of water supply. It may be affected by a possible storage dam on the Wooroloo Brook near its confluence with the Moore River. Public access would be restricted to some extent by Catchment Zone regulations. There are SEC lines in the area which is partly within both the Alcoa Mining Lease and the Pacminex Agreement Area. However, the potential for bauxite is low and Pacminex has no plans for mining in the area.

Recommendations

- M24.1 Reserve C18924 should be cancelled and the western section of Reserve C4967 excised and their respective areas added to Reserve C29269.
- M24.2 The Mundaring Shire Council, in consultation with the Department of Conservation and Environment, should plan to retain as much as possible of the natural vegetation of Reserve C29269.

M25 LAKE LESCHENAULTIA

The area comprises Reserves C23165 and C25433, both for Recreation, vested in the Shire of Mundaring and part of State Forest No. 68. It is situated about 3 km west of Chidlow (Figure 98). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Lake Leschenaultia was created artificially by a dam built in 1912 to provide water for steam engines. Five intermittent creeks flow into the lake. These creeks, several of which might be polluted, drain the townsite of Chidlow, farmland, the rubbish depot (in process of closure) and State Forest. The area contains five principal vegetation associations. The lateritic uplands, which predominate, carry open-forest of jarrah with some marri. Small trees of the understorey are principally bull banksia, sheoak and snottygobble. Open-forest of wandoo, marri and yarri is confined to depressions and there are two associations of closed-scrub in muddy depressions, which are waterlogged in winter. One is dominated by *Acacia saligna* and the other by *Melaleuca microphylla*. A number of exotic plants are established in the area but they are mainly restricted to the creeks and the surrounds of the lake.

The variety of habitat is important and the area has a diversity of bird species, seventy having been identified. Native mammals include the western brush wallaby, western grey kangaroo and quenda. Reptiles and amphibians are common.

The State Forest contains an Aboriginal site, typical of the sites in the Darling Range used by Aborigines. Many similar sites elsewhere have been destroyed by land development.

Although it is relatively small, the lake is important for recreational activities such as swimming, picnicking and nature study. It is very popular in summer, being the only substantial body of water in the Darling Range east of Perth that is accessible to the public for recreation. The growing number of visitors presents management problems, particularly associated with keeping the area clean and the prevention of bush fires.

The concept of a 'regional park', as discussed in Chapter 5, is relevant.

The area is partly within the Wooroloo Brook and Jane Brook Catchments, potential sources of water supply. Two storage dams may be constructed, one just below the confluence of Jane Brook and Mahogany Creek, and the other on Wooroloo Brook near its confluence with the Swan River. Public access would be restricted to some extent by Catchment Zone regulations. There are SEC lines in the area.

The Mundaring Shire Council has proposed that Reserves C22852 and C33253, for Gravel, and

C31052 and C33252, for Government Requirements, all not vested; and C31053, for Recreation, vested in the Shire of Mundaring, which are situated south of Lake Leschenaultia and Keane Street, should be amalgamated, made Class A and vested in the Shire.

Recommendations

- M25.1 Subject to the agreement of the controlling body, the purpose of Reserve C23165 should be amended to Parkland and Recreation and the Reserve should be vested jointly in the Shire of Mundaring and the Forests Department.
- M25.2 Subject to the agreement of the controlling body, the part of State Forest No. 68 should be excised and added to Reserve C23165.
- M25.3 Subject to the agreement of the controlling body, Reserve C25433 should be cancelled and its area added to Reserve C23165.
- M25.4 The Mundaring Shire Council and the Forests Department should prepare a management programme, giving consideration to:
- encouraging the growth and regeneration of local indigenous flora;
 - maintaining water-bird habitats;
 - only allowing passive recreation activities which are compatible with (a) and (b) above;
 - encouraging and providing for educational use;
 - protecting the Aboriginal site in State Forest No. 68.

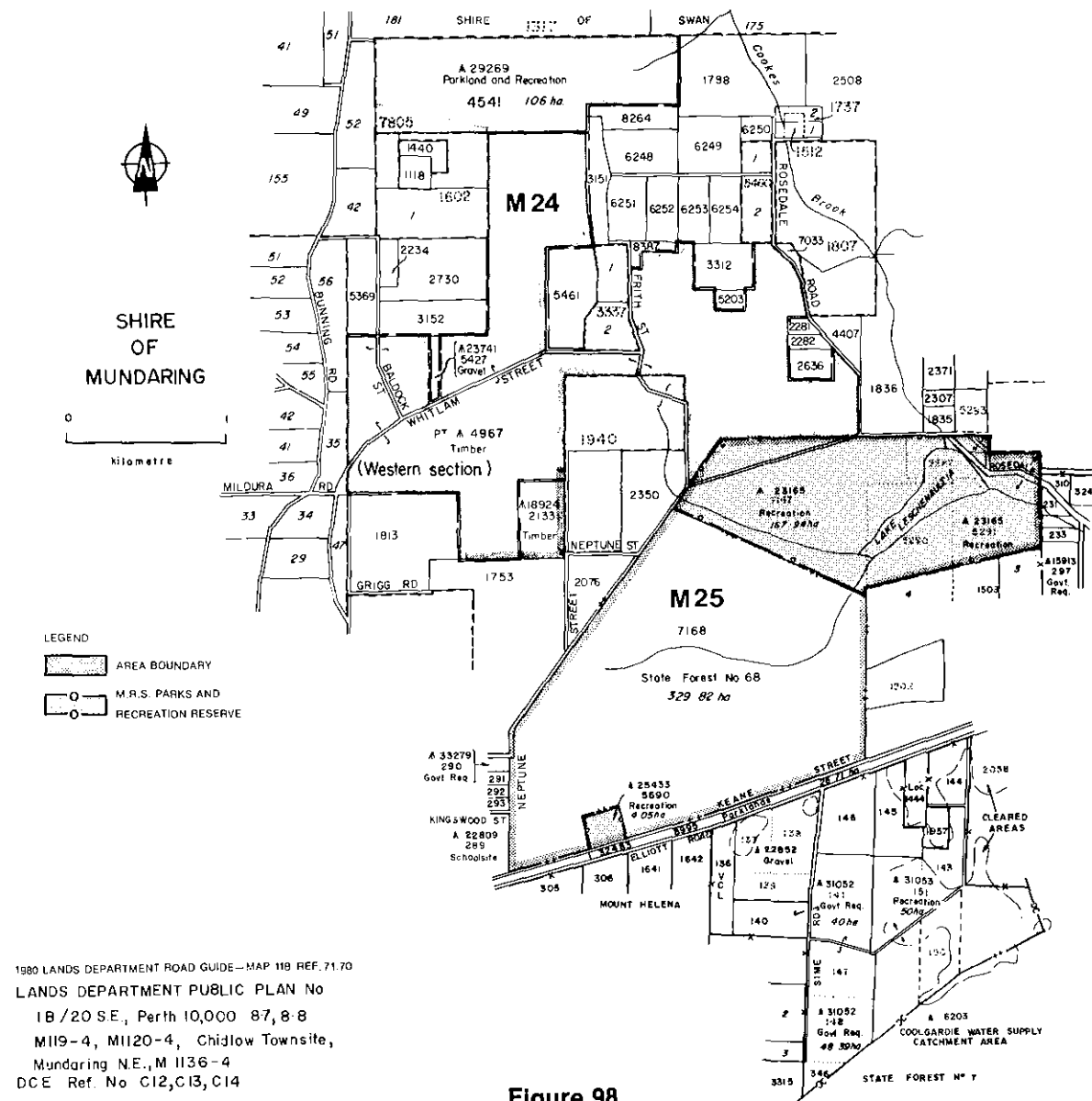


Figure 98

M26 RESERVES NORTH-EAST OF CHIDLOW

The area comprises Reserve C17100, for Timber, not vested; and the eastern section of Reserve C4967, for Timber, not vested. It is situated about 2 km to the north-east of Chidlow (Figure 99). The MRPA has indicated that the area might be considered suitable for Parks and Recreation 'reserves' under the Metropolitan Region Scheme.

The eastern section of Reserve C4967 resembles the western section (M24) being gently undulating and partly dissected by seasonal creeks. The vegetation is open-forest of jarrah and marri with some bull banksia, sheoak, parrot bush and snottygobble. There has been some disturbance due to tracks, a gravel pit for road building, and tree felling, but the vegetation is generally in good condition.

Reserve C17100 is similar in landform and vegetation.

The area is within the Wooroloo Brook Catchment, a potential source of water supply. It may be affected by a storage dam on the Wooroloo Brook near its confluence with the Moore River. Public access would be restricted to some extent by Catchment Zone regulations. There are SEC lines in the area, which will be affected by MRD gravel requirements. The area is partly within both the Alcoa Mining Lease and the Pacminex Agreement Area. The potential for bauxite is low and Pacminex has no plans for mining in the area.

The Mundaring Shire Council has proposed that Reserve C27248, for Gravel, should be included in the area.

Recommendations

- M26.1 Reserve C17100 should be cancelled and its area added to Reserve C4967, from which the western section should be excised and its area added to Reserve C29269.
- M26.2 The purpose of Reserve C4967 should be amended to Parkland and Recreation and the Reserve should be vested in the Shire of Mundaring.

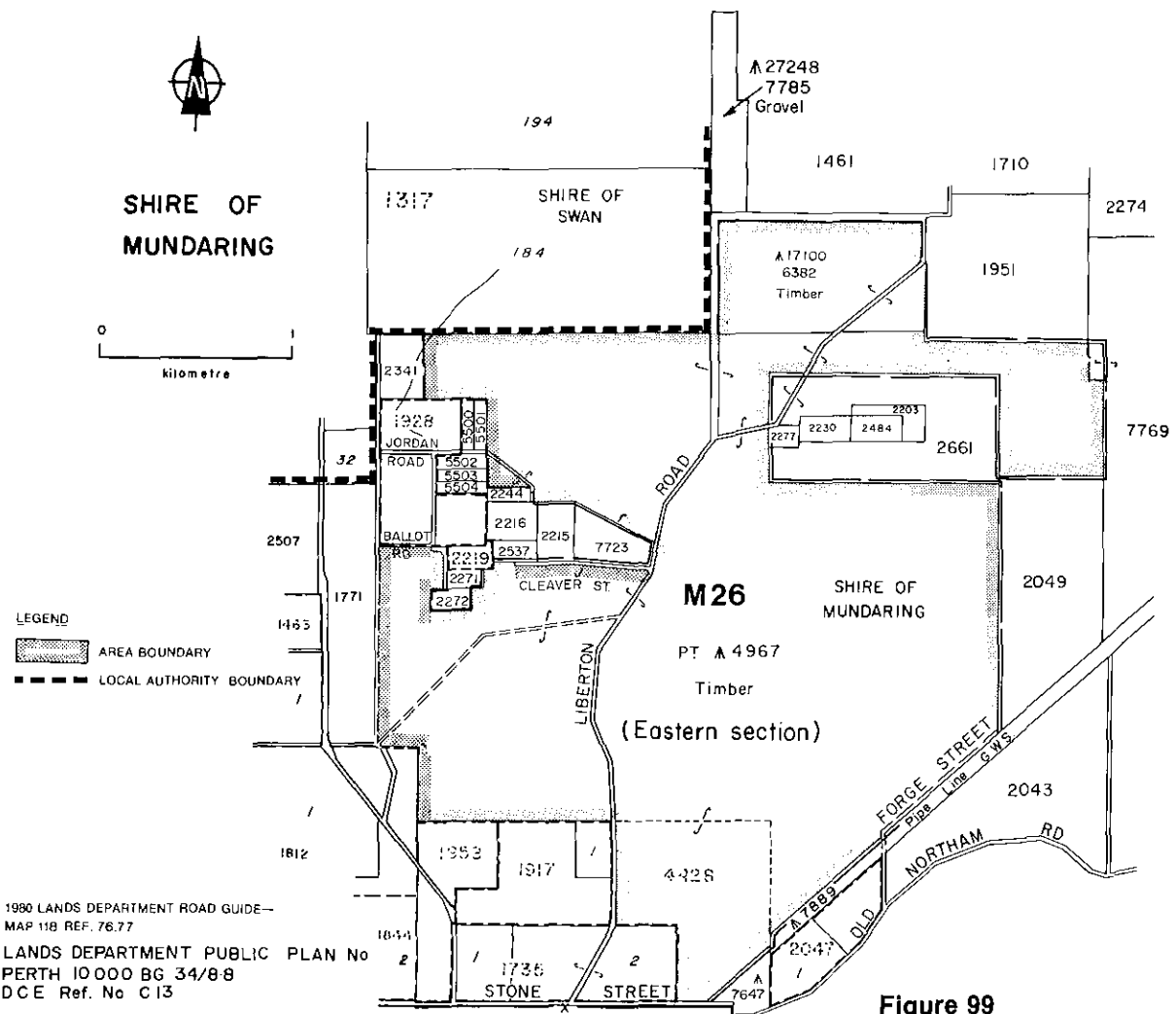


Figure 99

M27 RESERVES NORTH OF LAKE MANARING

The area comprises Reserves C30667, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority; C25033, Excepted from Sale, C30681, for Conservation of Flora and Fauna, and C30797, for Government Requirements, all not vested. It is situated near the intersection of the Great Eastern and Great Southern Highways about 40 km east of Perth (Figure 100).

Reserve C25033 is in two sections, each occupying a ridge with the intervening valley having been cleared for agriculture. The northern section lies along a high lateritic ridge and has low open-woodland of wandoo and marri. The southern section is lower, most of it being gravelly and supporting forest and woodland of jarrah with some marri and wandoo. The understorey is low and includes a good population of *Adenanthos tetes*, a rare mat plant of horticultural potential.

Lake Manaring, to the south, is a small wetland in private ownership. There has been some pressure to dredge it to make an ornamental lake.

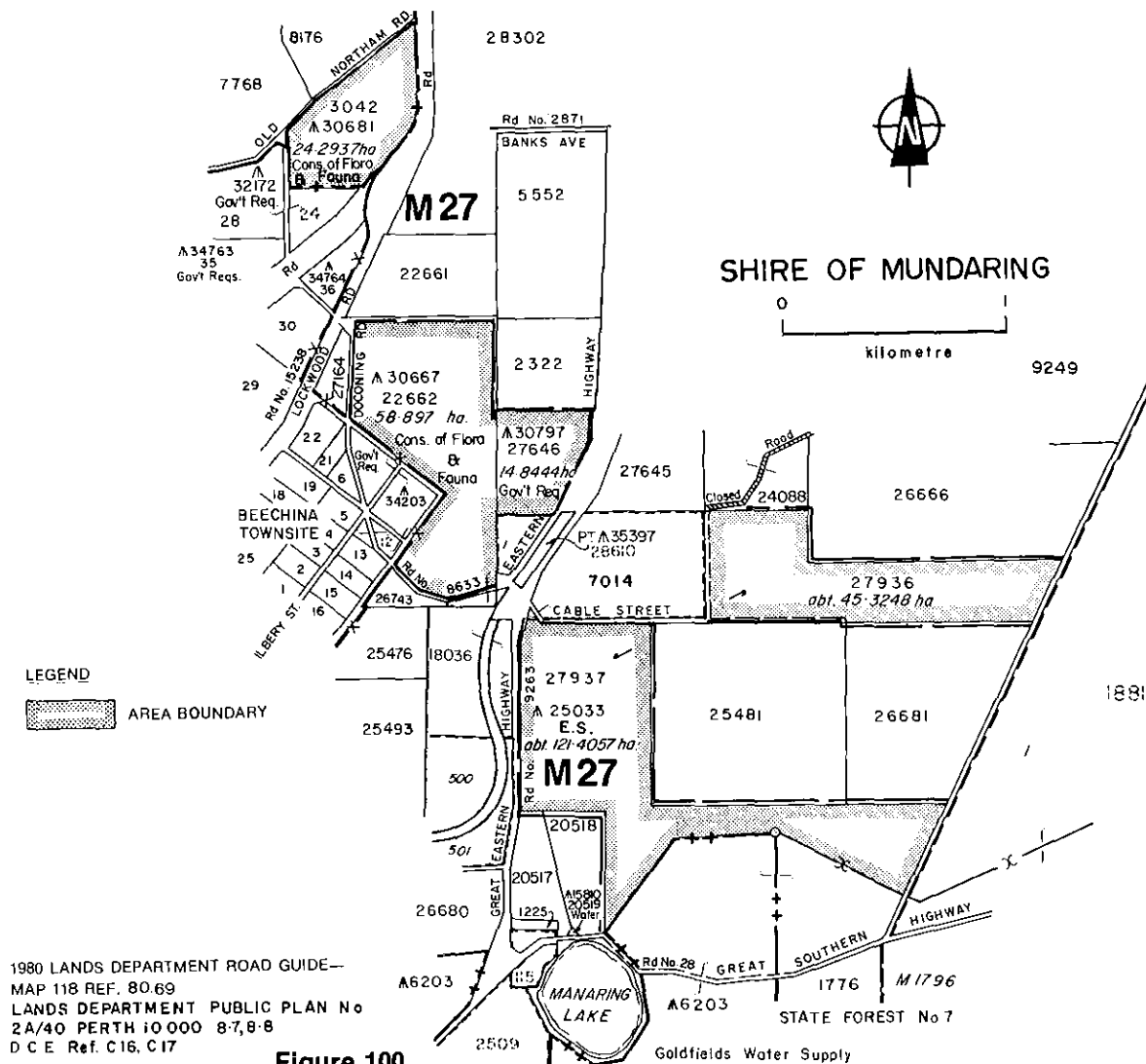
Reserves C30667, C30681 and C30797 occupy a broad lateritic ridge with a few sandy areas occurring on the western side. The vegetation, which is somewhat different to that in Reserve C25033, is open-woodland dominated by jarrah with some marri. There is a dense understorey of trees that includes parrotbush, sheoak and bull banksia, as well as a shrub layer.

The area is within the Wooroloo Brook Catchment, a potential source of water supply. It may be affected by a possible storage dam on the Wooroloo Brook, near its confluence with the Swan River. Public access would be restricted to some extent by Catchment Zone regulations.

Recommendations

M27.1 Reserve C30667 should be classified as Class A.

M27.2 Reserves C25033, C30681 and C30797 should be cancelled and their respective areas added to Reserve C30667.



M28 RESERVE C14278, EAST OF WOOROLOO

Reserve C14278, for Timber, not vested, is situated on the south side of the Great Eastern Highway, near Wooroloo, about 40 km east of Perth (Figure 101).

The land slopes gently upwards from the highway to a broad lateritic ridge. It contains a low woodland of wandoo, powderbark, marri and jarrah, the understorey being mostly low and open and interspersed with small trees. Little of this vegetation is found in reserves along the Great Eastern Highway as the region is being increasingly cleared. Two places have been used for extraction of gravel and timber has been cut in the Reserve but otherwise the vegetation is in good condition.

The Reserve is within the Wooroloo Brook Catchment, a potential source of water supply. It may be affected by a possible storage dam on the Wooroloo Brook near its confluence with the Swan River. The northern boundary will be affected by realignment of the Great Northern Highway.

Recommendation

M28.1 The purpose of Reserve C14278 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested in the W.A. Wildlife Authority.

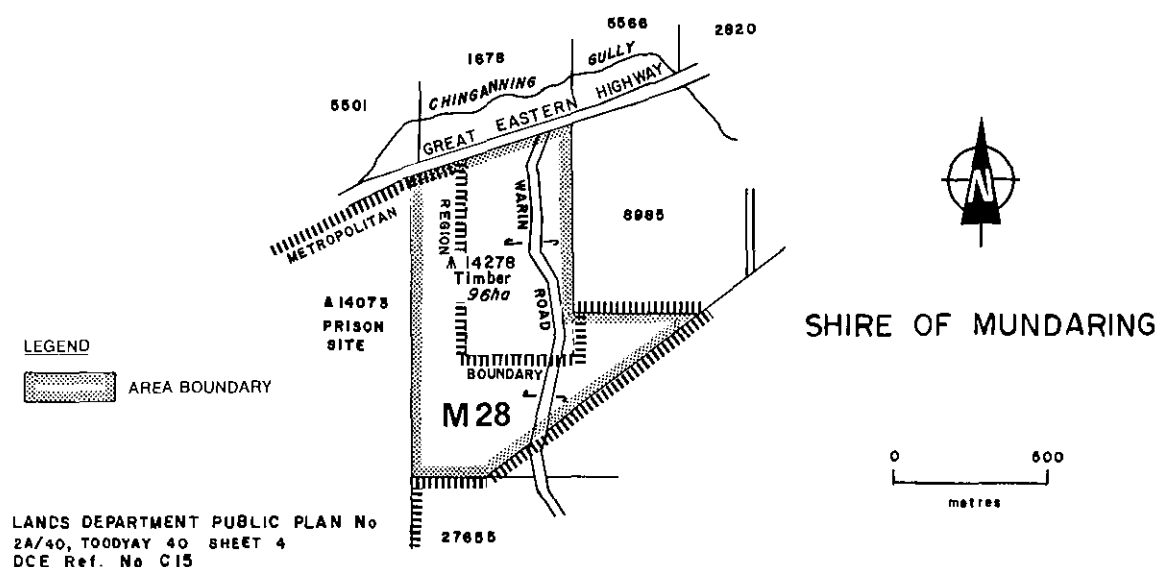


Figure 101

M29 GREENMOUNT NATIONAL PARK

The area comprises Reserve A25313, for National Park, vested in the National Parks Authority; Reserve C8120, for Recreation, vested in the Shire of Mundaring; Reserve C11940, for Trigonometric Station, not vested; and lots 281 to 296 (Helena Location 20b), and parts of Location 16 and Helena Location 20a, freehold land owned by the MRPA. It is situated at Greenmount, just south of the Great Eastern Highway (Figure 102). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The National Park occupies a spur between two valleys on the Darling Scarp. It has low woodland of jarrah, wandoo and sheoak on lateritic soils and heath on shallow granitic soils. It provides extensive views across the Coastal Plain, into the Helena Valley, and north along the Scarp. The south-western section descends steeply down to Coulston Road. The slopes have stands of marri and wandoo, and rugged granite outcrops with rich shrub flora, habitats which are different from those in the rest of the area.

Reserve C8120 has a creek lined with flooded gum.

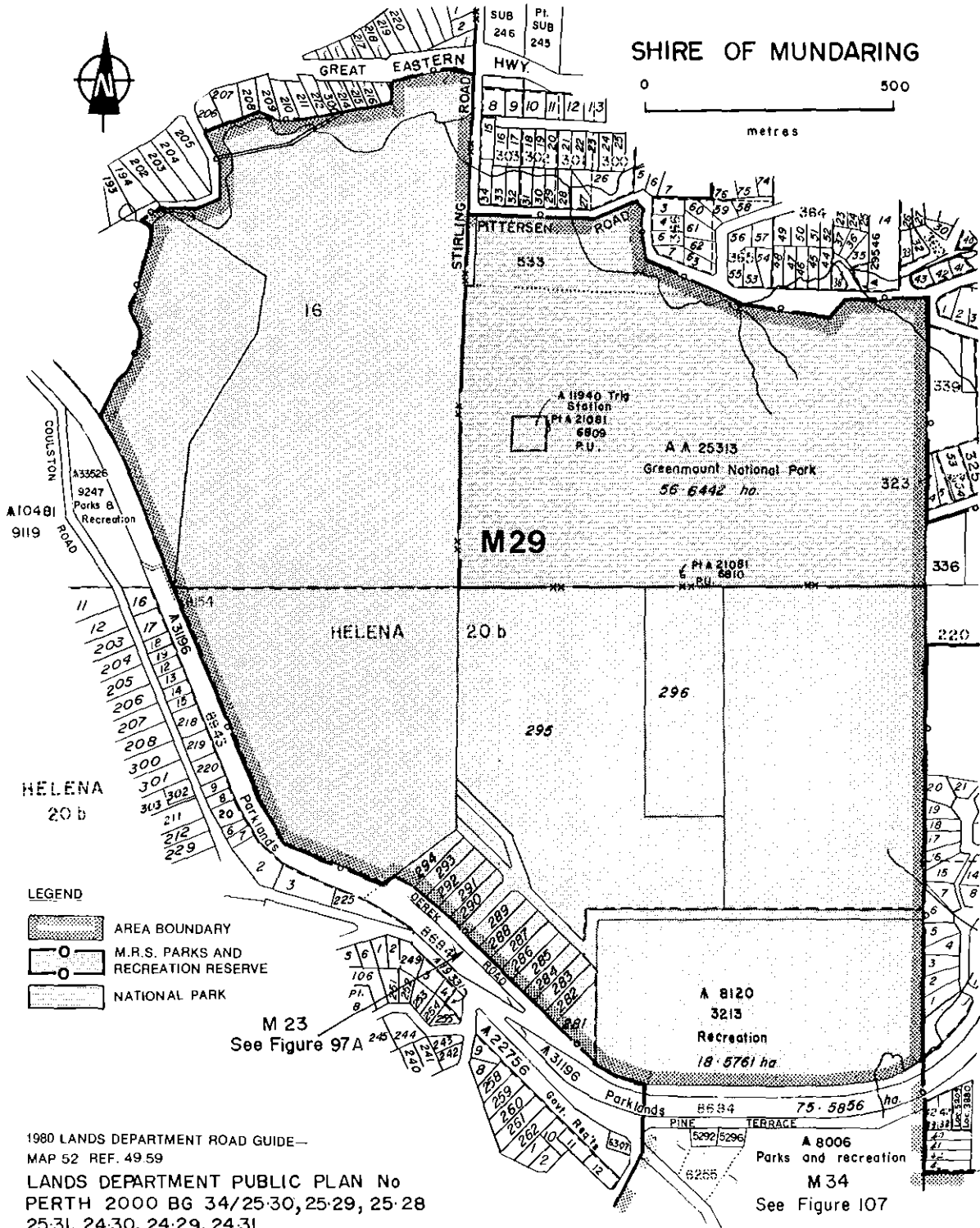
The area, which has high conservation value, is too small and too close to residential areas to be viable as a National Park. However the Kings Park Board is seeking a Park annexe in the hills where native flora suited to heavy soils can be grown. The Greenmount National Park, with proposed additions, would be very suitable for such a Park annexe, since the area contains a variety of soils and landforms, and part of a natural creek.

There are SEC lines in the area.

Land 'reserved' by the MRPA for Parks and Recreation under the Metropolitan Region Scheme links the area with the John Forrest National Park (M21) and the Helena Valley (M34).

Recommendations

- M29.1 Subject to the agreement of the controlling body, the purpose of Reserve A25313 should be amended to Botanical Gardens, and the Reserve should be vested in the Kings Park Board.
- M29.2 Subject to the agreement of the controlling body, Reserve C8120 should be cancelled and its area added to Reserve A25313.
- M29.3 Reserve C11940 should be cancelled and its area added to Reserve A25313.
- M29.4 The land owned by the Metropolitan Region Planning Authority should be managed as if part of Reserve A25313.



1980 LANDS DEPARTMENT ROAD GUIDE—
 MAP 52 REF. 49 59
 LANDS DEPARTMENT PUBLIC PLAN No
 PERTH 2000 BG 34/25 30, 25 29, 25 28
 25 31, 24 30, 24 29, 24 31
 DCE Ref. No E6

Figure 102

M30 RESERVES A1847 AND C31178, DARLINGTON

The area comprises Reserves A1847, for National Park, vested in the Shire of Mundaring, and C31178, for Recreation, not vested. It is situated on a steep hillside, west of the Greenmount suburban area (Figure 103). Reserve A1847 is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The vegetation includes a very good example of jarrah and marri woodland, with associated understorey.

As the area is small, the purpose of National Park is inappropriate.

Recommendations

- M30.1 Subject to the agreement of the controlling body, the purpose of Reserve A1847 should be amended to Parkland.
- M30.2 Reserve C31178 should be cancelled and its area added to Reserve A1847.
- M30.3 The Mundaring Shire Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to encouraging the growth and regeneration of local indigenous flora.
- M30.4 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

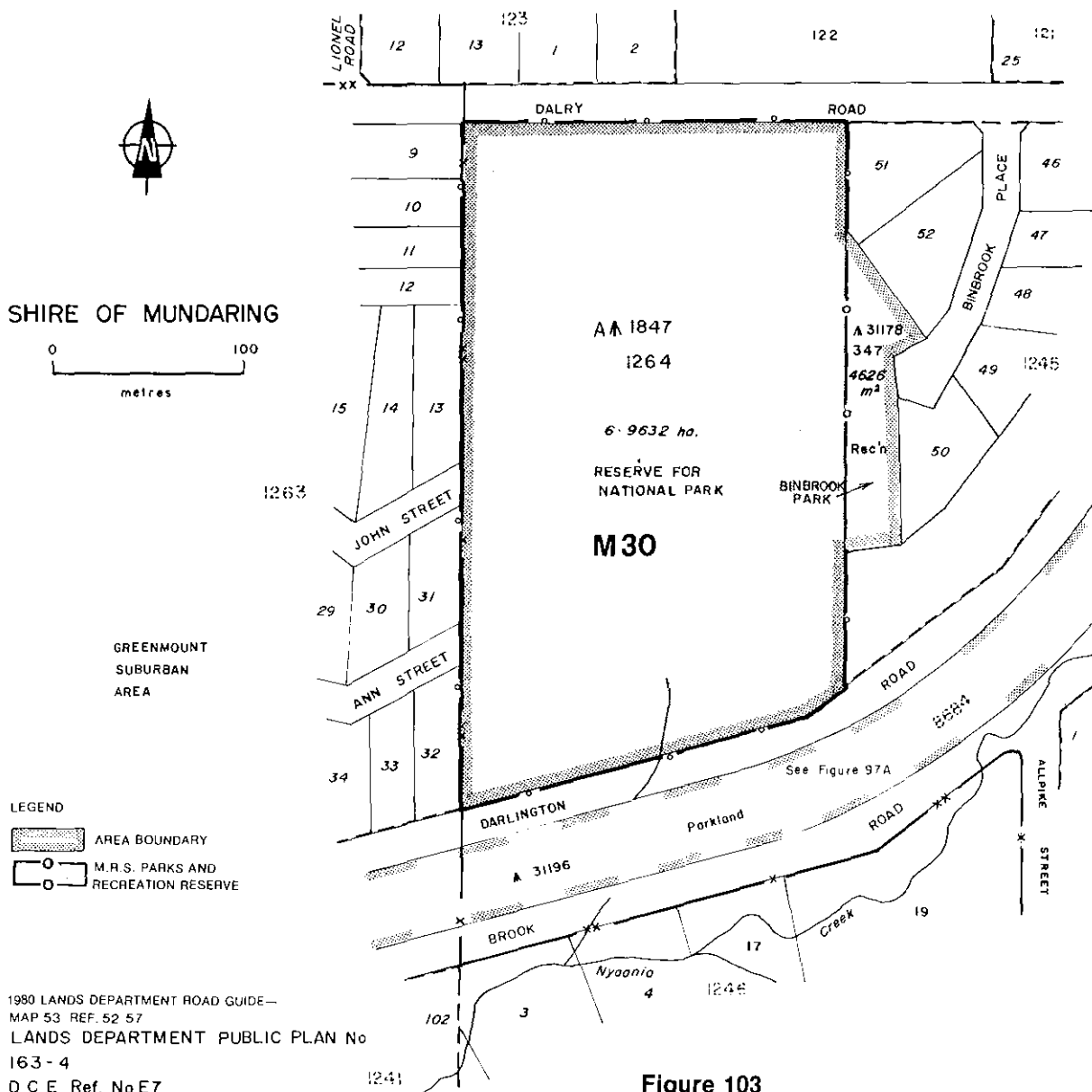


Figure 103

M31 RESERVE C32727, MUNDARING

Reserve C32727, for Parks and Recreation, not vested, is situated to the south of the Great Eastern Highway, about 4 km west of Mundaring (Figure 104). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

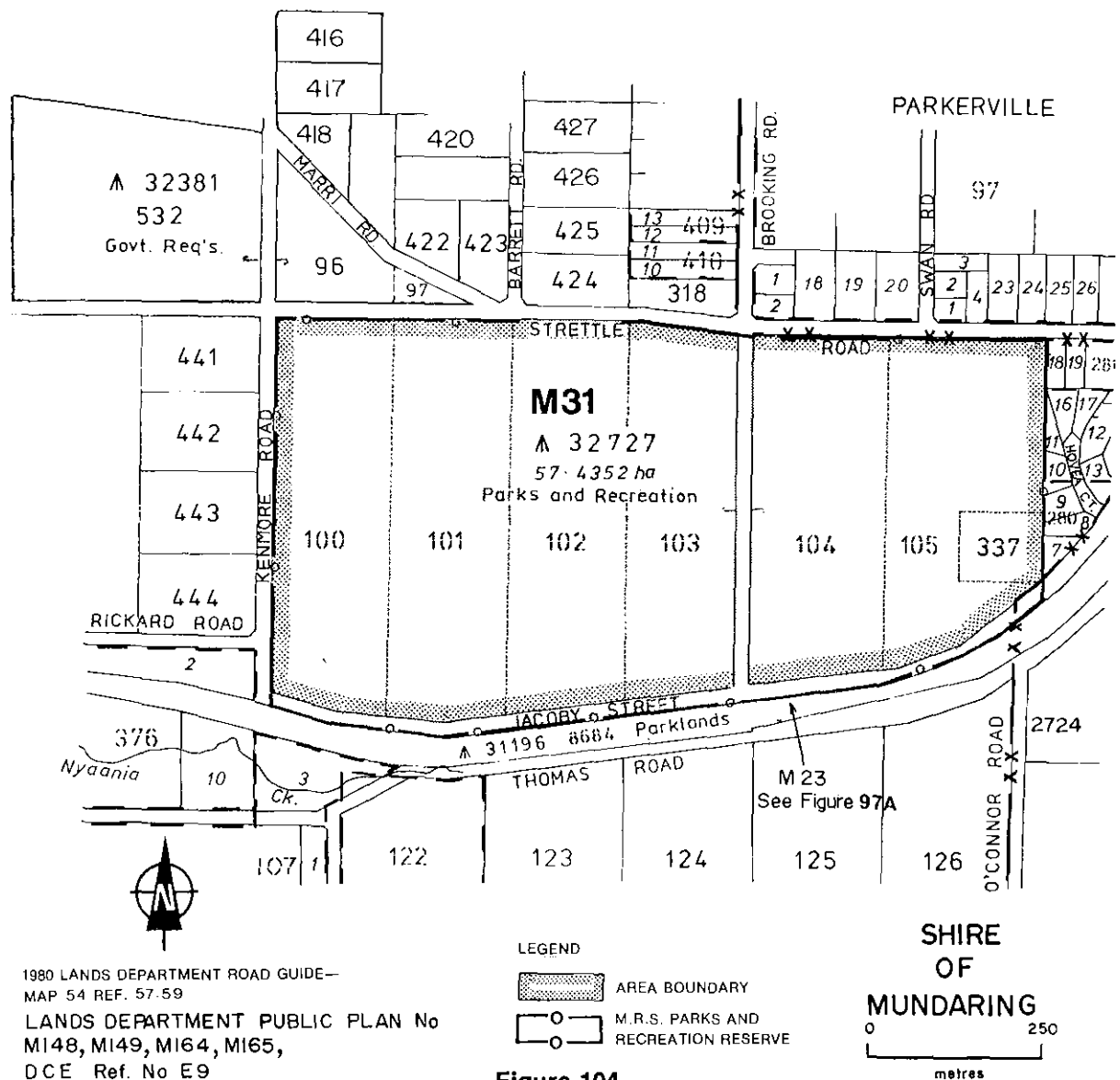
The Reserve is on the lateritic uplands of the western Darling Range. Its vegetation is open-forest of jarrah and marri, with smaller trees including bull banksia, snottygobble and sheoak in the south-western section. The Reserve is in good condition, little disturbed by tracks, and should be managed to retain the natural vegetation where possible.

The Reserve lies in the lower Helena River Catchment, and the Mahogany Creek Catchment, existing and potential sources of water supply respectively. It may be affected by a future pipehead dam to be constructed just below the confluence of Jane Brook and Mahogany Creek. The Mundaring Shire Council has proposed that Reserve C32381, for Government Requirements, not vested, and Locations 416, 417 and 424 to 427 should be included in Reserve C32727.

Recommendations

M31.1 Reserve C32727 should be vested in the Shire of Mundaring.

M31.2 The Mundaring Shire Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to encouraging the growth and regeneration of local indigenous flora.



M32 RESERVES C18130 AND C34103, SAWYERS VALLEY

Reserves C18130, for Timber, and C34103, for Government Requirements, both not vested, are situated on the southern side of the Great Eastern Highway about 30 km east of Perth (Figure 105).

The area's vegetation is jarrah-marri open-forest, characteristic of the lateritic plateau, with some smaller trees such as bull banksia and sheoak, and a diverse understorey including snottygobble, hairy jugflower, buttercup, couch honeypot and *Bossiaea aquilifolium*. The area provides a refuge for a variety of birds, as well as the western brush wallaby and the western grey kangaroo.

Because of the amount of clearing in the district, the area should be retained as an example of the local vegetation. It also provides pleasant scenery adjacent to a highway which is a main route for both local and interstate traffic entering and leaving Perth.

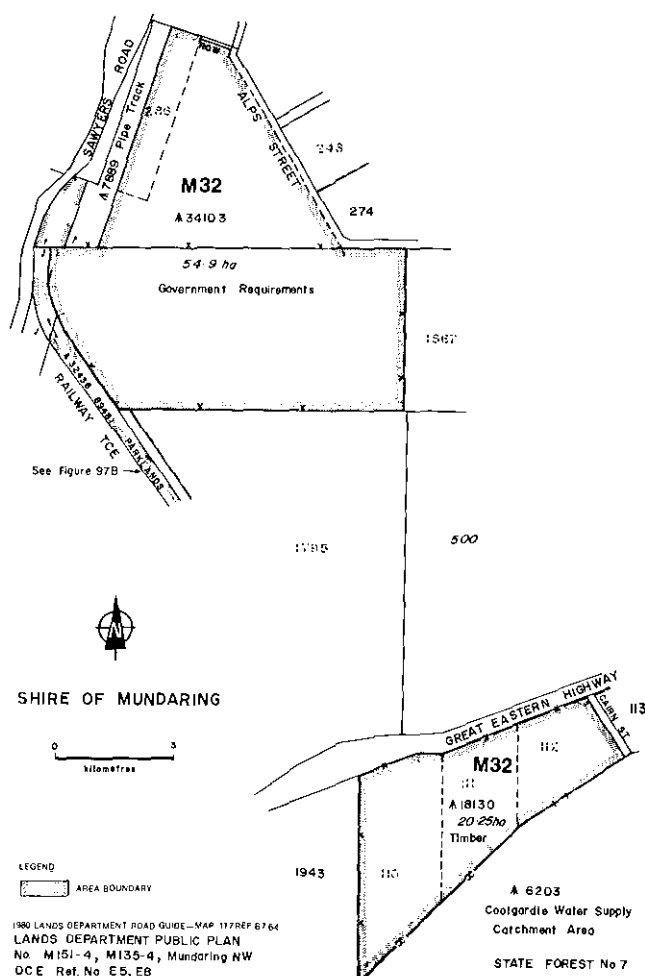
Reserve C34103 is used by local residents and visitors. The northern half is zoned residential under the Shire of Mundaring's town planning scheme.

The area is within the Jane Brook Catchment, a potential source of water supply. Reserve C18130 may be affected by a future pipehead dam, to be constructed just below the confluence of Jane Brook and Mahogany Creek, and a proposed Sawyers Valley bypass road. The area contains SEC lines.

The Mundaring Shire Council has proposed that part of State Forest No. 7 and Locations 113 and 120, freehold land, should be included in Reserve C18130.

Recommendations

- M32.1 The purpose of Reserves C18130 and C34103 should be amended to Parkland, and the Reserves should be vested in the Shire of Mundaring.
- M32.2 Reserves C18130 and C34103 should be managed for the long term conservation of the natural flora and fauna.
- M32.3 The Mundaring Shire Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to encouraging the growth and regeneration of local indigenous flora.



M33 HELENA RIVER - GUILDFORD TO DARLINGTON

The area comprises the section of the Helena River from the western boundary of the Darlington Townsite to the Railway Bridge at South Guildford (Figure 106). Part of the river and the adjacent land (downstream from East Guildford) has been 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. The MRPA has recommended in its Eastern Corridor Report that the banks of the Helena River and parts of the adjacent flood plain should be 'reserved' for Parks and Recreation under the Metropolitan Region Scheme, to be developed and managed as a linear park.

Flooded gum is the most common tree in the area, and paperbark is frequent along the flatter reaches. There is marri on the boulder-strewn banks below Darlington, and wattle is common near the Scott Street Bridge. Flooded gum is regenerating well on many of the flood plain flats, but the ground flora has been denuded almost everywhere else by cattle. Introduced trees include ash, near Guildford, and willow, in the Helena Valley. The groundcover on the flats includes introduced grasses such as *Paspalum distichum* and *Stenotaphrum secundatum*. On the steeper and rockier slopes of the upper reaches native species, including prickly moses, *Astartea fascicularis* and *Grevillea glabrata*, remain. There are clumps of *Triglochin procera* in the river.

The river banks, flood plains and fringing flats bear only small remnants of the natural vegetation. Nevertheless they contribute significantly to the landscape. The area is suitable for walking, fishing, bird-watching and general enjoyment of the scenery. If access by stock to the water were to be controlled, the fringing vegetation would be maintained and able to regenerate. This in turn would help to prevent erosion of the banks.

Several concepts discussed in this Report are relevant: 'pathway systems' (Chapter 5), 'riverine linear parks' (Chapter 6) and 'conservation buffer zones' (Chapter 5). The last concept is applicable since activities on privately owned land adjacent to the river may have adverse effects on the area's value as open space.

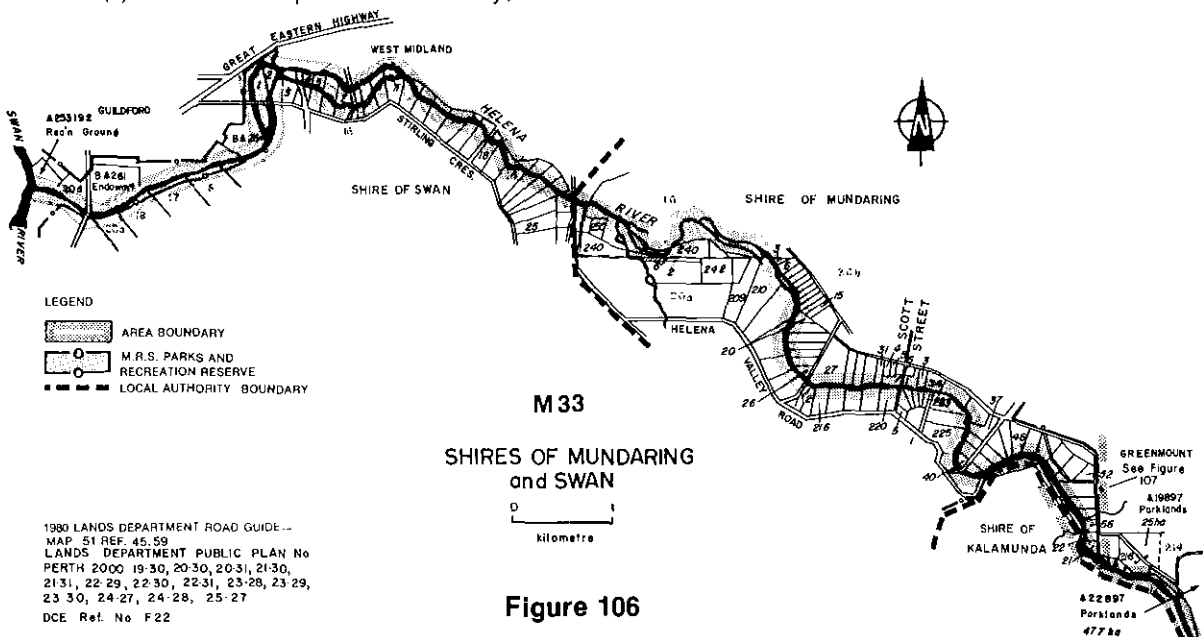
The area may be affected by proposed sewerage and drainage works. There are existing SEC lines. The area has potential for clay, loam and sand.

Recommendations

M33.1 The Metropolitan Region Planning Authority's proposal to 'reserve' additional land for Parks and Recreation under the Metropolitan Region Scheme is endorsed.

M33.2 In the preparation of any management programme, at the appropriate time, the Metropolitan Region Planning Authority should consider:

- encouraging the growth and regeneration of local indigenous flora;
- only allowing recreation activities which are compatible with the conservation of flora and fauna;
- providing pathways along the river banks;
- restricting vehicle access;
- controlling stock access to the river banks;
- the area's potential for clay, loam and sand.



M34 HELENA VALLEY

The area comprises Reserves A21314 and A30200, for National Park, both vested in the National Parks Authority; A23981, for Park, C8006, for Recreation, C19897, for Parklands and C20765, for Recreation and Bird Sanctuary, all vested in the Shire of Mundaring; A7980 for Surveys Standards Area, vested in the Lands Surveyors Licensing Board; A22835, for Parks and Recreation, A24182, for Park, C22897 and C23118, for Parklands, and A23537, for National Park, all not vested; C32890, for Water Supply and part of C5342, for Camping, both vested in the Minister for Water Resources; C10448, for Education Purposes, vested in the Minister for Education; C27154, for Parks and Recreation and C16922, for Recreation and Water Supply, both vested in the Shire of Kalamunda; and part of Reserve C17343, for Public Utility, vested in the Darling Range Road Board; part of State Forest No. 54 (but not including the Jacoby land); vacant Crown land (part of Location 975); and part of Helena Location 20(a) adjacent to and east of Ridge Hill Road, lots 1, 2, 11, 12, 263 to 265, 281 to 284, 320, 321, 324, 325, 327, 330 to 333, 336 to 338, 341 to 343, 352 to 362 (Helena Location 20a), lots 7 to 12 (Location 1290), lot 17 (Location 1763), part of lot 119 (Location 1532), Locations 213, 563, 711, 999 and part of Locations 963, 972 and 1298, all owned by the MRPA; lots 253 to 258 and part of lots 252 and 351 (Helena Location 20a), lots 3 and 4 (Location 119), lots 1 and 2 (Location 120), Swan Location 1722, part of Locations 361, 1033, 1345, 1763 and all of Locations 455, 946, 965, 968, 982, 1181, 5687, 5688, privately owned freehold land (Figure 107). Most of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The Helena Valley below Mundaring Weir is the only large river valley through the Darling Scarp near Perth which retains substantial areas of uncleared land and which has no highway or railway running through it. The opportunity exists to create a large reserve or park which would contain areas for conservation of flora and fauna as well as for recreation, and also provide protection for the water catchment. The area would provide an unbroken link between Gooseberry Hill and Mundaring Weir Road, at a point just below the Weir itself.

A range of vegetation types occurs in the area. The forests and woodland are variously dominated by jarrah, marri, wandoo and flooded gum and there are areas of heath, especially in granitic soils where many plant species typical of the Darling Scarp are to be found. The portion of the Helena Valley which lies upstream from the small pumpback dam is particularly valuable, as parts are still in an excellent condition and several rare species of flora are to be found there. Although some sections have been burnt too frequently and will need careful management, the area as a whole has extremely high conservation value for both flora and fauna.

The area is an important recreation resource, being scenically attractive, close to residential areas and yet remaining fairly secluded, since it can only be entered at limited access points and along walking and riding trails. The area is suitable for a range of passive and active recreation activities, although the portion with the highest conservation value, that portion of the Helena Valley upstream from the pumpback dam, would deteriorate if environmentally destructive activities (e.g. trail-bike riding, horse riding) were permitted.

The concept of a 'regional park', as discussed in Chapter 5, is relevant to the Helena Valley, as is the concept of a 'scenic river'. The Eastern Corridor Report recommends that a National Park should be created in the area.

Public access to parts of the area is restricted by Catchment Zone regulations. These restrictions are satisfactory in view of the conservation value of that portion of the Helena Valley, since management for water purity requires minimal disturbance of the environment. There are SEC lines in the area. There may be requirements for a major road along the Helena Valley and a controlled access highway between Sawyers Valley and Bushmead, across the northern section. The area contains residential areas, small farms and orchards.

Recommendations

- M34.1 The area within the stippled boundary should be considered as a potential Regional Park.
- M34.2 The Metropolitan Region Planning Authority, in consultation with the National Parks Authority and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.
- M34.3 The land within the catchment of the pumpback dam should be set aside and declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and Water, and the Reserve should be vested jointly in the Ministers for Fisheries and Wildlife, and Water Resources.
- M34.4 Existing and future Land Act Reserves should include Water as a purpose.
- M34.5 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority to include representatives of appropriate authorities and interested parties.

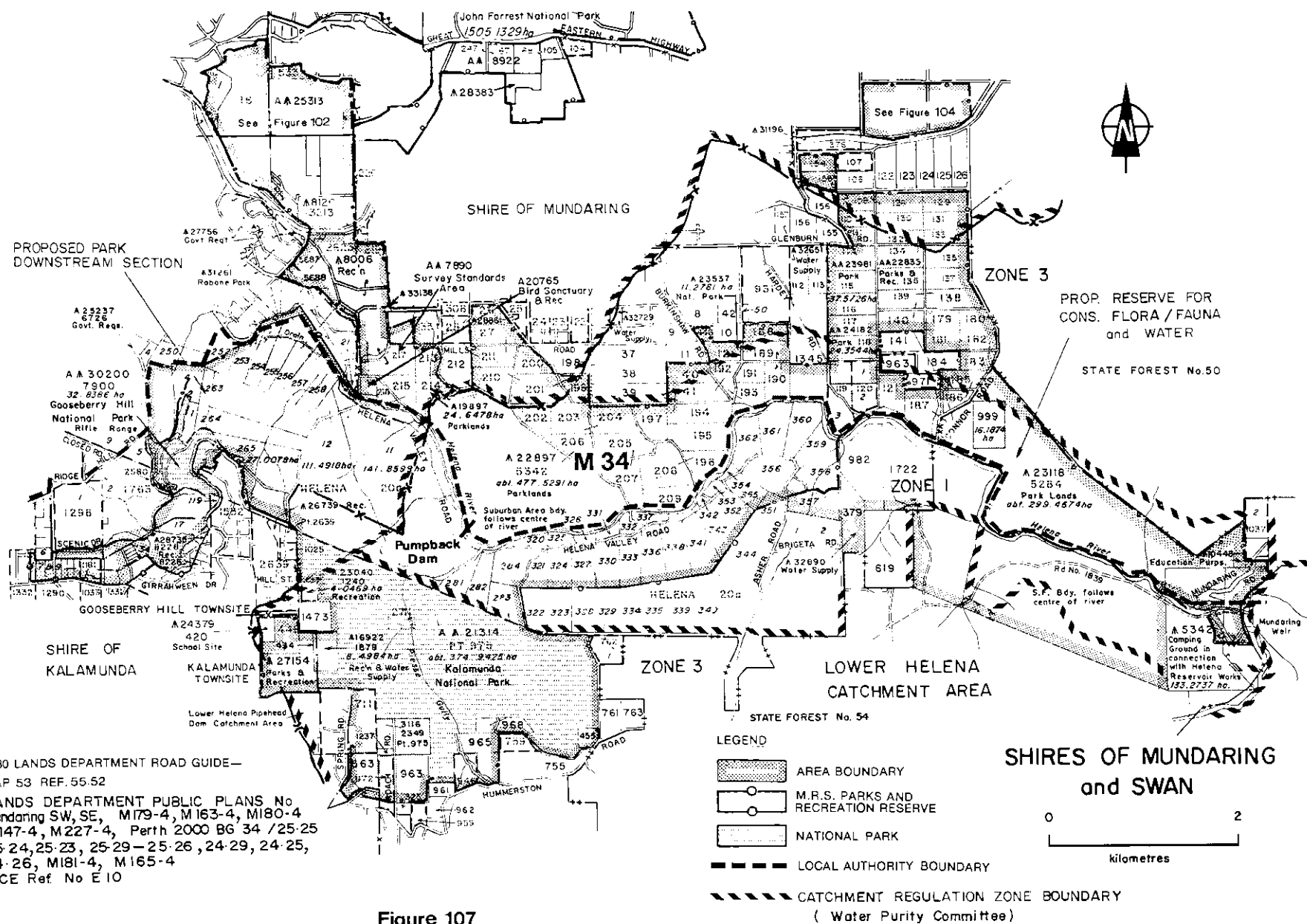


Figure 107

M35 STAR SWAMP, NORTH BEACH

The area comprises Reserves A21406, for Recreation, vested in the City of Stirling; and lot 218 and part of lot 2 (Location 564), freehold land held in the names of the City of Stirling and the State Housing Commission. It is situated inland of Watermans Beach (Figure 108).

Star Swamp is bordered to the east, north and south by low open-forest of swamp paperbark, with an understorey dominated by the sedges *Juncus maritimus* and *Baumea juncea*, with some *Scirpus maritimus* and the blue-flowered *Lobelia alata*. A variety of acacia shrubs occurs on the dry side of the open-forest. The remainder of the vegetation in the swamp basin includes open-woodland and open-forest of tuart, and in the south, an understorey of banksia species, with a groundstorey containing buttercup, pixie mops and couch honeypot. In the eastern section there is little understorey, apart from a patch which includes parrot bush and prickly moses. In the northern section, the understorey includes bull banksia, *Logania vaginalis* and stinkwood.

Reserve A21406 and adjacent land support attractive open-forest and woodland of marri, tuart and jarrah, often with an understorey of bull banksia. The ground storey includes blackboy, stinkwood and zamia.

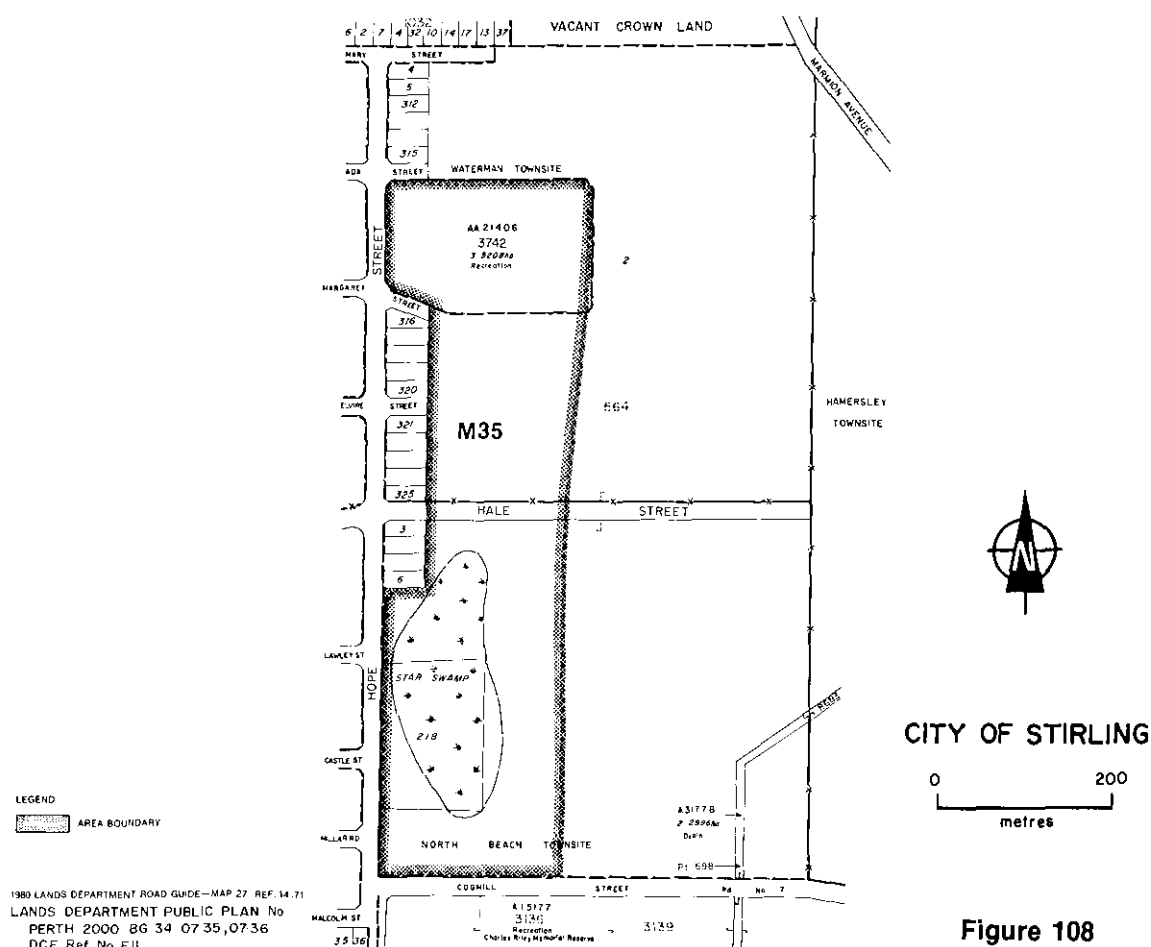
As well as its conservation value, the area is regularly used for teaching, and is popular for bushwalking and bird-watching.

Private groundwater extraction and storm-water drainage will affect water levels and groundwater may become polluted by local septic systems. The area may be affected by proposed sewerage and drainage works.

The Stirling City Council considers that the area should be extended eastwards to Marmion Avenue.

Recommendations

- M35.1 Subject to the agreement of the controlling body, the purpose of Reserve A21406 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested jointly in the City of Stirling and the W.A. Wildlife Authority.
- M35.2 That part of Location 564 containing Star Swamp and forming a corridor between Reserve A21406 and Coghill Road, should be managed as if part of Reserve A21406.



M36 RESERVES NEAR KARRINYUP

The area comprises Reserves C32559, for Parkland, C27471, C33679 and part of Reserve C33680, for Recreation, all vested in the City of Stirling; lots 5 and 7, and part of lot 6 (Location 1153), being freehold land owned by the MRPA (Figure 109). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The section south of Karrinyup Road provides one of the few examples in the metropolitan area of a belt of vegetation extending from the sea to tuart woodland. It contains yellow sands, stabilised by vegetation. The first ridge of dunes east of West Coast Highway carries open-heath, including *Pelargonium capitatum*, swordgrass and *Acanthocarpus preissii*. To the north and east there is an area of closed-heath dominated by *Acacia rostellifera* and *Olearia axillaris* with patches of yellow-tail flower and *Scaevola nitida*, and around the hill tops there are species such as *Pelargonium capitatum*, *Melaleuca acerosa* and quandong. Just east of Elliott Road the vegetation changes to open-woodland of tuart, with an understorey dominated by *Pelargonium capitatum*, *Acacia lasiocarpa* and *Scaevola holosericea*. The understorey is richest around the hill tops, and includes snakebush, yellow leschenaultia and one-sided bottlebrush. There is some banksia, sheoak and stunted jarrah in the most easterly section.

In Reserve C33680, on the northern slopes of the dunes near Karrinyup Road, there are patches of closed-scrub of *Casuarina lehmanniana*, and the distinctive shrub *Gyrostemon ramulosus*. Both these species are rare in System 6. Another unusual occurrence is Rottnest cypress, which was once common on the coast near Perth but has now largely disappeared. Introduced grasses, such as *Lagurus ovatus*, are present in the open-heath and open-woodland vegetation. Much of the area has been badly affected by fire. It contains a well established network of trail-bike tracks, especially in the eastern section.

Despite its proximity, the area north of Karrinyup Road is very different. Reserves C27471 and C33679 are fairly flat and contain brown sand, with limestone at or near the surface. The vegetation is mainly open-woodland of tuart and woodland of marri, with some low open-woodland of banksia species near Karrinyup Road. Bull banksia and stunted jarrah occur in places, and the understorey includes scrub sheoak, prickly moses and honeybush. Where limestone is at the surface on a low rise near Karrinyup Road the associated vegetation is closed-heath, including cockies' tongues, chenille honeymyrtle and *Acacia truncata*.

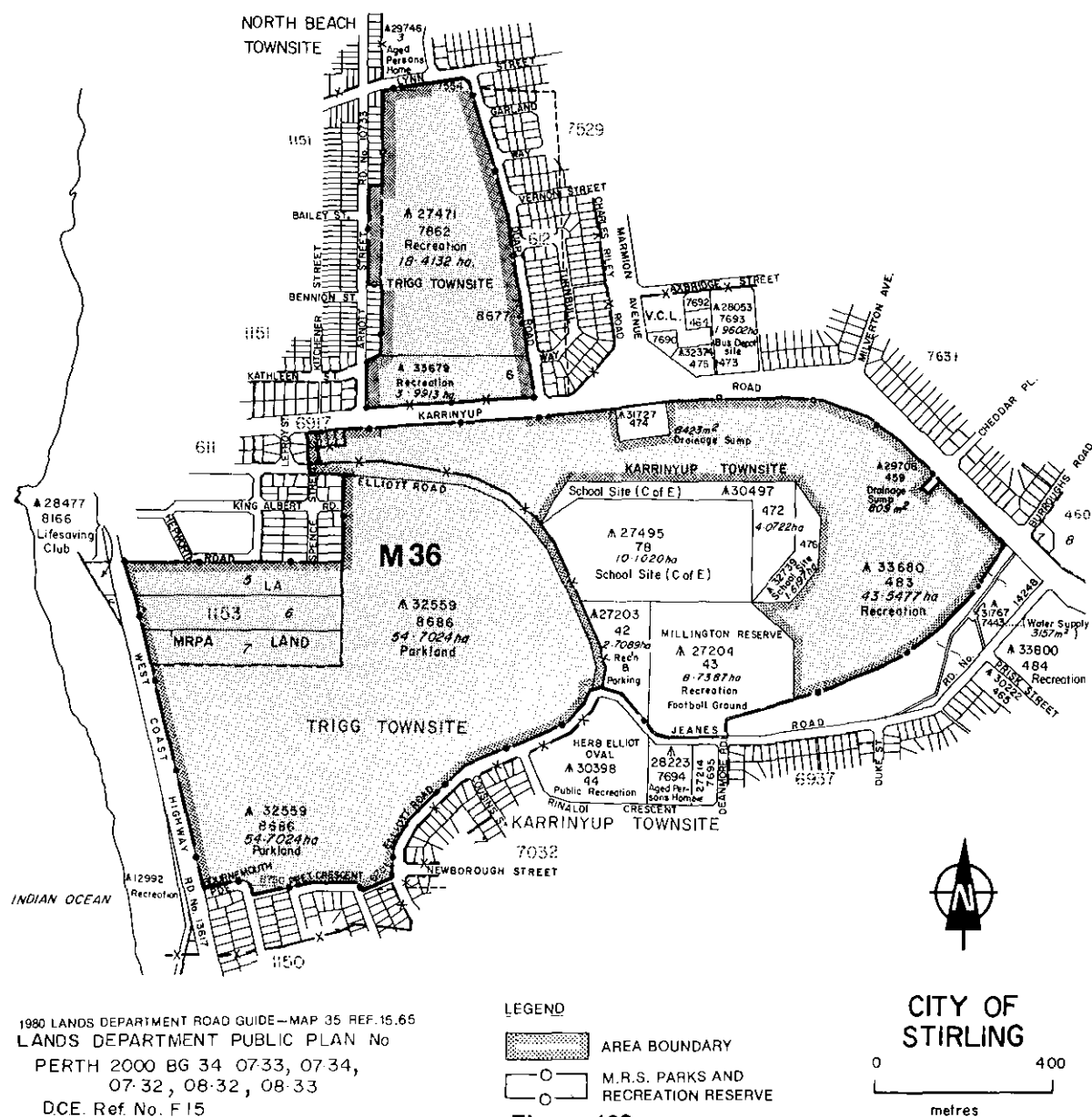
Except for some dying tuarts, the vegetation in the area is in good condition, the understorey dense, and marri is regenerating prolifically. This is probably due to the network of fire breaks and fencing of part of the perimeter. The area is regularly used by schools for educational purposes.

The MRPA and the City of Stirling are working on a programme of dune preservation. The section south of Karrinyup Road has been fenced, restricting public access until dune rehabilitation can be assessed.

Private and MWB groundwater extraction may affect water levels. The area may be affected by proposed sewerage works and a future road link between Marmion Avenue and the West Coast Highway.

Recommendations

- M36.1 Subject to the agreement of the controlling body, the purpose of Reserves C27471, C33679 and C33680 should be amended to Parkland.
- M36.2 Subject to the agreement of the controlling body, Reserves C27471 and C33679 should be vested jointly in the City of Stirling and the W.A. Wildlife Authority.
- M36.3 The Stirling City Council, in consultation with the Metropolitan Region Planning Authority and the Department of Conservation and Environment, should prepare a management programme for Reserves C32559 and C33680 giving consideration to:
 - (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) only allowing recreation activities which are compatible with the conservation of flora and fauna.



M37 CARINE SWAMPS

The area includes Big Carine Swamp and Little Carine Swamp and comprises lot 10 (Location 565), lot 10 (Location K), lot 10 (Location 568), Locations 185, 189, 566 and 567, freehold land owned by the MRPA. It is situated a few kilometres north of Karrinyup (Figure 110). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme and is being developed by the MRPA and the City of Stirling as part of the Carine Lake, Region Open Space Reserve.

Big Carine Swamp comprises two main bodies of water — a larger northern one, consisting partly of open water and partly of sedgeland of bulrush (*Typha orientalis*), and a smaller southern body of open water. Between the two is an extensive area of low closed-forest of swamp paperbark, which is in good condition. There is another area of paperbark around the north-eastern section of the lake, and behind this there is an open-forest of tuart. There are remnants of vegetation in other places: some marri and tuart to the south and south-east of the lake, and clumps of flooded gum, mainly saplings, on the lake's western shore.

Big Carine Swamp supports a good variety of water-birds, including mountain duck, grey teal and great crested grebe, which are rare in the metropolitan area. It provides a summer refuge because it is semi-permanent, and the dense growth of paperbarks affords protection and nesting sites.

Private and MWB groundwater extraction may affect water levels in the area. There are MWB works and additional works may be required.

M37.2 Any future Land Act Reserves should include Water as a purpose.



M38 CARENIUP SWAMP, GWELUP

The area comprises parts of lots 1 and 2 (adjacent to Balcatta Road), 1 to 7 (North Beach Road), 1 and 2 on the eastern side of Careniup Swamp, and parts of lots 9 to 11, 22, 26, 27, 29, 32 to 37, 50 and 96 (Location 92), privately owned freehold land. It is situated in Gwelup (Figure 111). The Metropolitan Region Scheme zoning (currently Urban Deferred) of the area is being reviewed by the MRPA.

Careniup Swamp is semi-permanent and provides a summer refuge and feeding ground for water-birds. The soils are rich and peaty and support extensive sedgelands and low closed-forest of swamp paperbark and flooded gum.

The conservation value of the area is high because wetlands are uncommon in the metropolitan area and Careniup Swamp forms part of a system of wetlands, including Lake Gwelup, Lake Karrinyup and Carine Swamps, which provide good diversity of habitat. The swamp could be highlighted as a landscape feature when the Mitchell Freeway is extended along the east of the area.

The area is within the Gwelup Water Pollution Control Area. Private and MWB groundwater extraction may affect water levels, and groundwater may become polluted by local septic systems. The area may be affected by proposed controlled access roads and MWB works. There is an existing coal mining lease.

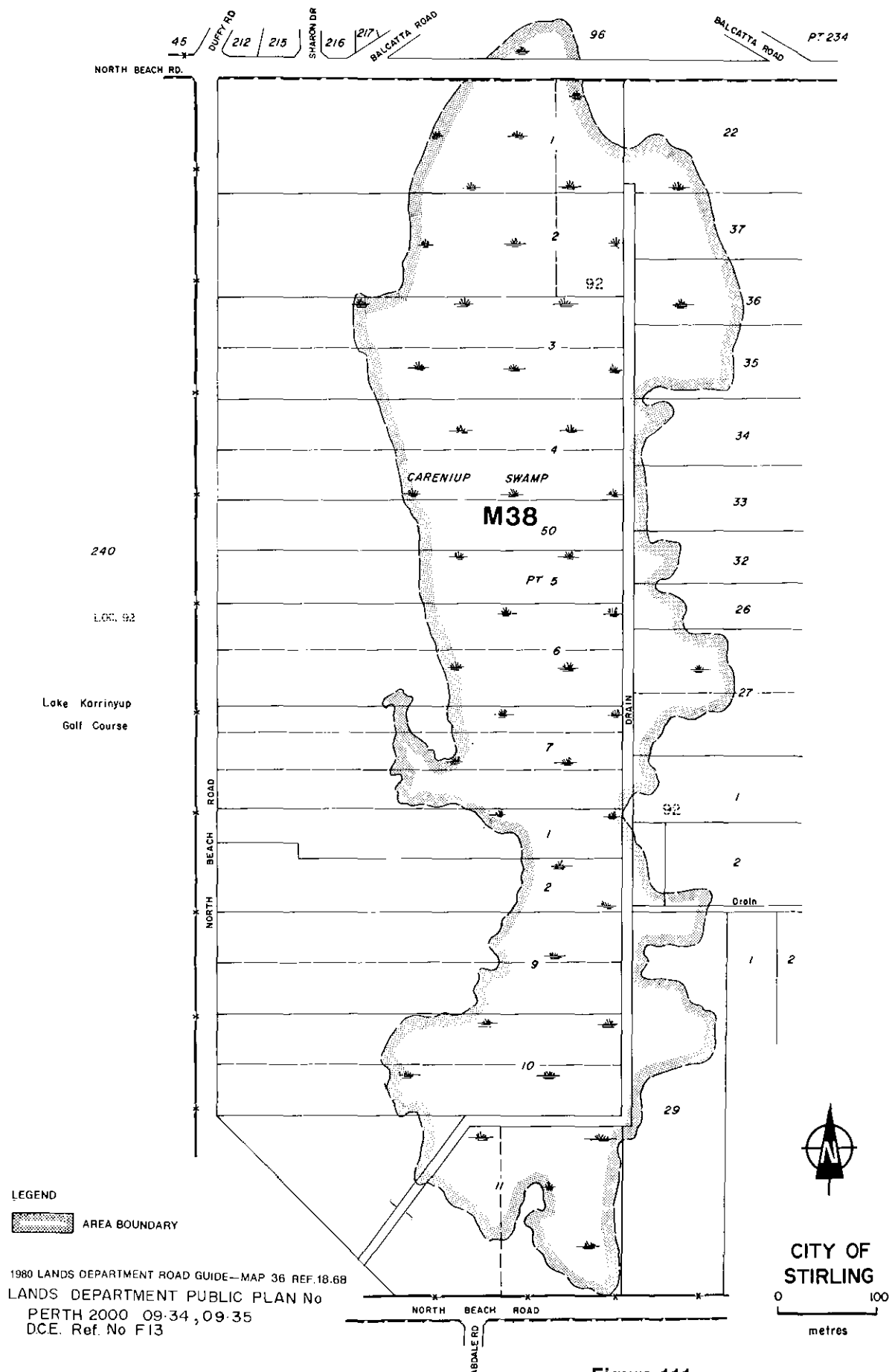
The Conservation and Land Use Committee proposed that the strategy of multiple vesting for the multiple purposes of conservation and/or recreation, water and mining should be applied to the area.

Recommendations

M38.1 The Metropolitan Region Planning Authority should consider 'reserving' the wetland portion of Careniup Swamp, together with some surrounding land, for Parks and Recreation under the Metropolitan Region Scheme.

M38.2 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- (a) ensuring that development adjoining the area is not detrimental to the wetland;
- (b) maintaining water-bird habitats;
- (c) making a landscape feature of the land adjacent to the future northern extension of the Mitchell Freeway.
- (d) the area's potential for water and minerals.



M39 LAKE GWELUP

The area comprises Reserves C31538 and C33116, for Public Recreation, both vested in the City of Stirling; C36291, for Parks and Recreation, vested in the MRPA; part of Reserve C33142, for Public Recreation, vested in the City of Stirling; lot 1 (adjacent to Wanstead Street), lot 3 (adjacent to Huntriss Road), lots 1 to 6, 9, 10, 12, 13, 15, 32, 33, 50, 53, 62, 77, 80 to 82, 117, 121, 124, 150, 523 and 542 (Perthshire Location At), being freehold land, mostly owned by the MRPA. It is situated in Karrinyup (Figure 112). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Except for a few flooded gums and swamp paperbarks, most of the land bordering the lake to the west and south has been cleared. However, land to the north and east of the lake has a good cover of natural vegetation, which includes tuart, a few jarrah, marri and banksia. Much of the vegetation around the lake is regenerating, and it is important that this process should continue.

The lake is deep and permanent, supports a good variety of water-birds and is important as a drought refuge. Some species occur in large numbers, and grey teal and black duck are known to breed on the lake.

At present the area is used for horse riding and walking. Local residents are concerned about the use of trail-bikes in the area.

Private and MWB groundwater extraction may affect water levels, and groundwater may be affected by pollution from local septic systems. There are SEC lines in the area which may be affected by proposed sewerage and drainage works.

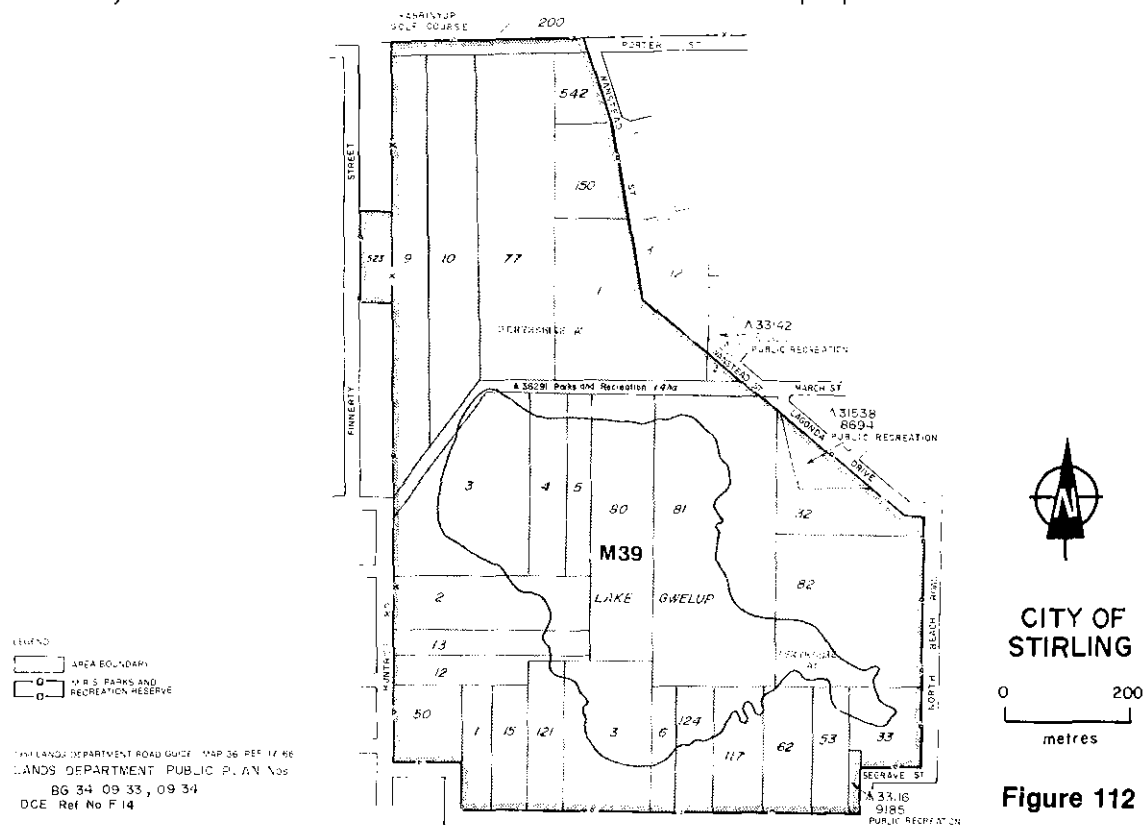
The Stirling City Council is preparing a development plan for the area for submission to the MRPA. The plan proposes an extension of the area.

Recommendations

M39.1 The Metropolitan Region Planning Authority and the Stirling City Council in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- encouraging growth and regeneration of local indigenous flora;
- preservation of the landscape;
- maintaining the habitat for water-birds;
- only allowing recreation activities which are compatible with the conservation of flora and fauna.

M39.2 Any future Land Act Reserves should include Water as a purpose.



M40 DIANELLA OPEN SPACE

The area comprises Reserve C34538, for Recreation, vested in the City of Stirling; lots 32, 86, 87 and part of lot 88, (Location V), lots 138 to 140, 143, 146 to 149, 151 and part of lots 85, 135, 136 (Location U), Locations 4812 to 4816, and the Sturt Street, Station Street, Holdsworth Street, Union Street and Fleming Street subdivisions, all freehold land owned by the MRPA but leased to the City of Stirling; and lots 70, 84 (Location U) and Location 7729, privately owned freehold land (Figure 113). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The vegetation in that part of the area which is uncleared is in good condition. There is low open-forest and low woodland of banksia, Christmas tree and pricklybark, with a varied understorey including purple flag, blackboy and scrub sheoak. In the south-eastern section there is woodland of marri with an understorey dominated by blackboy.

Some of the sheoaks and banksias in the more elevated sections have died recently, probably because the water table has been lowered by drainage systems in Dianella and also because of recent low rainfall. However, the vegetation is mostly in good condition and will probably adjust to the change in the water table.

Private groundwater extraction may affect water levels. There are sewerage and drainage works, and SEC lines in the area. Additional sewerage and drainage works are proposed.

The MRPA and Stirling City Council have a management programme for the area, and an artificial lake and island have been constructed in the south-western section.

Recommendations

- M40.1 Subject to the agreement of the controlling body, the purpose of Reserve C34538 should be amended to Parkland.
- M40.2 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

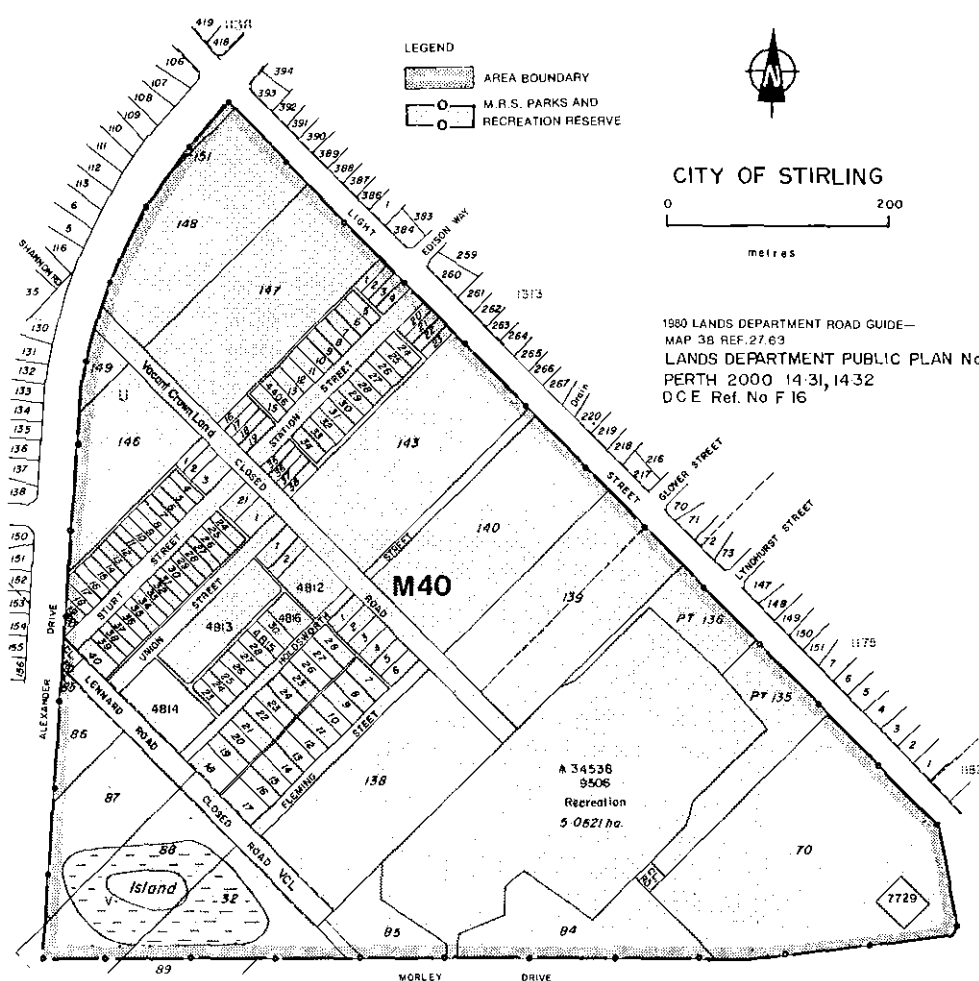


Figure 113

M41 BENNETT BROOK

The area comprises part of Reserve C25363, for Mental Hospital Site, not vested; part of lots 278, 279, 281, 626 to 628 (Location I), 10, 14, 47, 73, 74 (Location K), lots 30, 31, 40, 41 (Location K1), lots 107, 99, 133, 100 to 102 (Location L), 9 to 15 (Location M), part of Locations M1, O1, P and 2988, privately owned freehold land (Figure 114). The MRPA has indicated that the sections north of Reserve C25363 and south of lot 101 might be suitable for 'reservation' for Parks and Recreation under the Metropolitan Region Scheme. The MRPA considers that the area should be developed and managed as a linear park.

Upstream from Benara Road, the brook and tributaries are seasonal streams, partly disrupted by agricultural activities. However, they retain fringing vegetation of paperbark and flooded gum for a width of approximately 100 metres.

The area between Benara Road and Harper Streets has been modified by grazing, excavation for clay, and damming of the stream, and contains permanent pools which are fringed by paperbark and flooded gum.

South of Harper Street the water course spreads out to a swamp approximately 800 metres wide, containing a diversity of vegetation, including swamp paperbark and sedge, which provide a habitat for bush birds as well as a feeding and breeding ground for water-birds. The swamp contains several species of swamp-breeding frogs whose habitat is diminishing elsewhere due to urban development. The watercourse downstream from the swamp to the Swan River is narrow with fringing vegetation of paperbark and flooded gum.

The conservation and recreation value of the area is high, given its proximity to the rapidly expanding and densely populated suburb of Lockridge. Reservation of the area would help protect and improve the quality of the water from the Bennett Brook Catchment entering the Swan River.

Several concepts discussed in this Report are relevant: 'pathway systems' (Chapter 5), 'riverine linear parks' (Chapter 6) and 'conservation buffer zones' (Chapter 5). The last concept is applicable since activities on privately owned land adjacent to the river may have adverse effects on the area's value for open space.

Private and MWB groundwater extraction may affect water levels, and groundwater may be affected by organic pollution from nearby unsewered residences. There are sewerage works and SEC lines in the area and additional sewerage works are planned. Additional roads and a subdivision of land between Patricia Street and Benara Road have been proposed. The area north of Location 2988, to Benara Road, may have potential for clay and sand, and there is a mining claim in Location 2988, which is privately owned. It may be necessary to relocate the water course to cater for further clay extraction.

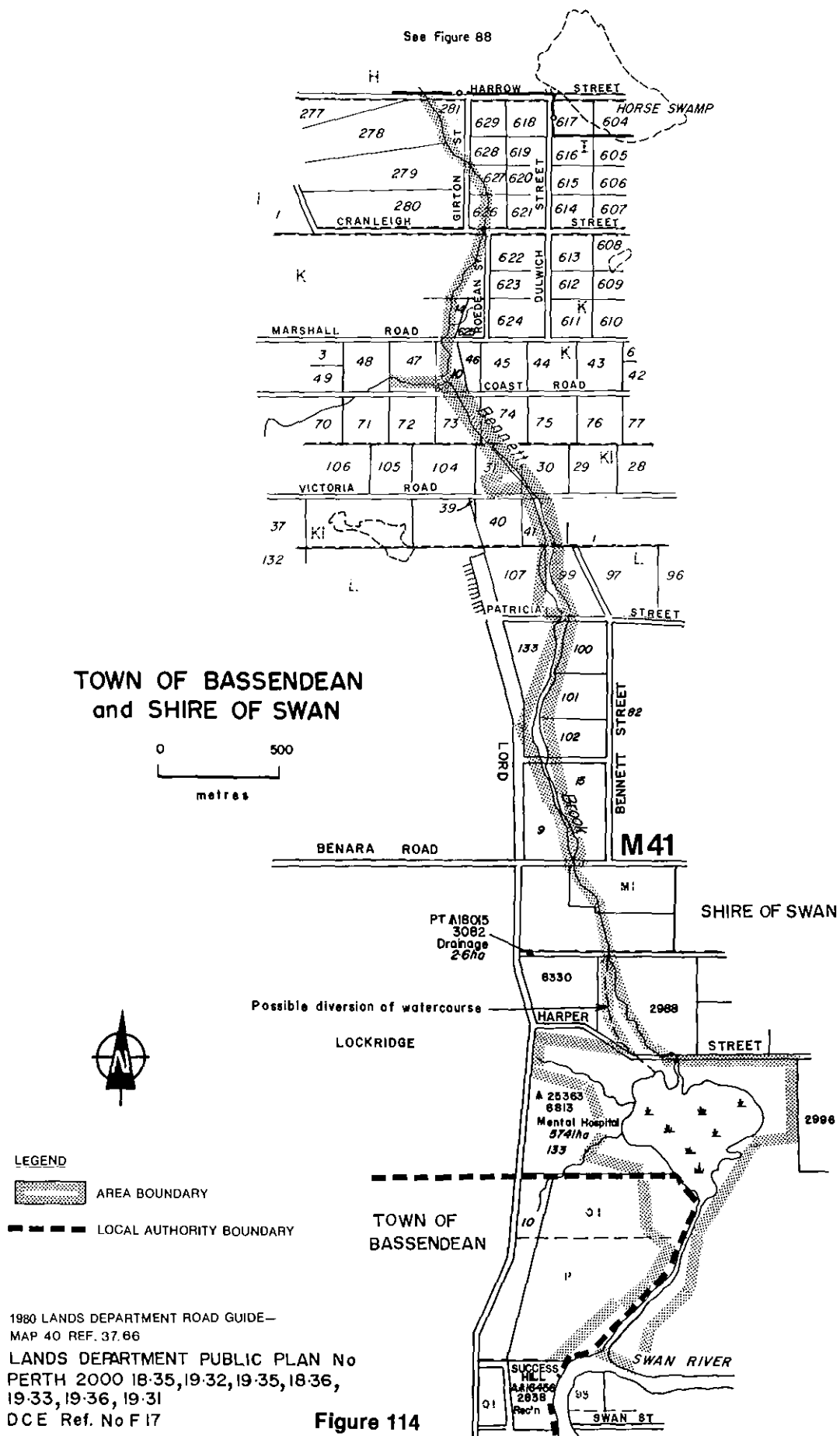
Recommendations

M41.1 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

M41.2 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

Consideration should be given to:

- (a) maintaining wetland habitats;
- (b) only allowing passive recreation activities which are compatible with the conservation of flora and fauna;
- (c) providing pathways around the swamps specifically for walking, bird-watching and educational purposes;
- (d) restricting vehicle access;
- (e) the area's potential for clay and sand;
- (f) possible diversion of the watercourse to avoid areas affected by future clay extraction.



M42 JACKADDER LAKE, WOODLANDS

The area comprises part of Reserve C27766 for Recreation, vested in the City of Stirling; and part of lots 404 and 406 (Perthshire Location At), being freehold land, owned in fee simple by the City of Stirling (Figure 115).

The lake is now permanent, as water levels are maintained during summer by water from the Osborne Park drain. The lake's surrounds are cleared and grassed with couch. Only a few remnant flooded gums remain but there are numbers of planted weeping willows. Large numbers of black swan, black duck and white-eyed duck, which is fairly uncommon, have been recorded on the lake. Private groundwater extraction may affect water levels. There are drainage works in the area.

Recommendations

- M42.1 Subject to the agreement of the controlling body, the purpose of Reserve C27766 should be amended to Recreation and Water.
- M42.2 The Environmental Protection Authority should endorse the Stirling City Council's management programme.
- M42.3 The Stirling City Council, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

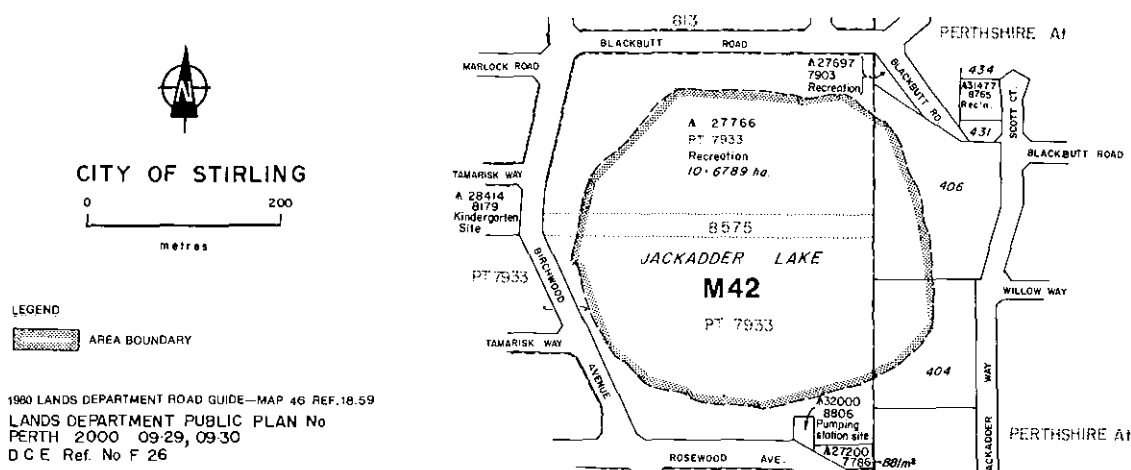


Figure 115

M43 HERDSMAN LAKE

The area comprises Reserves C31906, for Parkland and Recreation, C32094, for Recreation, both not vested; part of Reserves C28763, for Recreation, vested in the City of Stirling, and C32812, for Drain, vested in the Metropolitan Water Board; C28366, for Recreation, not vested; Special Lease 3116/7367; part of lots 1 to 6, 2, 9, 15, 50 (Perthshire Location Aq), part of lot 109 (Location 968), Herdsman Lake sub-lots 388, 393 to 400, 403, 405, part of sub-lots 389, 406 to 408, 411, all vacant Crown land; part of Herdsman Lake sub-lots 47 to 54, 80 to 86, 113, 115 to 119, 130, 131, 134 to 144, 153 to 155, 350, 367, 370 to 374, part of lots 1 and 2 of sub-lot 111, part of lot 3 of sub-lot 110, lot 9 of sub-lot 349, lot 9 of sub-lot 133, lot 4 of sub-lot 132, part of lots 1 to 4, 12 and all of Herdsman Lake sub-lots 368, 401, 402 and 404, freehold land, some of which is owned by the MRPA (Figure 116). The area has been 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The MRPA has developed a concept plan for the lake with a view to retaining the best portions of the present Herdsman Lake habitat and providing for passive recreation. The plan also provides for active recreation in the north-western section. Part of the south-western section has recently been dredged for a housing development and is being landscaped as an ornamental lake. Most of the area is a fenland of sedge and bulrush. There are remnants of flooded gum woodland, particularly in the west, where there is also a groundstorey of bracken. There are many clumps of paperbark, which forms a low woodland in the north. Swishbush and wattle also occur around the northern part of the lake.

Herdsman Lake supports many water-fowl as well as bush birds and birds of prey. About a hundred species have been recorded, of which about one-third breed there. The lake bed is rich in peat and is

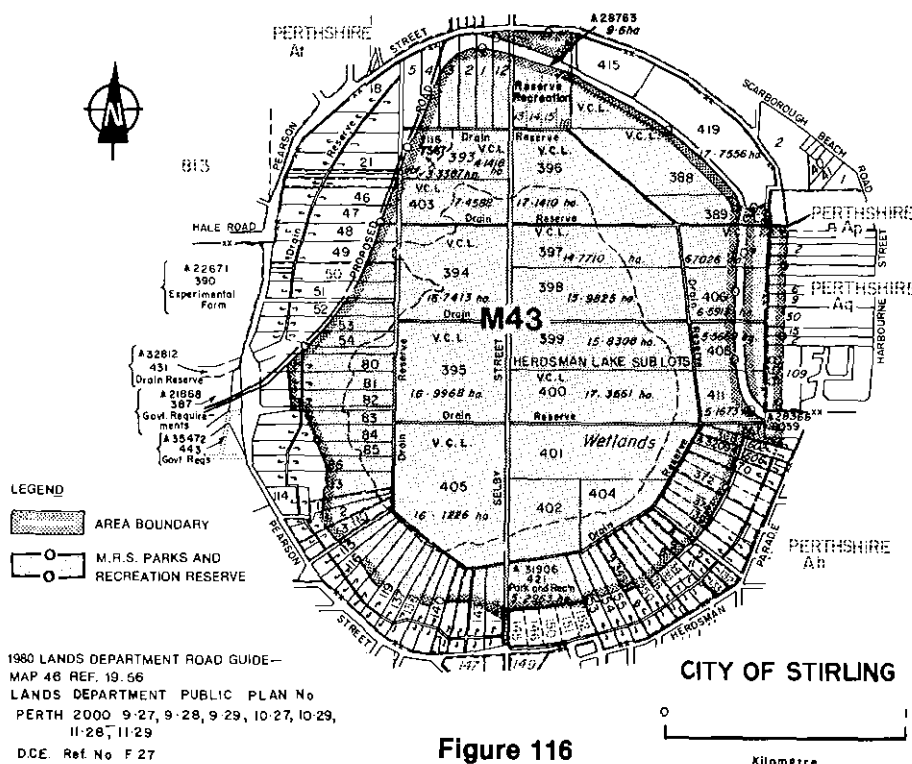
highly productive in biological terms. It offers different types of habitat from the open water and parklands of nearby Lake Monger and Jackadder Lake. Herdsman Lake is of outstanding importance both as a summer refuge for water-birds and as a winter breeding area. The lake is also of great recreational, educational and scientific interest, especially as it is within the urban area and is easily accessible.

Herdsman Lake is of regional, rather than just local significance, and the concept of a 'regional park', as discussed in Chapter 5 of this Report, is relevant, although much of the area is not suitable for intensive recreation use.

The lake functions as an important drainage compensating basin and will continue to rely on drains for a significant part of its water input. Private groundwater extraction may affect water levels. The area is affected by sewerage and drainage works and additional works may be constructed in the future. The area is also affected by several mineral claims for diatomaceous earth, peat and sand. The EPA has approved limited exploration of two mineral claims for the dredging of diatomaceous earth and sand in Herdsman Lake. Any further development is subject to submission of an acceptable Environmental Review and Management Programme. The EPA will not recommend commercial dredging unless the rehabilitation process is compatible with the MRPA concept plan. The Conservation and Land Use Committee proposed that the strategy of multiple vesting for the multiple purposes of conservation and/or recreation, water and mining should be applied to the area.

Recommendations

- M43.1 The Environmental Protection Authority should endorse the Metropolitan Region Planning Authority's concept plan.
- M43.2 The Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- replanting with, and encouraging the growth and regeneration of local indigenous flora;
 - the regional significance of the area;
 - continually assessing the progress of the ornamental lake developed as part of the Floreat Waters subdivision, so that experience gained from this development can be used in evaluating and implementing any future dredging proposals for Herdsman Lake.



M44 SWAN RIVER BACKWATER, SOUTH GUILDFORD

The area comprises lots 3, 55 and 58 (Location 21) and part of Locations 22 and 23, freehold land owned by the MRPA; and River View Avenue lots 47 to 52 and 54 (Location 22), privately owned freehold land (Figure 117). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The area is a saline backwater with open pools of water, and vegetation which includes *Suaeda australis*, *Atriplex hartala* and *Apium prostratum*. The backwater is fringed with scattered trees of flooded gum and salt water paperbark, and the native undergrowth has been replaced by introduced species including *Centella cordifolia*, *Cynodon dactylon* and *Paspalum distichum*.

The area provides a good refuge for many species of birds including swamphen, reed warbler and sacred kingfishers.

The area contains sewerage and drainage works, and a pumping station.

Recommendations

M44.1 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

M44.2 In the preparation of any management programme, at the appropriate time, the Metropolitan Region Planning Authority should consider:

- (a) encouraging the growth and regeneration of local indigenous flora;
- (b) maintaining water-bird habitats;
- (c) only allowing recreation activities which are compatible with the conservation of flora and fauna;
- (d) restricting vehicle access.

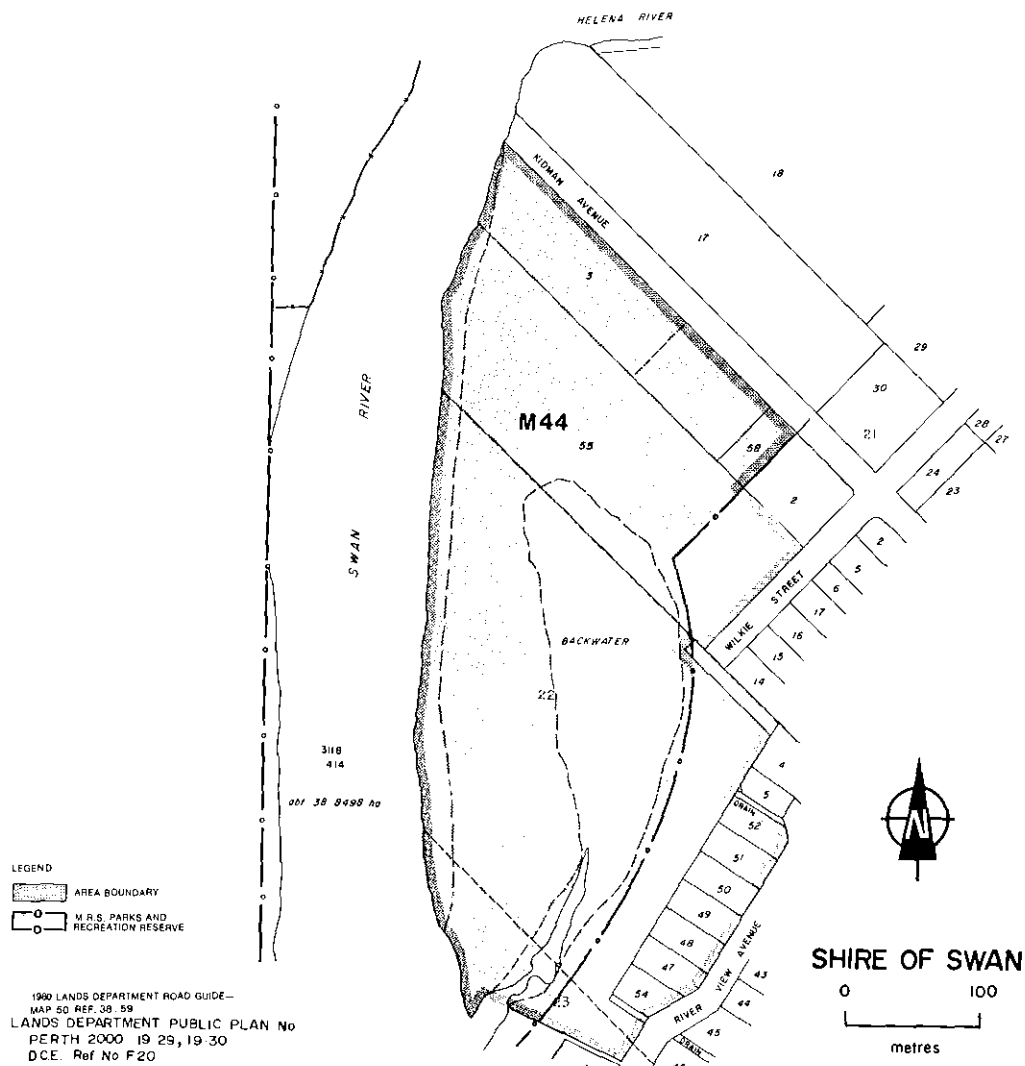


Figure 117

M45 HAZELMERE LAKES

The area comprises parts of lots 1, 120 to 127, 133 to 135, 363 and 364 (Helena Location 20a), privately owned freehold land. It is situated a few kilometres south-east of Guildford (Figure 118).

Stock grazing has eliminated almost all the fringing vegetation from the northern lake. However, the southern lake is almost completely encircled by swamp paperbark, with some flooded gum as well as Moonah paperbark at the southern end of the lake, where the fringing vegetation merges with the remnants of the surrounding woodland marri, banksia, sheoak and Christmas tree.

The lakes support a good variety of water-birds, waders as well as water-fowl, including the red-necked avocet, banded stilt and black-winged stilt, which are uncommon in the eastern part of the metropolitan area. The lakes retain water for most of the year, and so serve to some extent as summer refuges for water-birds. Water-birds on the northern lake can easily be viewed from the surrounding roads.

Stock have access to the water in both lakes, but their exclusion would assist regeneration of the vegetation and reduce degradation of the lakes' banks. The lakes cannot be used for passive recreation unless pedestrian access is provided across freehold land from nearby roads.

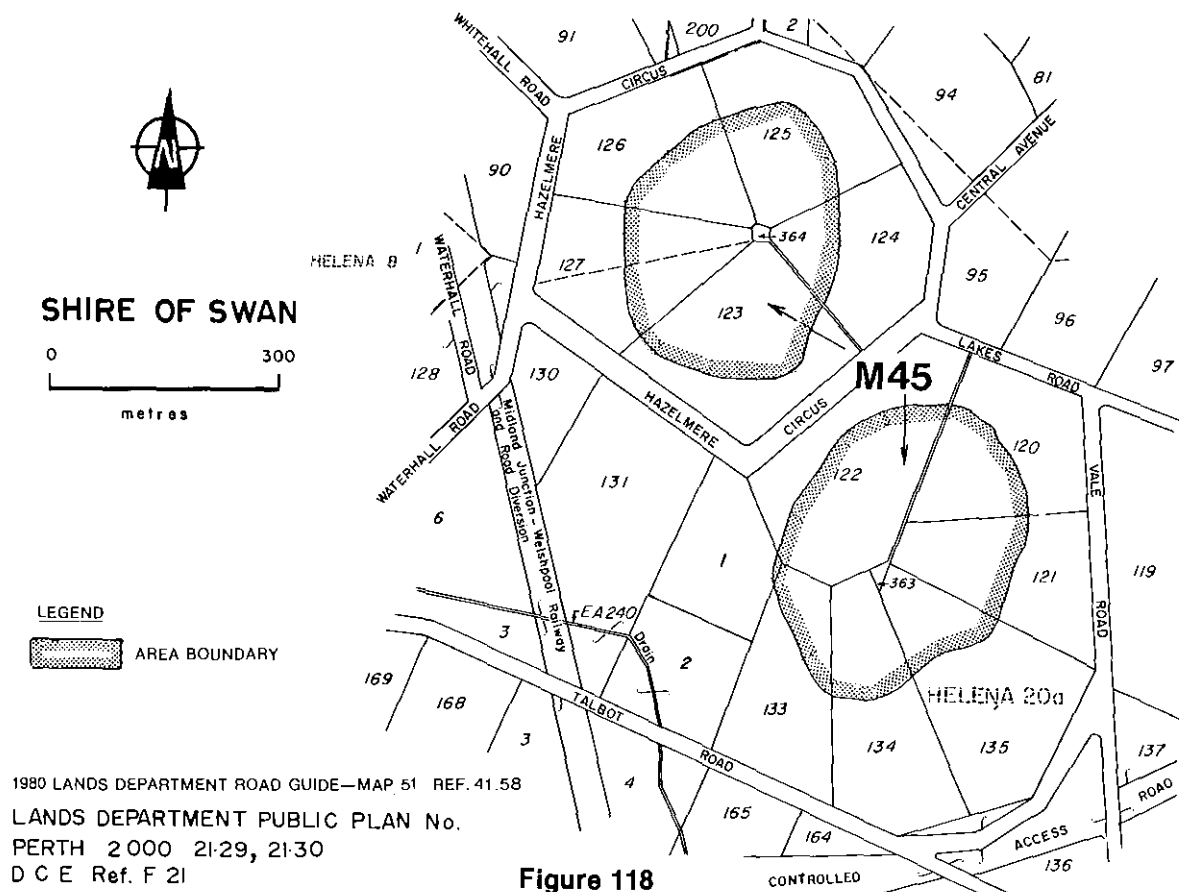
As activities on adjacent freehold land are adversely affecting the area, the concept of 'conservation buffer zones', as discussed in Chapter 5 of this Report, is relevant.

Private groundwater extraction may affect water levels and there may be organic pollution due to drainage from septic tanks. The area may be affected by proposed sewerage and drainage works.

Recommendation

M45.1 The Swan Shire Council, in consultation with the W.A. Wildlife Authority and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- encouraging the growth and regeneration of local indigenous flora;
- rehabilitation of the shorelines;
- only allowing recreation activities which are compatible with the conservation of flora and fauna;
- controlling stock access.



M46 SWANBOURNE BEACH AND RIFLE RANGE

The area comprises Reserves A23729 and A27250, for Recreation, both vested in the City of Nedlands; part of Location 1911, owned in freehold by the City of Perth, subject to the City of Perth Endowment Lands Act; and part of Location 313, covered by lease 37L/449 held by the Commonwealth of Australia. It is situated in North Cottesloe (Figure 119). The northern tip of Location 1911 is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The sands of the northern section support, in equal abundance, closed-heath of wattle and open-heath dominated by melaleuca. The tops of the dunes are rich in species, including Geraldton wax, one-sided bottlebrush, snakebush, tar bush and rats' tails. There are some patches of closed-scrub of peppermint in the northern section, and woodland of tuart and banksia with an understorey of prickly moses, scrub sheoak, boobialla and zamia in the eastern section.

The Indian Ocean foreshore is relatively undisturbed in the northern section and contains mainly acacia species. The land, however, once supported a woodland of tuart, as indicated by dead and dying trees.

There is a wide variety of birds, including the variegated and white-winged wren, white and yellow-plumed honeyeater and the white-backed swallow. The area is of great significance as a corridor for the movement of birds along the coast and thence inland through reserves such as Bold Park (M47).

Snakes in the area include the colourful western black-striped snake, which is infrequent in System 6 and rare elsewhere, the half-ringed snake and the little whip snake. The turtle frog occurs in the older dunes. It has unusual habits, spending most of its time underground where it feeds on termites. Two species of jewel beetle and one species of ant lion, which eats other insects dependent on dune vegetation and which has practically disappeared from the metropolitan area, are also found in the area.

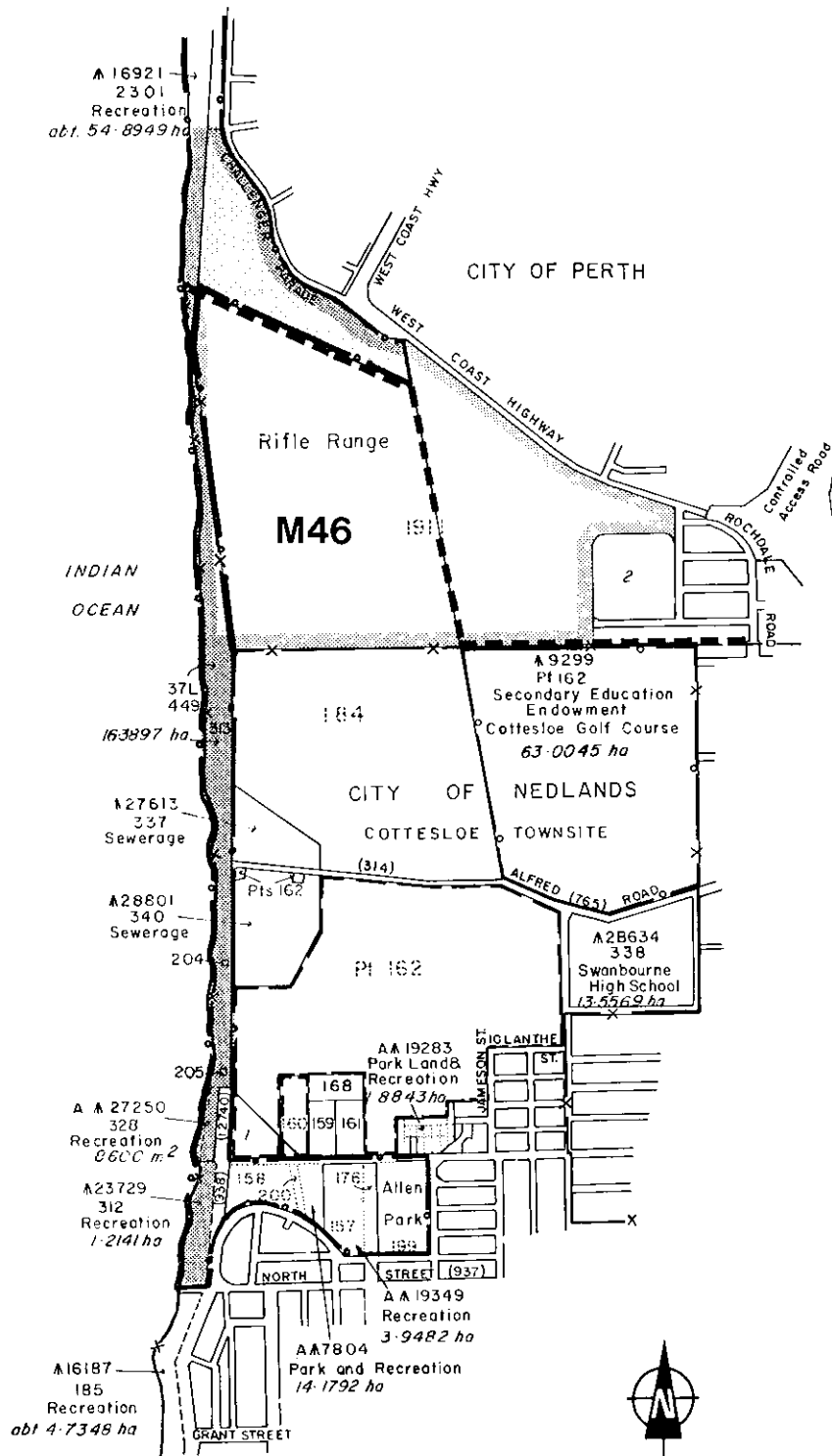
The foreshore is used intensively for recreation. Access and facilities, however, are inadequate. The vegetation of the foredunes to the south of the Rifle Range has been destroyed by off-road vehicles and by people seeking pedestrian access to the foreshore. This traffic seriously threatens the stability of the dune system and the damage would extend further northward if access were to be provided. It is important that well defined paths should be provided along the foreshore and foredunes in order to conserve the biologically significant dune vegetation. The North Swanbourne foreshore is poorly provided with services, lacking toilets, surf-lifesaving facilities and access for emergency vehicles.

Recommendations

M46.1 Reserves A23729 and A27250, that part of Location 313 covered by lease 37L/449, and the foreshore portion of Location 1911 should be managed for recreation by the Nedlands City Council, the Commonwealth of Australia, and the Perth City Council, respectively, with consideration being given to:

- (a) protecting and managing the dunes in a manner consistent with the conservation of flora and fauna;
- (b) restoring and stabilising the damaged foredunes, south of the Rifle Range, by planting suitable dune plants, preferably locally indigenous species;
- (c) prohibiting all vehicular and pedestrian access to the dunes, except along well defined pathways;
- (d) providing sufficient facilities for the health, safety and comfort of the public using the foreshore.

M46.2 The Perth City Council, in consultation with the Department of Fisheries and Wildlife, should manage the foreshore portion of Location 1911 for the conservation of flora and fauna.



LEGEND

- AREA BOUNDARY
- M.R.S. PARKS AND RECREATION RESERVE
- LOCAL AUTHORITY BOUNDARY

LANDS DEPARTMENT PUBLIC PLAN No
PERTH 2000 07-21, 07-22, 07-23, 07-24
07-25, 08-24
D.C.E. Ref. No F 29

1980 LANDS DEPARTMENT ROAD GUIDE—MAP 55 REF. 14.47

CITIES OF PERTH and NEDLANDS

0 1
kilometre

Figure 119

M47 BOLD PARK, CITY BEACH

The area comprises part of Endowment Land, owned by the City of Perth, subject to the City of Perth Endowment Lands Act, including part of Locations 571, 585, 617, 1911, 2103 and part of Perthshire Locations Al and Ak (Figure 120). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The area has deep, calcareous sands on the high sharp ridges, pale yellow and grey siliceous sands in the interdunal valleys, and dark-brown sands east of Reabold Hill.

Most of the section west and south-west of Reabold Hill is covered by woodland or open-woodland of tuart. The deeper moister soils of the valleys and depressions carry dense stands of banksia with a scattering of tuart and sheoak, and just north of the pine plantation, a few isolated jarrah. The understorey is dominated by blueboy and *Pelargonium capitatum*.

On the limestone ridges and the upper part of Reabold Hill the tree cover is sparse or absent. There are a few tuarts, but the vegetation is mainly a very rich closed-scrub or closed-heath, which includes snakebush, rats' tails and yellow lily, and where limestone is present, parrot bush, yellow leschenaultia and spider-net grevillea. The vegetation on the northern slope of Reabold Hill, just below and east of the old quarry, is distinctive and comprises closed-scrub dominated by *Acacia xanthina* with a few emergent tuarts associated with such species as *Scaevola nitida* and chenille honeymyrtle.

The vegetation of the dry slopes and ridges comprises woodland or open-woodland of tuart, with an understorey of banksia, and a groundstorey which includes blueboy, one-sided bottlebrush and prickly moses. In the extreme south-west the vegetation includes *Olearia axillaris*, *Conostylis candicans* and *Melaleuca acerosa*.

Along the western side of Perry Lakes Drive there is open-forest of tuart, jarrah, marri and flooded gum. Flooded gum is dominant around the small seasonal swamp near the corner of Perry Lakes Drive and Underwood Avenue, with some swamp banksia in the understorey. North of the swamp is a thicket of Fremantle mallee, which is uncommon in System 6 and rare in the metropolitan area.

Although much of the section of Bold Park between Oceanic Drive and The Boulevard is developed, there are still areas of bush. Especially significant is another smaller stand of Fremantle mallee north of Oceanic Drive, and the area south-west of the Skyline Drive-In, which supports low open-forest and low woodland of limestone marlock, which is uncommon in the metropolitan area. The grassed area around Perry Lakes contains a large number of native trees, including flooded gum, tuart and marri, with a second storey of wattle and banksia.

Bold Park supports close to a hundred varieties of birds, including a number of rare species such as the splendid wren (now lost from Kings Park) and the black-capped sitella. Species from Perry Lakes include black duck, grey teal and grebe. The reptiles in Bold Park include the bob-tailed lizard, sandhill dragon and bearded dragon, four species of skink and three of gecko. There is also a wide variety of insects, including the large colourful iridescent jewel beetle.

Reabold Hill is one of the highest parts of the Coastal Plain near Perth and is used for sightseeing. The remainder of the area is popular for bushwalking, for which gravel paths have been provided, and for recreation in general. The main management problem is that of controlling bush fires. A large area was devastated by an arsonist in 1977.

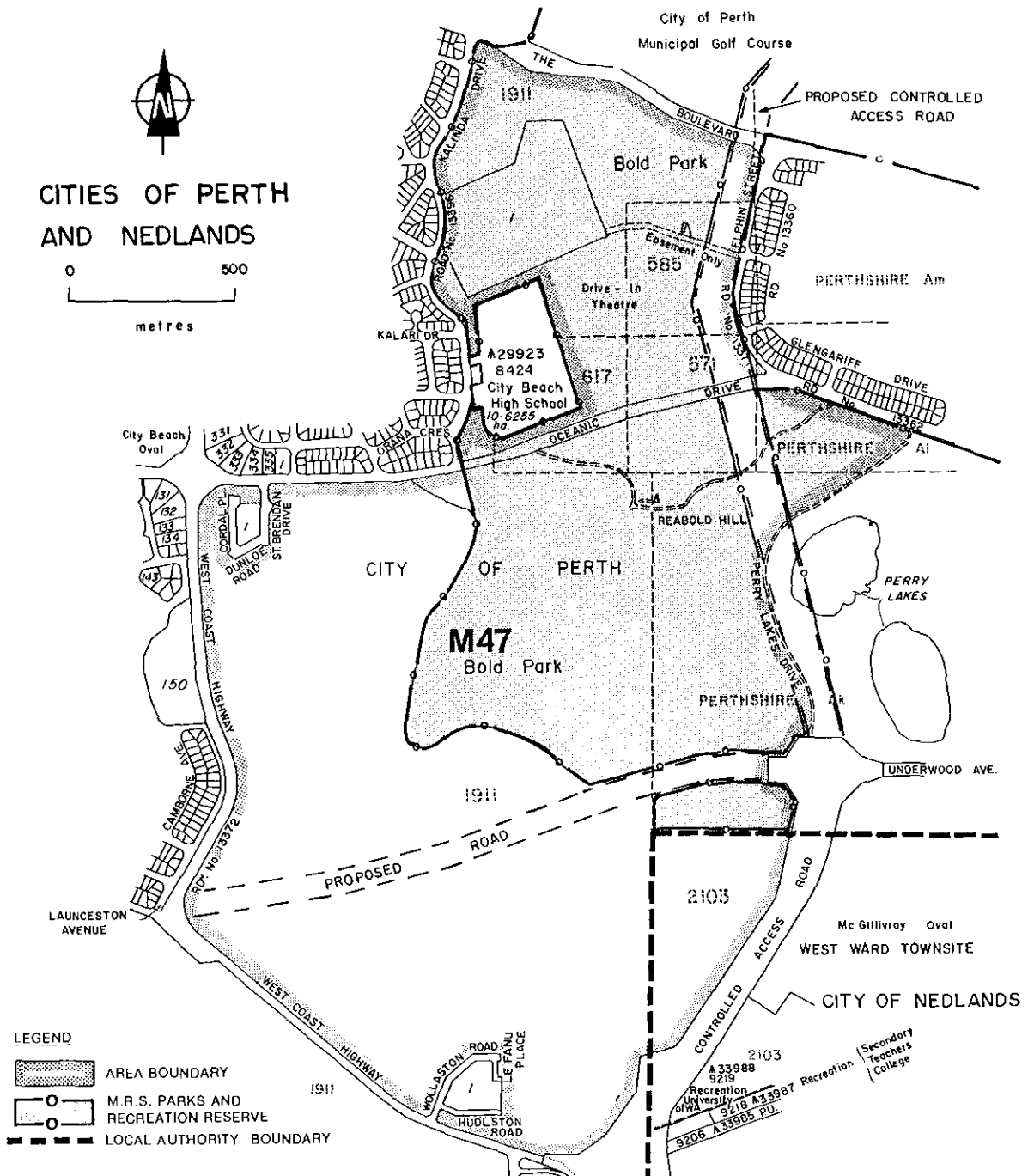
The concept of a 'regional park', as discussed in Chapter 5 of this Report, is relevant to Bold Park, especially when the adjacent parklands at Perry Lakes are taken into account.

Private groundwater extraction may affect water levels in the area, which contains sewerage works and SEC lines, and may be affected by proposed road works. The construction of the proposed controlled access highway along the eastern edge of Bold Park and an important regional road to the south would destroy the seasonal swamp and much of the patch of rare Fremantle mallee to the north, and detract from the Park's recreational value, by the intrusion and noise of traffic and restriction of movement of pedestrians. The Park's value as a regional park in conjunction with the Perry Lakes parkland would be severely diminished by the highway since the two areas would be split apart. In addition, the movement of fire-fighting vehicles would be curtailed. If the highway cannot be sited elsewhere, it should be built so as to minimise damage to scenic and biological features of the Park.

The area of natural bushland and pine plantations to the south-west of Bold Park has been proposed by the Perth City Council for inclusion in the Park. The pine plantations include a quarry and a paddock which will be used for parking and picnic facilities. The Council is seeking an amendment to the Endowment Lands Act, to enable money gained from the sale of Endowment Land to be used to maintain and extend Bold Park, for which the Council has a development and management policy.

Recommendations

- M47.1 The Environmental Protection Authority should endorse the Perth City Council's proposal to maintain and extend Bold Park.
- M47.2 The Perth City Council, in consultation with the Department of Conservation and Environment, should give consideration to:
- encouraging the growth and regeneration of local indigenous flora, especially the Fremantle mallee and limestone marlock;
 - restricting planting to local indigenous flora;
 - improving fire control.
- M47.3 Any future Land Act Reserves should include Water as a purpose.



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 46 REF. 16.51

LANDS DEPARTMENT PUBLIC PLAN No
7:25, 7:26, 8:24—8:26, 9:25, 9:26
D C E Ref. No F 28

Figure 120

M48 LAKE CLAREMONT

The area comprises parts of Perthshire Aw lots 1, 2, 5 to 8, 58, and parts of Perthshire Locations 223, 224, 227 to 229, 231, 232, 237, 238 and 6223, owned in fee simple by the Town of Claremont (Figure 121). It is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Lake Claremont, also known as Butler's Swamp, contains mud pond weed, bulrushes and many dead paperbarks which probably died as a result of a one metre water level rise early this century when the surrounding land was cleared. Most of the remaining vegetation is around the north-west side of the lake, where the shore is lined with paperbark and the rush *Scirpus maritimus*. Further away from the lake there is a woodland of tuart, marri and peppermint, there being many fine specimens of the last species.

The lake is normally permanent and provides a summer refuge for a wide variety of water-birds. Many of these breed there and some including the pink-eared duck are uncommon in the inner metropolitan area. The area is popular with ornithologists.

The Claremont Town Council has provided a picnic area and cycle track and has investigated methods of removing bulrushes to provide more open water for water-birds.

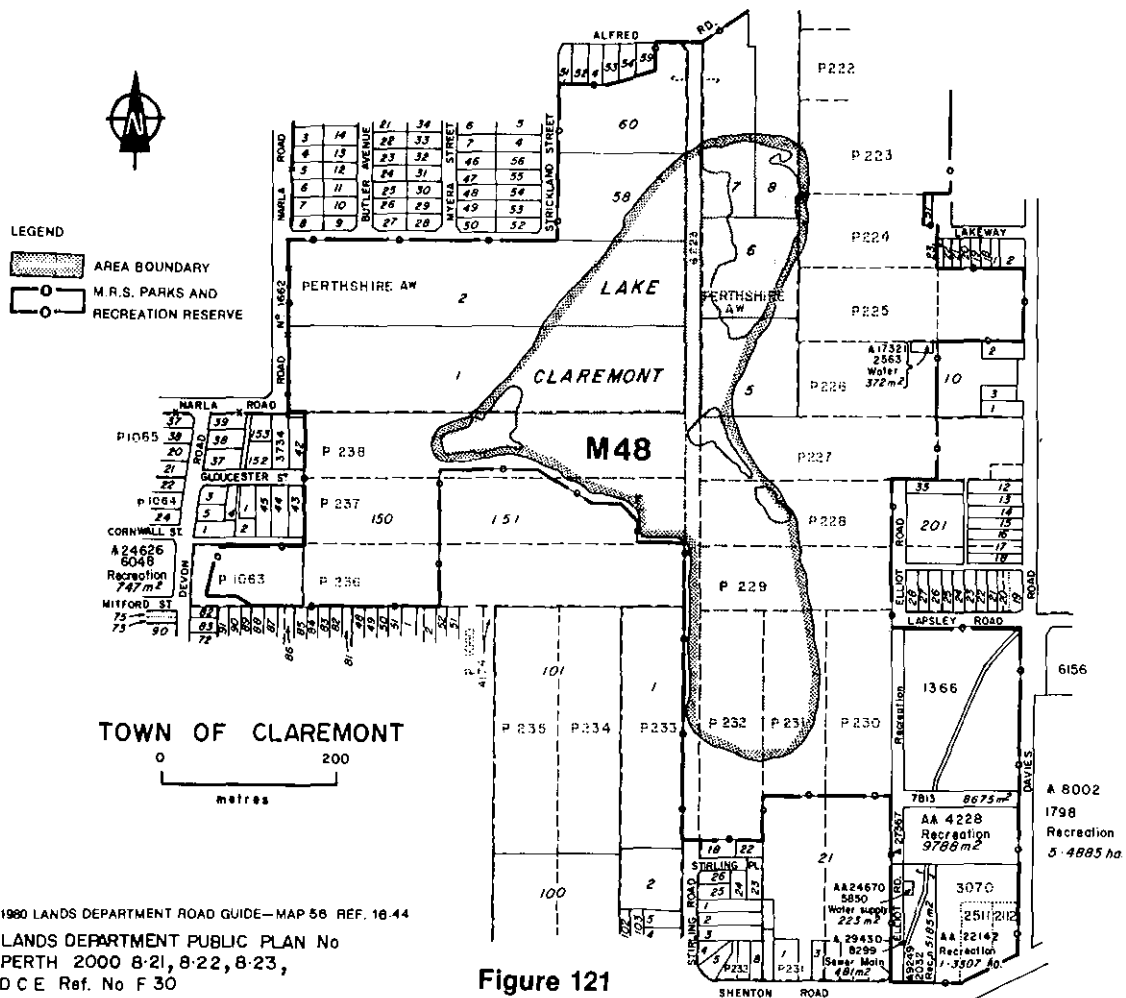
The area is affected by sewerage and pumping works, and private groundwater extraction may affect water levels. The area may also be affected by spraying for mosquitoes.

Recommendations

M48.1 The Claremont Town Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- only allowing recreation activities which are compatible with the conservation of flora and fauna;
- improving the lake's value as a summer refuge for water-birds.

M48.2 Any future Land Act Reserves should include Water as a purpose.



M49 KINGS PARK

The area comprises Reserves A1720, for Public Park, vested in the Kings Park Board; and C22352, for Water Supply, vested in the MWB. It is situated in West Perth (Figure 122).

About two-thirds of Kings Park is undeveloped bush, most of which is low open-forest of woodland dominated by sheoak, slender banksia and Menzies' banksia. Less common trees include tuart, jarrah, marri, Christmas tree and acacia.

The limestone scarp overlooking the Swan supports quite different vegetation. Much of it is closed-scrub dominated by parrot bush with stinkwood and tree smokebush. In the rockier areas cockies' tongues, chenille honeymyrtle and *Scaevola nitida* predominate. The closed-scrub also includes Hackett's hop bush, an uncommon species restricted to the metropolitan area.

The vegetation in the Park comprises about two hundred and fifty native species, and about fifty introduced species. Introduced species include Eastern States eucalypts such as sugar gum and lemon-scented gum, and bulbous weeds such as romulea and gladiolus.

There are over sixty species of birds of which about half are regular inhabitants, including western silvereye, twenty-eight parrot, black duck and wood duck. The brush possum is the only native mammal surviving in quantity in the Park. Bob-tails, skinks and other reptiles are also to be found.

The Park's character has been altered by frequent fires and the invasion of veldt grass. Upsets in the ecological balance have led to the destruction by insects of many tuart and jarrah trees. Feral cats have eliminated some species of fauna, and reduced numbers of others. There are a number of endangered species in Kings Park.

Kings Park is an important educational resource. It is visited by more than eleven thousand children annually and has an Education Centre which runs nature study programmes. It is also used regularly for research by the Commonwealth Scientific and Industrial Research Organization, government departments and tertiary institutions. It has important recreation value and many facilities and features are visited by over five million people a year. Due to the extremely high number of visitors, the concept of a 'regional park', as discussed in Chapter 5, is relevant to Kings Park.

The area contains roads, water supply reservoirs and mains, sewerage works and SEC underground cables. The Botanic Gardens and arboreta occupy 17 ha and 19 ha respectively. More than twelve hundred species of native Western Australian plants have been brought into cultivation and are displayed in these living collections. The biology of the native flora is studied to aid in bringing into cultivation more native species and in management of bushland parks.

The Kings Park Board is appointed and operates under the Parks and Reserves Act, 1895-1978.

Recommendation

M49.1 The Secretariat, proposed in Chapter 5, should review the Parks and Reserves Act, 1895-1978, under which the Kings Park Board is appointed and operates.

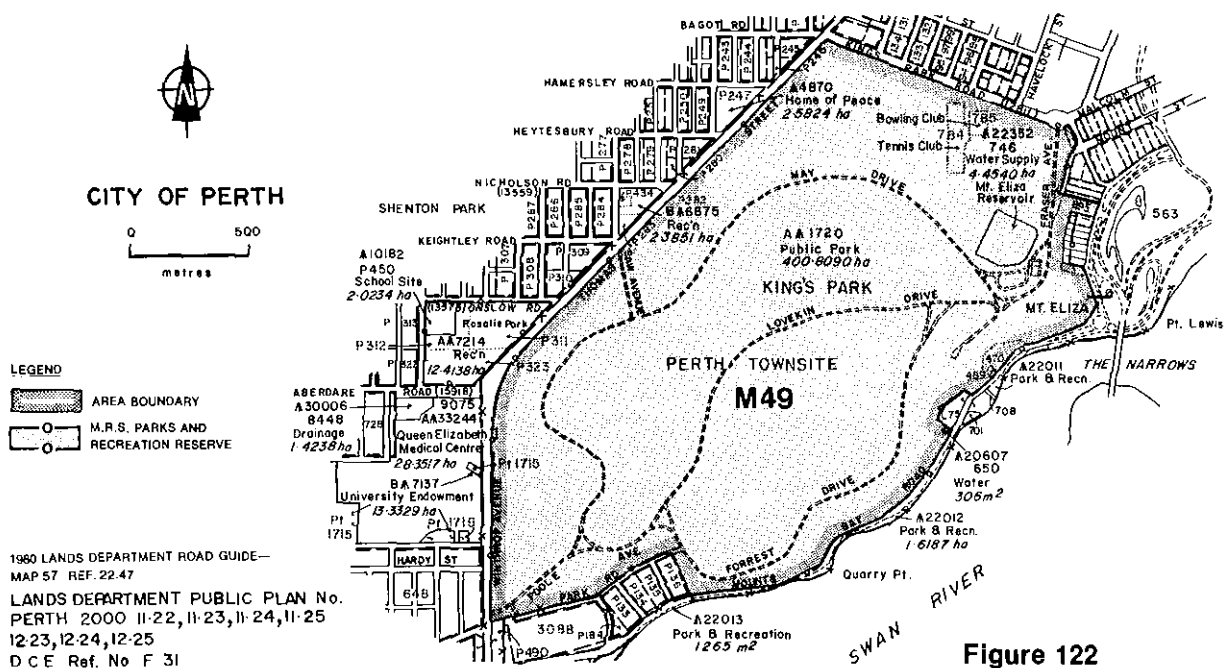


Figure 122

M50 SWAN RIVER FORESHORE, MAYLANDS

The area comprises Reserve C34262, for Public Recreation, not vested; part of Reserves A9323, for Recreation, and C33966, for Public Recreation, both vested in the City of Stirling; part of Reserves C33932, for Drain, and C33967, for Government Requirements, both not vested; part of lots 7, 22, 23, 27, 104, to 112, 119, 511 and all of lots 1, 4, to 6, 9 to 11, 8 to 10, 14 to 16, 28, 50, 113 to 118, 512 (Location 2039), part of lots 1, 2, 1 to 3, 7, 22, 23 (Location Y), part of lot 1 (Location Z), part of lots 346 to 359 (Location A5), part of lots 360 to 368 (Location A4), freehold land some of which is owned by the MRPA. This foreshore extends from just south of the proposed Swan River Drive to Banks Reserve, Mount Lawley, excluding Bardon Park and the Maylands Yacht Club (Figure 123). The northern section of the area has been 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The Stirling City Council has a management programme for the area, which involves conserving vegetation and allowing passive recreation.

Just downstream of Bardon Park there is a swampy area with a thick growth of *Typha orientalis*. Further downstream from the boat ramp, between the river bank and the bund which surrounds the aerodrome, there is a strip of saltmarsh which consists mainly of *Salicornia australis* and *Suaeda australis*, with some *Juncus kraussii* and *Rhagodia* species. There has been an invasion of the exotic *Aster subulatus*, especially where the level has been raised by landfill, the drainage improved or the vegetation burnt over. Where the level has been raised further, probably by dumping or dredging, the saltmarsh has been lost to couch grass and wild oats. On the higher portions of the river bank there are a few small swamp sheoaks with some larger swamp sheoak east of the boat ramp. The north-western section of the Maylands foreshore has extensive reed beds of *Juncus kraussii*, *Scirpus validus* and *S. maritimus*, on the landward side of which are bulrushes and paperbark. The natural vegetation on the eastern section of foreshore has been reduced to a few reeds, including *Juncus kraussii* and *Scirpus validus*, and a broken line of trees, comprising mainly swamp sheoak, flooded gum and a few paperbarks.

As well as having high conservation value, the area is also significant for fauna. The water rat, which is uncommon in the Darling Range and rare elsewhere in Australia, has been recorded in the swampy section near Bardon Park. The reed beds in the north-west are feeding grounds for many water-birds, including such species as swan, coot and crane, and could be useful nesting sites for reed-warblers, if less affected by wash from boats. In fact, boats are the main cause of environmental damage in the area. Motor vehicles have made tracks along the saltmarshes, which have also been destroyed by dumping and filling.

There is clay excavation and associated factory production on the Maylands Peninsula.

Recommendation

M50.1 The Metropolitan Region Planning Authority and the Stirling City Council, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- (a) encouraging the growth and regeneration of native flora;
- (b) maintaining water-bird habitats;
- (c) allowing only passive recreation.

M51 SWAN RIVER SALTMARSHES, BELMONT AND MAYLANDS

The area comprises Reserve C24708, for Recreation and Road, not vested; and part of Reserve C32042, for Drain, vested in the Metropolitan Water Board; part of lot 10, part of lots 5 to 11, lots 13, 102 to 111 and 114 (Location W), part of lots 1 to 8 (Location X), part of lots 496, 498 to 504 (Location 2039), part of lots 64, 223 to 230, 234, 235 and lot 233 (Location 33), freehold land partly owned by the MRPA (Figure 123). This foreshore extends from Garratt Road Bridge to approximately 1 km downstream. It is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The saltmarshes are most extensive on the southern side of the river. The principal species are *Salicornia australis* and *Suaeda australis*. The southern bank carries paperbark and flooded gum and the northern bank scattered clumps of swamp sheoak. Further downstream, near the bend in the river, there are sand bars that are fairly well covered with trees, adjoining which are some saltmarshes. On the northern bank there is a flat and a saltmarsh, which carry patches of bulrush and paperbark, with native reeds and introduced grasses. On the landward margin of the flat there are marri and wattle, and scattered clumps of swamp sheoak together with some introduced willows. These saltmarshes, trees, and adjoining extensive wading areas make up one of the few undisturbed areas along the river which support a wide variety of water-birds.

The area is affected by clay extraction. The northern bank may be affected by the proposed Swan River Drive.

Recommendation

M51.1 The Metropolitan Region Planning Authority, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- encouraging the growth and regeneration of local indigenous flora;
- maintaining water-bird habitats;
- only allowing recreation activities which are compatible with the conservation of flora and fauna.

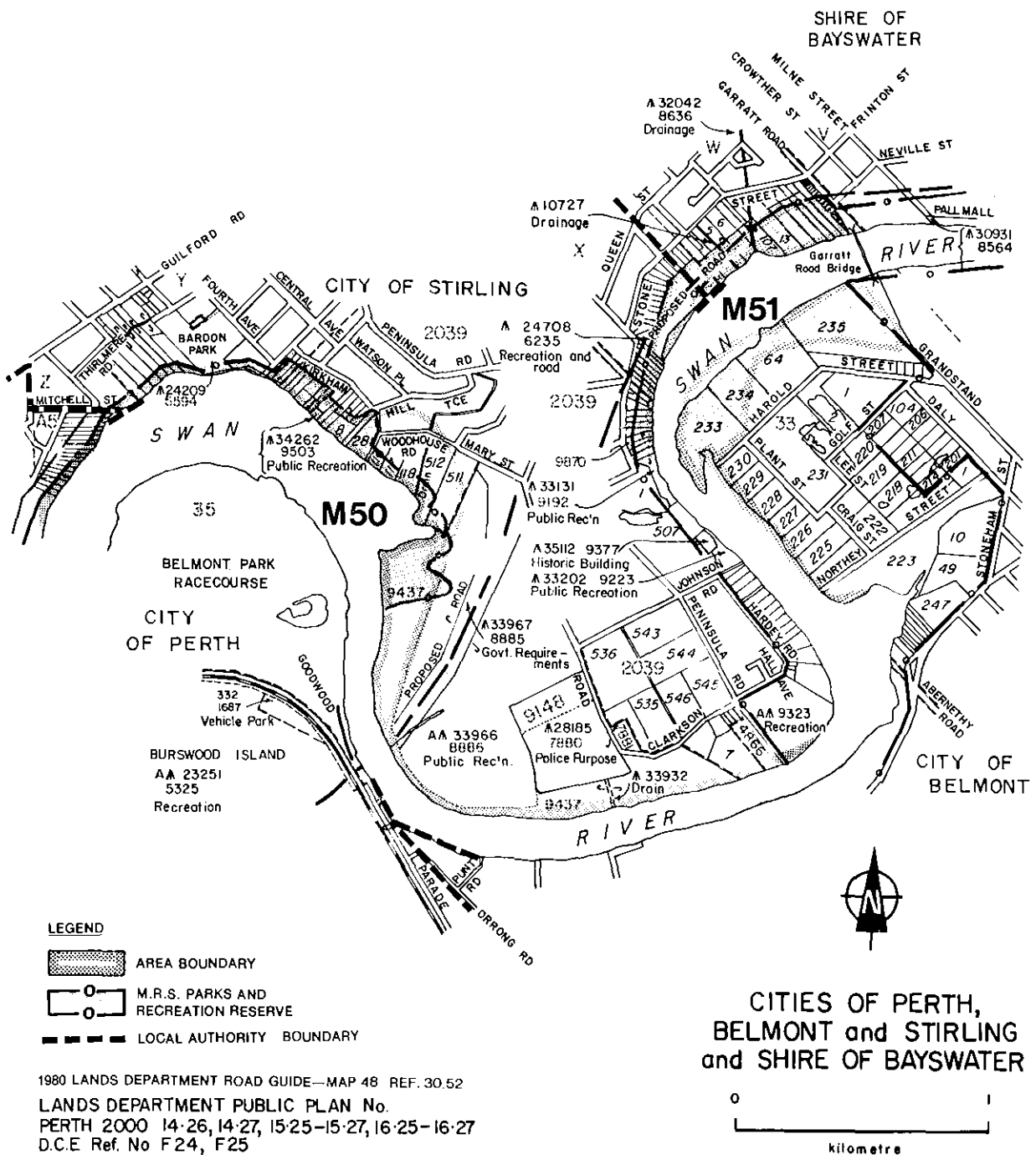


Figure 123

M52 PERTH AIRPORT

The area comprises Locations 687, 783, 2803, 3346, 4886, 6246, and part of Locations 24 to 33, and 773, freehold land owned by the Commonwealth of Australia (Figure 124).

Although Perth Airport is more than twice as large as Jandakot Airport, a smaller portion has been left uncleared. Most of the vegetation is in the north-eastern section near Kalamunda Road, and includes woodland of marri, open-woodland of jarrah and low woodland of banksia and sheoak. In the eastern section near the Wittenoom Road railway crossing, there are winter-wet flats which carry low closed-forest of swamp paperbark and emergent flooded gum, some woodland of marri, and many other swamp plants. In the southern section along Hardey Road there is low closed-forest of paperbark species and swamp banksia, and low woodland of other banksia species, Christmas tree and pricklybark. Most of the remainder of the airport that is undeveloped is partly cleared. Trees of the above species are present in places but the understorey is usually absent.

Private groundwater extraction may affect water levels. There are drainage works and SEC lines in the area which may be affected by proposed drainage works.

The Swan Shire Council has supported the eastward extension of Perth Airport, as indicated by the MRPA in its Eastern Corridor Report.

Recommendation

M52.1 The Commonwealth of Australia, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- the retention, where possible, of uncleared sections of vegetation;
- encouraging the growth and regeneration of local indigenous flora.

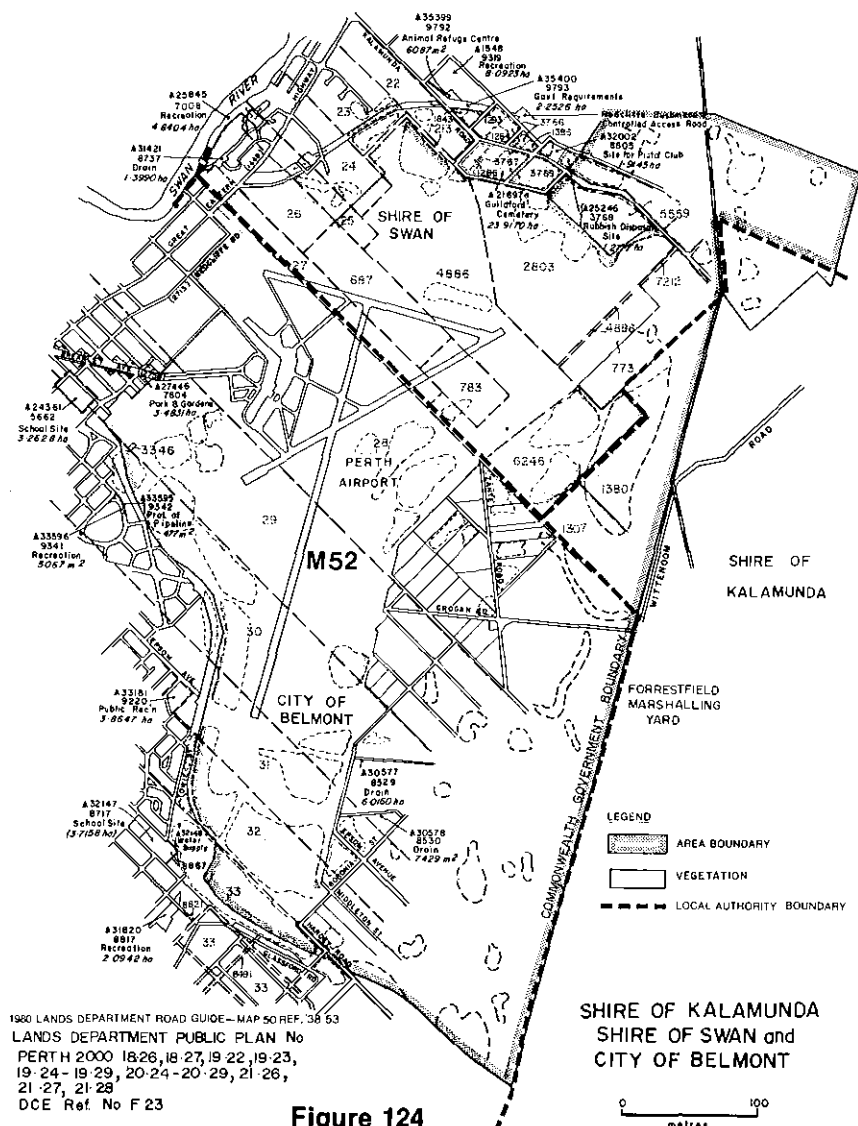


Figure 124

M53 RESERVE C29880, FORRESTFIELD

The area comprises Reserves C29880, for Government Requirements, not vested; C33525 for Government Requirements, not vested; C36238, for Road Purposes, vested in the Commissioner for Main Roads; part of Reserve C31709, for Sewage Treatment Works Disposal Site, vested in the MWB; and lots 1, 2, 31, 32, 33, 39, 40, 43, 44 and part of lots 19, 20, 21, 30 (Location 31), privately owned freehold land. It is situated to the east of the Newburn Marshalling Yard (Figure 125).

The area contains a significant uncleared portion of the eastern Coastal Plain near Perth. The vegetation is low open-forest of banksia, mixed with some jarrah. Over a hundred species of indigenous flora occur in the reserves. Some, including *Isopogon drummondii* and *Dasypogon* species, are of particular importance, occurring in few localities elsewhere. The swamp flats just north of the junction of Maida Vale Road and Hardey Road support low closed-heath with a composition unlike other swamp vegetation near Perth.

The western part of Reserve C29880 has been allocated in two portions to the SEC and the W.A. Fire Brigades Board. An area in the centre of Reserve C31709 is used by the MWB but the remainder is uncleared. These organisations should be encouraged to retain as much as possible of the natural vegetation in the Reserves.

The SEC has already undertaken extensive clearing and earthworks construction in the north-western section of Reserve C29880. The proposed route for the Roe Freeway passes through the Reserve along its eastern side, and an interchange is planned where Hardey and Maida Vale Roads now intersect.

Recommendation

M53.1 The State Energy Commission, the W.A. Fire Brigades Board, the Main Roads Department and the Metropolitan Water Board, in consultation with the Department of Conservation and Environment and local land owners, should manage the area so as to retain as much as possible of the natural vegetation.

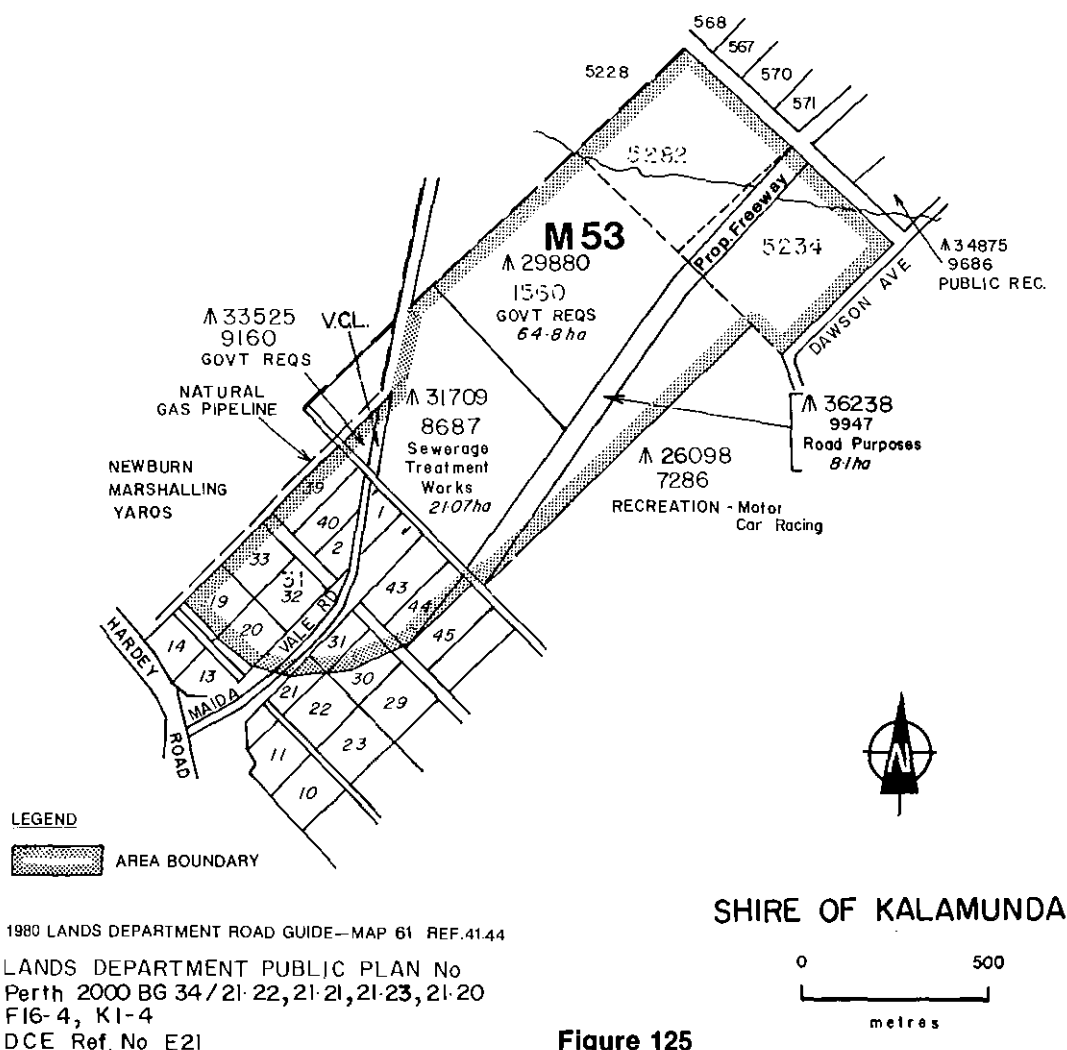


Figure 125

M54 FORESHORE RESERVE, PEPPERMINT GROVE

Reserve A17113, for Recreation, vested in the Shire of Peppermint Grove, is situated along the foreshore of Freshwater Bay (Figure 126).

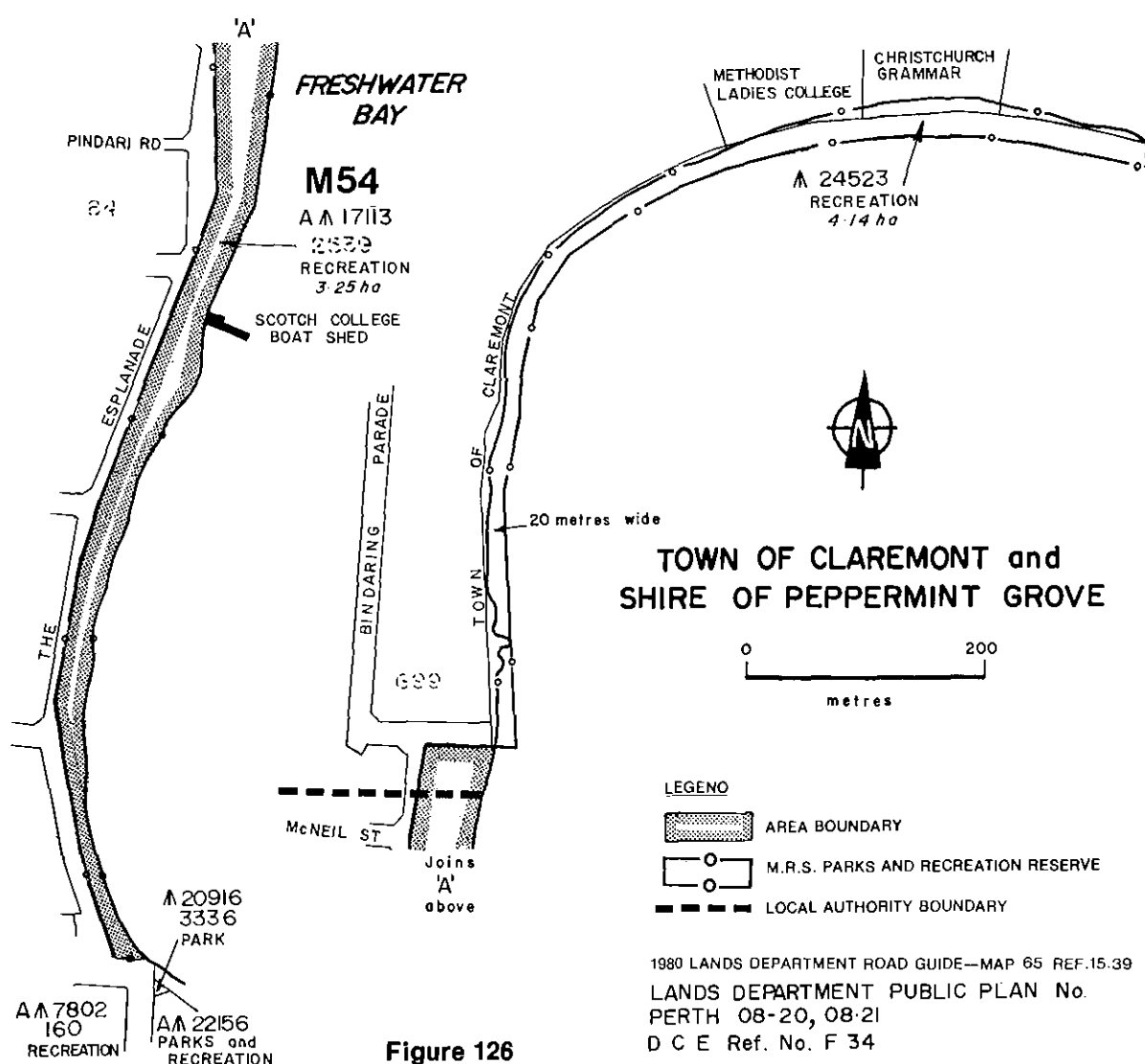
The northern section is uncleared and supports a thriving vegetation, which is mainly closed-scrub of thirty-two species, including Rottneest cypress, acacia, parrotbush, chenille honeymyrtle, cockies' tongues and tar bush, a species which is now rare in Perth. There are also emergent tuart. The Reserve is significant because of its structure and the fact that few areas of closed-scrub remain on the Coastal Plain, because of frequent fires. The Reserve has not been burnt for some time, and so has outstanding specimens. It provides one of the best examples in the metropolitan area of the closed-scrub vegetation characteristic of limestone hills on the Coastal Plain.

The area is also important geologically, as it contains one of Australia's few Pleistocene deposits. There are few, if any, sites which are of comparable age and composition to the emergent shell bed near the Scotch College boat shed. The Peppermint Grove Shire Council has erected a sign which prohibits excavation or removal of material without the Shire's written permission. However, due to the vulnerability and small size of the deposit, further measures are likely to be needed in order to preserve it.

The Claremont Town Council has proposed a northward extension of the area to include Reserve C24523, for Recreation, vested in the Town of Claremont.

Recommendation

M54.1 The Geological Sites Committee, in consultation with the Peppermint Grove Shire Council, should prepare a management programme to preserve the vegetation and the shell deposits.



M55 BUCKLAND HILL, MOSMAN PARK

The area comprises Reserves C9140, for University Endowment, and C27798, for Use and Requirements of the University of Western Australia, both under Crown Grant to the University of Western Australia; C9403, for Government Requirements and C11418, for Obelisk and Trigonometric Station, both not vested; C13374, for Water Supply, vested in the Minister for Water Resources; C32057, for Parklands and Recreation, vested in the Town of Mosman Park; Locations 288, 293 to 295 and part of Location 174, most of which is controlled by the Commonwealth Department of Defence (Figure 127). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

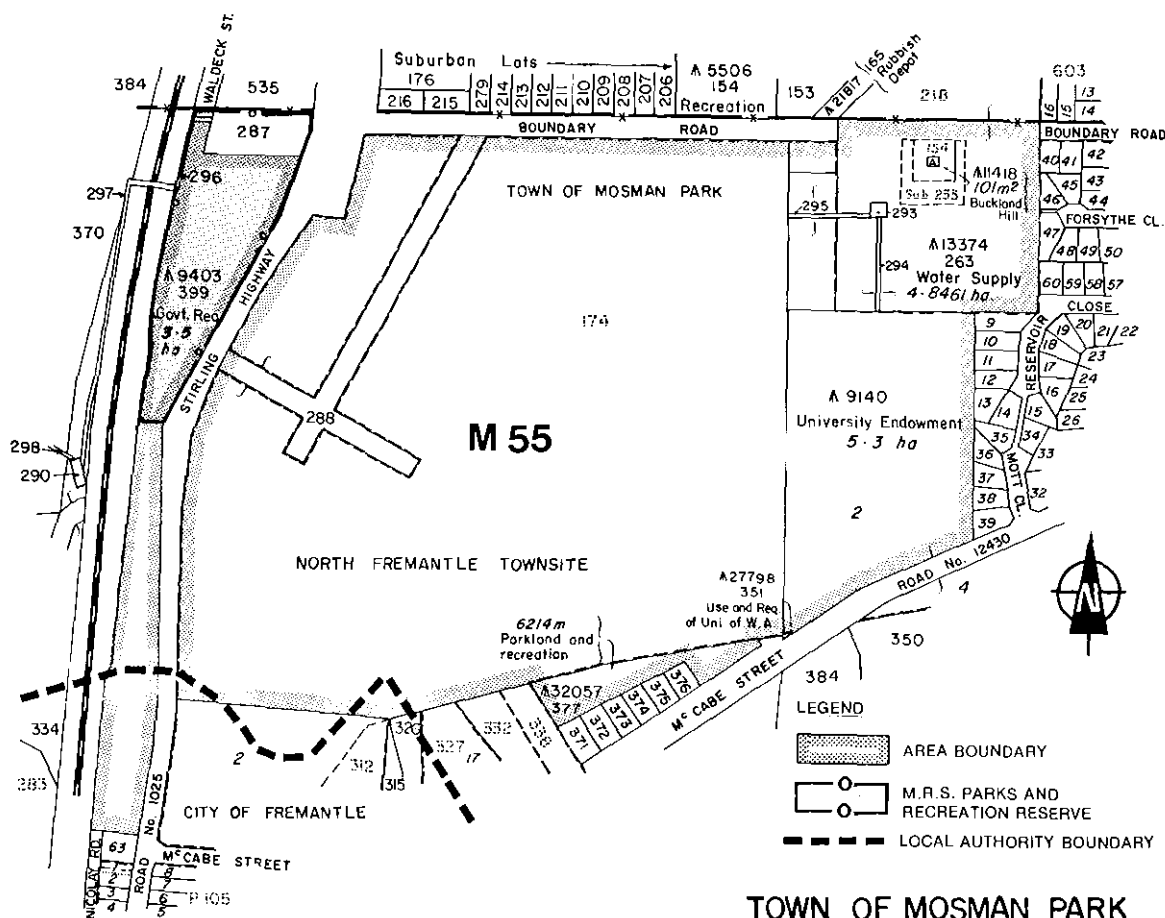
The shallow sandy soils overlying limestone on the northern and north-western sides of Buckland Hill carry an open-shrubland which includes chenille honeymyrtle, *Acacia xanthina* and *Acacia lasiocarpa*. On the northern side and summit of the hill there are such species as cockies' tongues, peppermint and couch honeypot. In both areas, exotic species have become dominant.

Buckland Hill is significant for two main reasons. Firstly it has historic value, as it was one of the sites Captain Stirling chose for the Swan River Colony. Secondly it has regional importance as the only large undeveloped area (apart from Kings Park) on the Stirling Highway north of the river. It provides visual relief from the light industry to the south and suburbia to the north. It also provides open views to the sea, and emphasises Fremantle as a separate entity from Perth.

Recommendation

M55.1 The Commonwealth of Australia and the Mosman Park Town Council, in consultation with the Department of Conservation and Environment and the University of Western Australia, should prepare a management programme, giving consideration to:

- encouraging the growth and regeneration of local indigenous flora;
- retaining the open character of the area, through careful planning of any future development.



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 65 REF. 1434
LANDS DEPARTMENT PUBLIC PLAN No
PERTH 2000 07:17
DCE Ref. No F 40

Figure 127

TOWN OF MOSMAN PARK
and CITY OF FREMANTLE

0 300
metres

M56 FORESHORE RESERVES, MOSMAN PARK

The area comprises Reserves A3346, A25466 and C8369, for Recreation, all vested in the Town of Mosman Park; and vacant Crown land. It is situated along the southern part of Mosman Bay and at Chidley Point in Mosman Park on the north bank of the Swan River (Figure 128).

Reserve C8369 has a narrow rocky shore with a dense fringe of the rush, *Scirpus nodosus*. Behind this a steep slope rises about 50 m. In places it is sandy, and in others coastal limestone forms small caves. On the slope there are scattered tuarts, thickets of wattle, a good population of *Diplopeltis huegellii* and a number of other shrub species. The slope has been disturbed, especially by frequent burning and pedestrian damage, with subsequent erosion, but enough natural vegetation remains which is worth conserving.

Although much of the vegetation has been removed from Reserves A3346 and A25466, there are some fine swamp sheoak close to the river, with slender banksia and parrot bush on the sandy slope behind. Further downstream there is a tall shrubland which includes parrot bush and three acacia species. There is also some quandong and snakebush, which do not occur anywhere else along the Swan River. The vegetation which remains is in good condition and well worth preserving.

The area has some historical interest, for there is a cave in a cliff at the Chine which was occupied in 1917 by Paul 'Bunny' Statham, a Lands Department draftsman, who travelled by canoe for part of his journey to work.

Recommendations

M56.1 The vacant Crown land should be added to Reserve C8369.

M56.2 The Mosman Park Town Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- encouraging the growth and regeneration of local indigenous species;
- constructing suitable footpaths, which would serve as fire breaks;
- preventing other pedestrian access in order to reduce erosion;
- burning off as little as possible, with at least five years between burns, and preventing unauthorised fires.

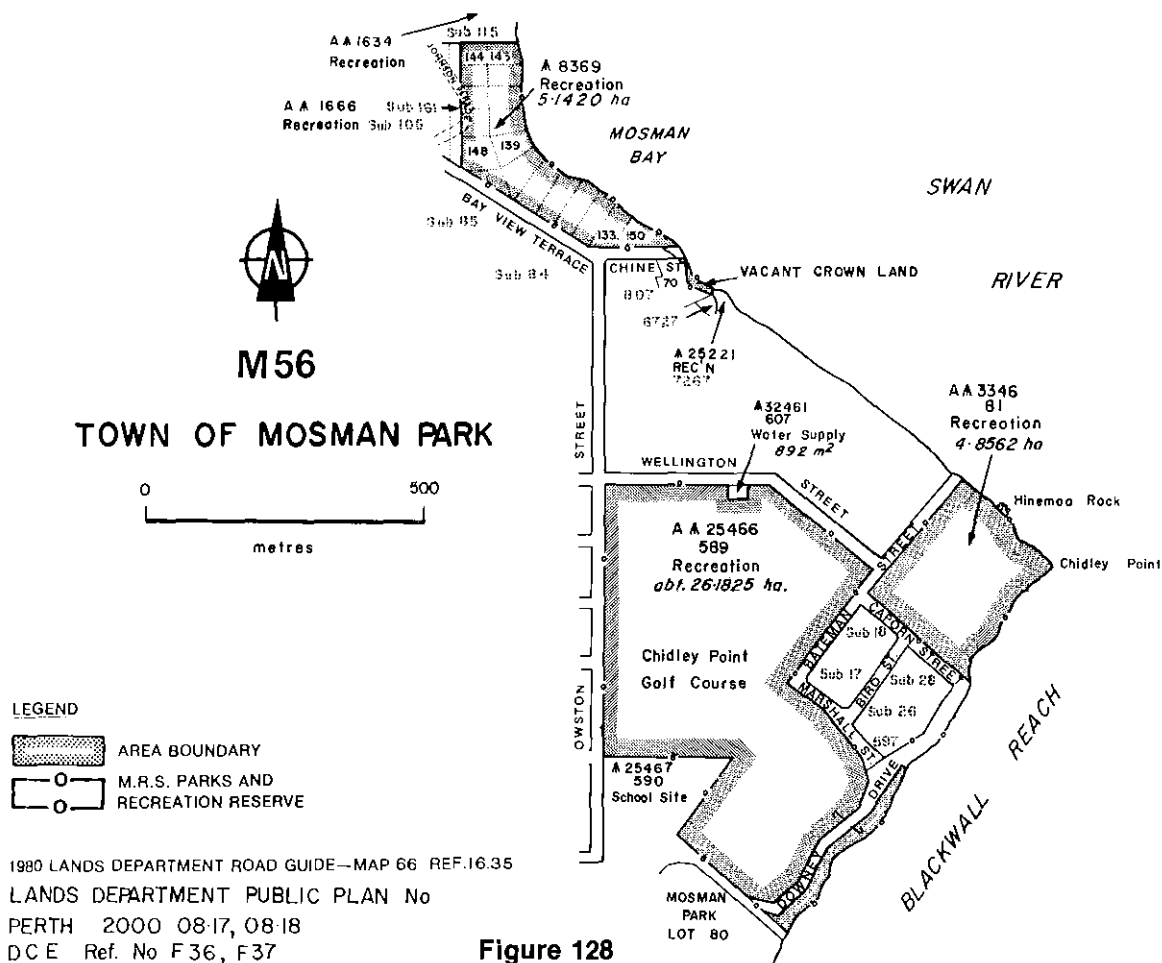


Figure 128

M57 MINIM COVE FORESHORE, MOSMAN PARK

The area comprises Reserves C31156, for Recreation, C31157, for Park, A1630 and A1631, for Recreation, and C24242 for Recreation, all vested in the Town of Mosman Park; and portion of a closed road which is vacant Crown land (Figure 129). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The cliffs expose a rich fossiliferous shell bed that was probably deposited towards the latter part of the Pleistocene Era. The bed is one of the best preserved and most informative deposits of its age in Western Australia, and is located conveniently close to Perth. It has been studied by geologists and others for the past fifty years, and its value to the study and teaching of history and geology is outstanding.

Recommendations

M57.1 The vacant Crown land should be added to Reserve A1631.

M57.2 The Geological Sites Committee, in consultation with the Mosman Park Town Council and the Metropolitan Region Planning Authority, should prepare a management programme for protection of the fossil deposits.

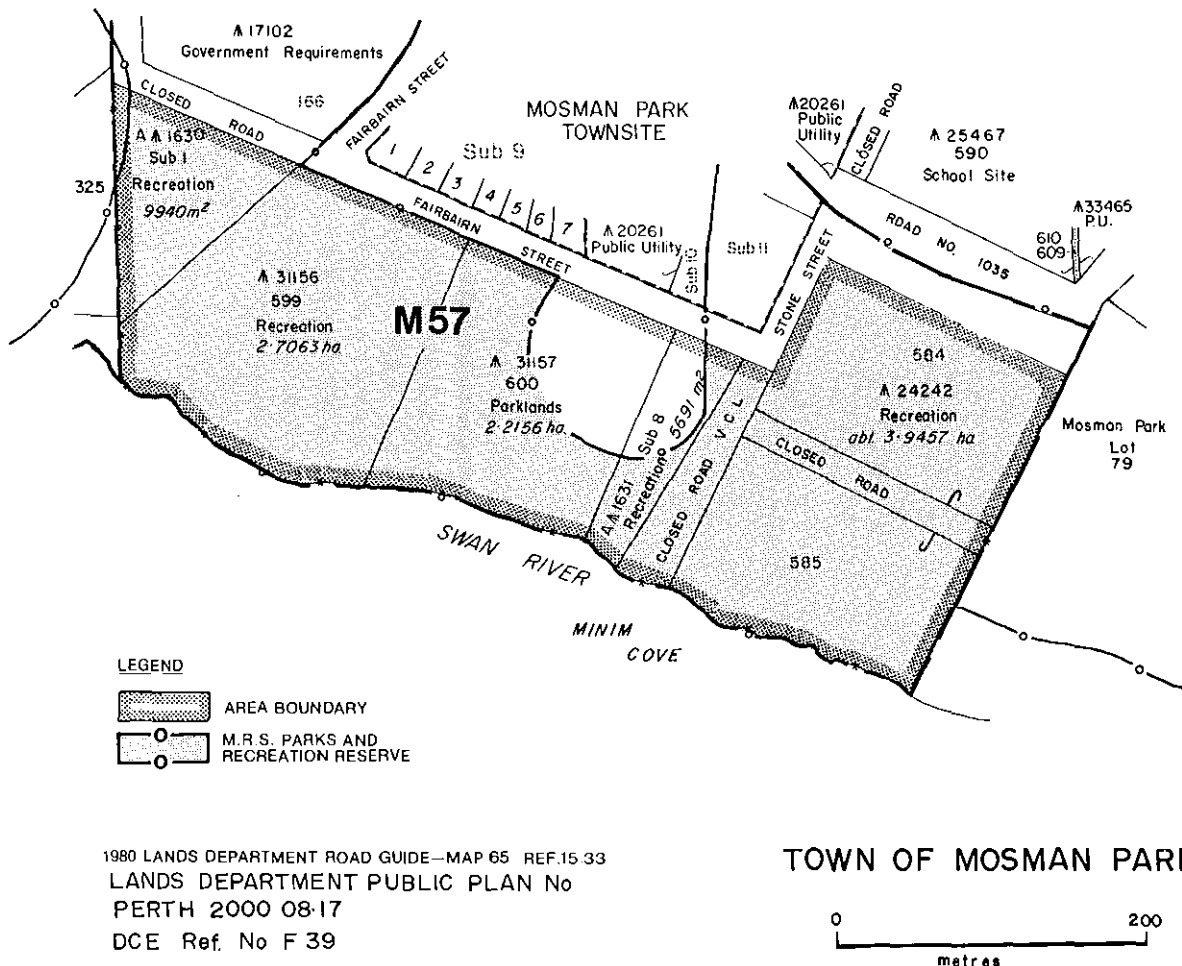


Figure 129

M58 BLACKWALL REACH FORESHORE, BICTON

The area comprises part of Reserve A4813, for Recreation vested in the City of Melville. It is situated on the north-eastern part of Blackwall Reach (Figure 130). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Blackwall Reach is the only relatively untouched area of river limestone left in the region. The limestone cliffs rise sheer from the river to a height of about 20 m.

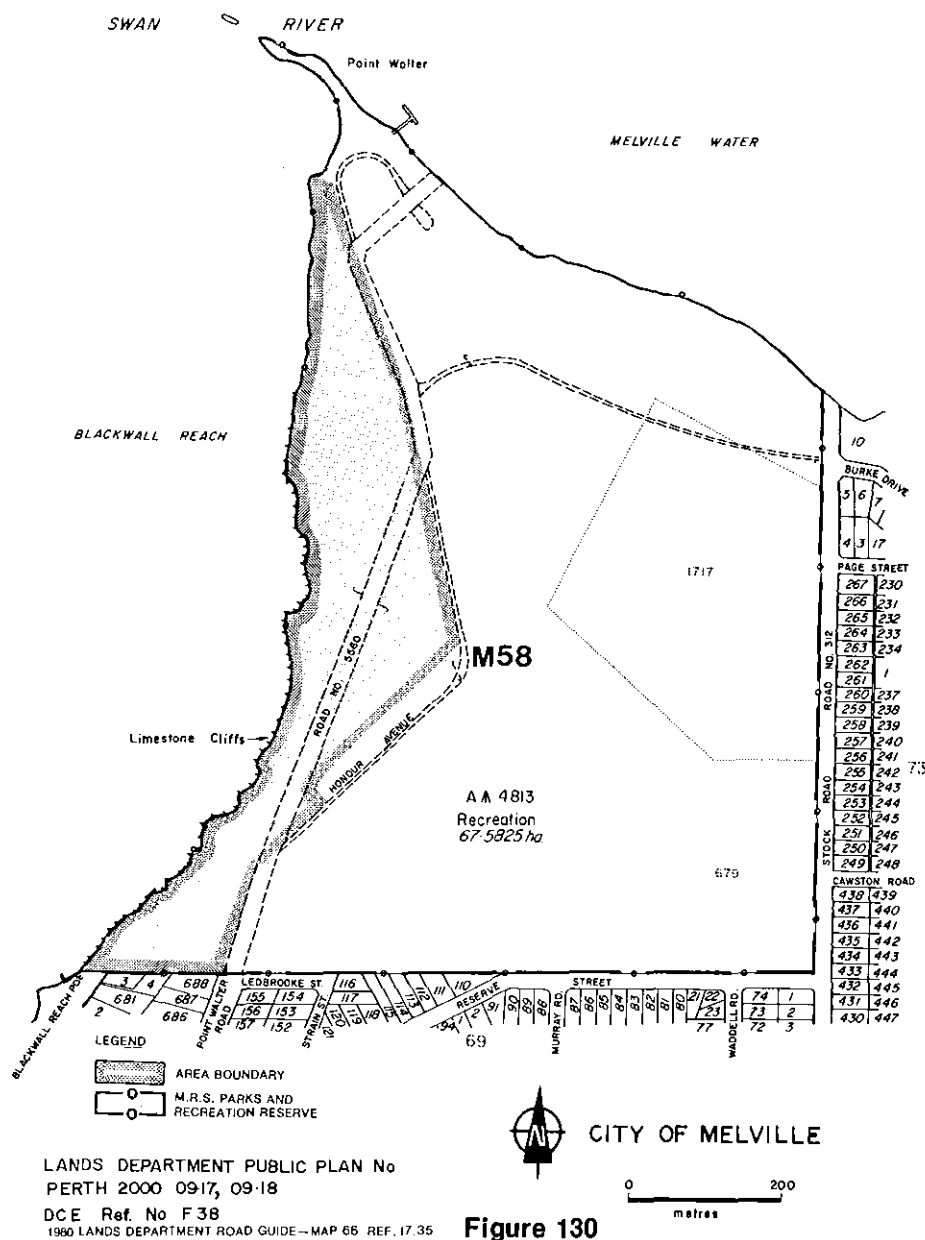
There are some shrubs on the cliffs, including parrot bush, *Spyridium globulosum* and *Alyxia buxifolia*. On top of the cliffs, and reaching back as far as Honour Avenue, there is an open-woodland of tuart, with peppermint, blackboy and parrot bush.

Blackwall Reach is a welcome contrast to the highly developed shores downstream and is also a significant natural feature of the Swan River, so it should retain its present character.

The area is affected by SEC lines.

Recommendation

- M58.1 Subject to the agreement of the controlling body, portion of Reserve A4813 west of Honour Avenue, should be excised and declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and the Reserve should be vested jointly in the City of Melville and the W.A. Wildlife Authority.



M59 POINT RESOLUTION FORESHORE, DALKEITH

The area comprises Reserve A1624 and part of Reserve A1668, for Recreation, both vested in the City of Nedlands, with power to lease. It is situated at Point Resolution, on the north bank of the Swan River in Dalkeith (Figure 131).

The shoreline around Point Resolution is sandy and rocky and is backed by a short steep slope with picturesque coastal limestone pinnacles and rocks.

From the point northwards into Freshwater Bay, the dominant shrub is parrot bush, with such species as *Jacksonia furcellata* and *Scaevola nitida* and some specimens of the relatively uncommon *Grevillea crithmifolia*. The sedge *Scirpus nodosus* and the native grass *Sporobolus virginicus* occur along the shore. Towards the northern end, on a sandy flat behind the shore, is a grove of peppermints. A number of bird species have been recorded in the area, including two specimens of the rare sea-eagle. There are several exotic species — fig, a pepper tree, European olive and veldt, couch and buffalo grass.

Recommendations

- M59.1 Subject to the agreement of the controlling body, the purpose of Reserve A1624 should be amended to Parkland and Recreation.
- M59.2 Subject to the agreement of the controlling body, that portion of Reserve A1668 to the west of Victoria Avenue should be excised and added to Reserve A1624.
- M59.3 The Nedlands City Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:
 - (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) minimising disturbance from fire and trampling of vegetation.

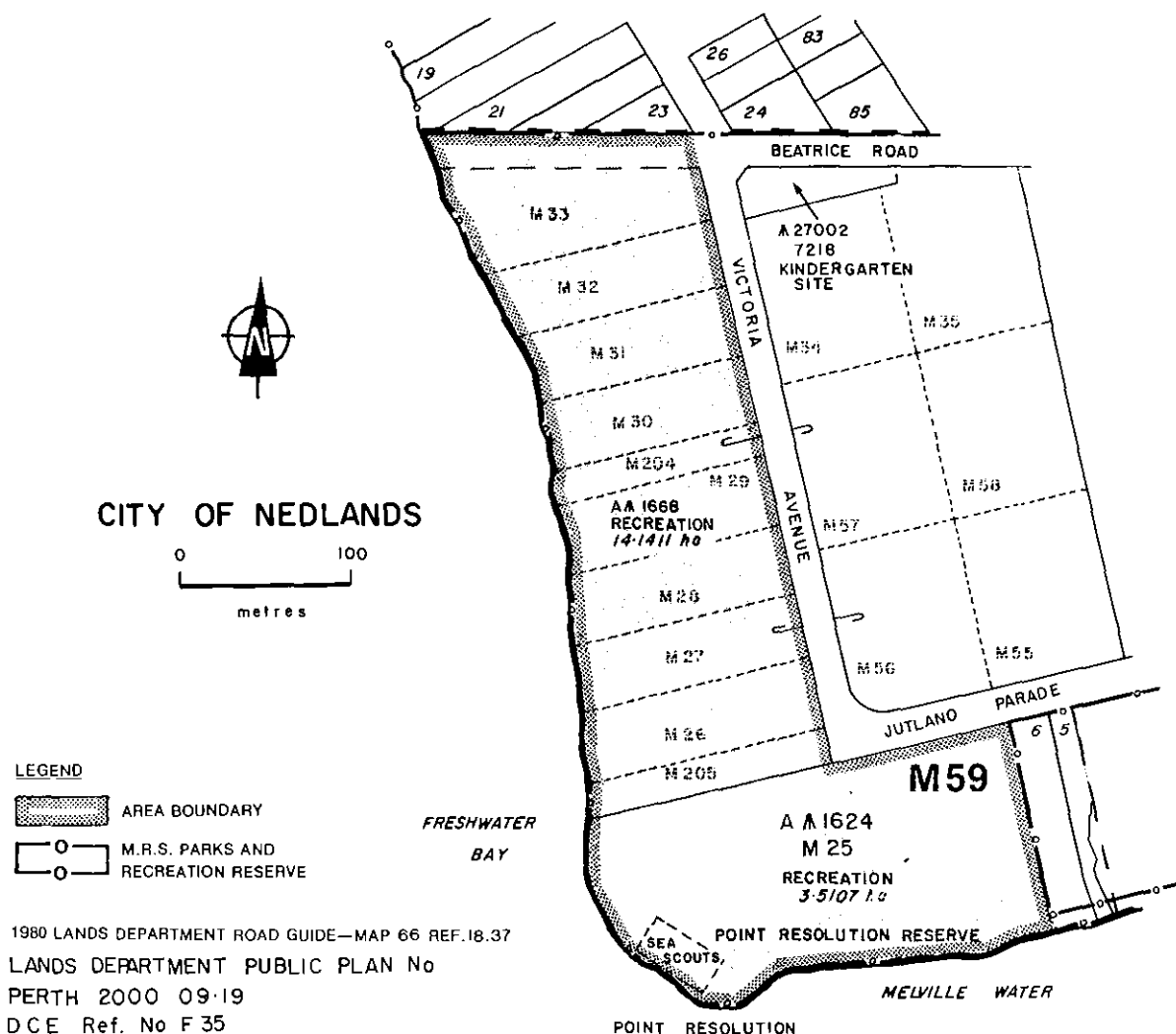


Figure 131

WADING BIRD HABITATS ON THE SWAN RIVER ESTUARY

Only three significant areas of wading bird habitat remain on the Swan River. These are tidal flats in South Perth, the tidal flats and saltmarsh areas of Alfred Cove in Attadale, and the tidal flats, marsh and lake at Pelican Point in Crawley.

These three areas provide the only significant remaining habitat for several thousands of wading birds which migrate to the Swan River each year from their breeding grounds in the northern hemisphere. Twenty-two species of these "transequatorial migratory wading birds" have been recorded on the Swan River, though only a few are plentiful. The most abundant species is the red-necked stint which has its breeding grounds in north-eastern Siberia and western Alaska. As many as four thousand stint have been observed on the tidal flats on the Swan River.

The migratory waders feed almost exclusively on the invertebrate life (molluscs, worms, crustaceans, etc.) which the tidal flats and marshes provide. If these areas were to be destroyed by dredging or reclamation then existing wader populations could not be maintained. The three areas which are described below complement each other, depending on tides and weather.

M60 AQUATIC RESERVE, SOUTH PERTH

The proposed Aquatic Reserve comprises tidal flats adjacent to Reserves C21483, C33803 and C33804, immediately to the west of the Kwinana Freeway, South Perth (Figure 132).

The vegetation of the area adjacent to the Kwinana Freeway consists mainly of a belt of sedgeland dominated by giant rush and *Scirpus nodosus*. Some exotic species, particularly poplar and bamboo, have become established but these can probably be controlled.

Recommendation

M60.1 The area of water, as shown on Figure 132, should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the W.A. Wildlife Authority.

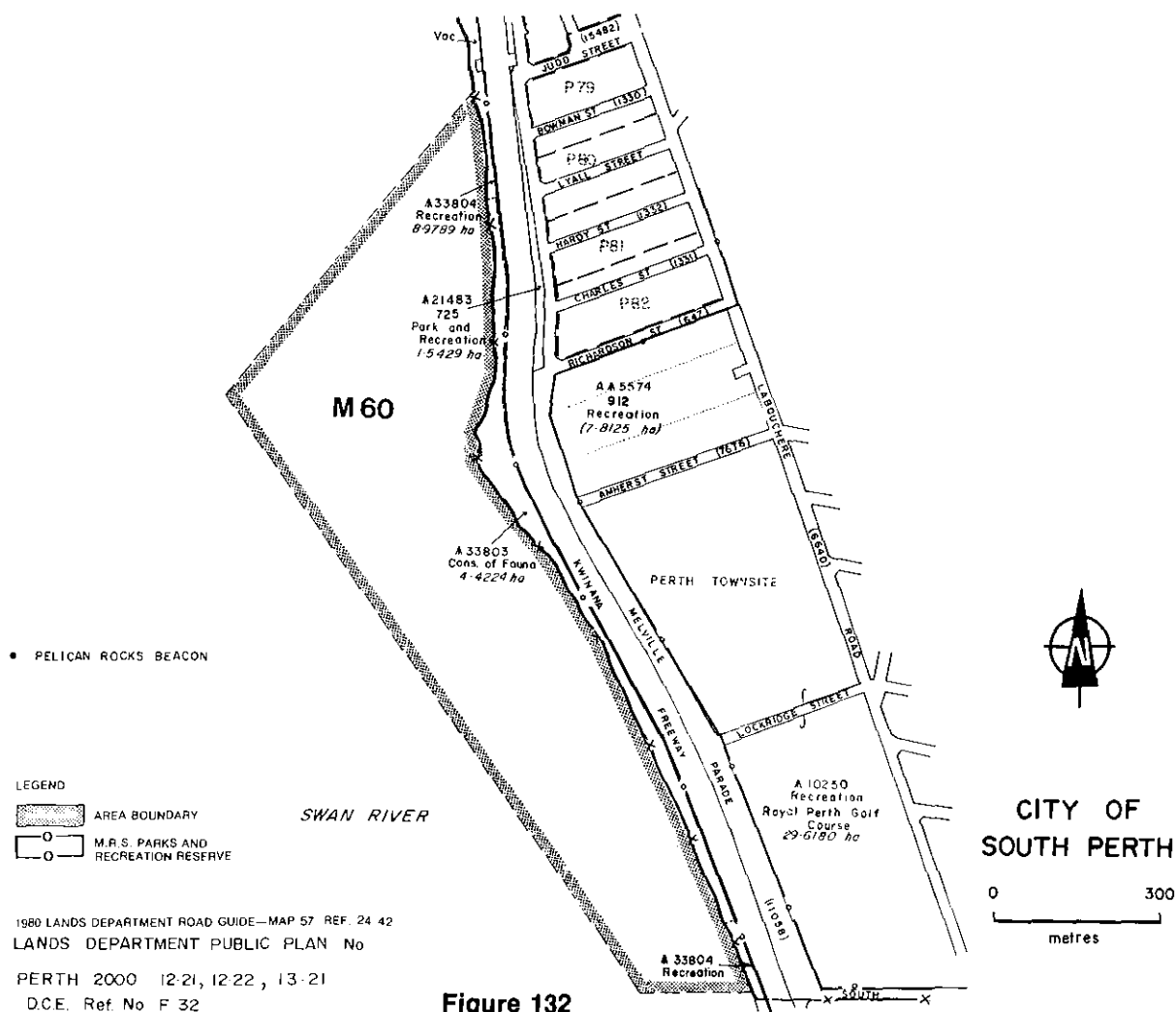


Figure 132

M61 AQUATIC RESERVE, ATTADALE

The area comprises the tidal flats and saltmarsh areas of Alfred Cove and off Point Waylen in Attadale (Figure 133).

Point Waylen and Alfred Cove are bordered with a belt of samphire which is up to 50 m wide in Alfred Cove. The southern section of Alfred Cove supports extensive areas of sedgeland of *Juncus kraussii*, with a few small patches of bulrush. Further north there are areas of closed-heath of *Arthrocnemum* species and near Burke Drive there is a narrow belt of low closed-forest of swamp paperbark with an understorey of *Gahnia trifida* bordered by a few flooded gums.

In Alfred Cove there exists an unmodified fossil deposit of sea shells, which is of considerable scientific interest and should be left undisturbed.

Most of the shoreline bordering the proposed Aquatic Reserve is within Reserve C35066, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority.

Recommendation

M61.1 The area of water, as shown on Figure 133, should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the W.A. Wildlife Authority.

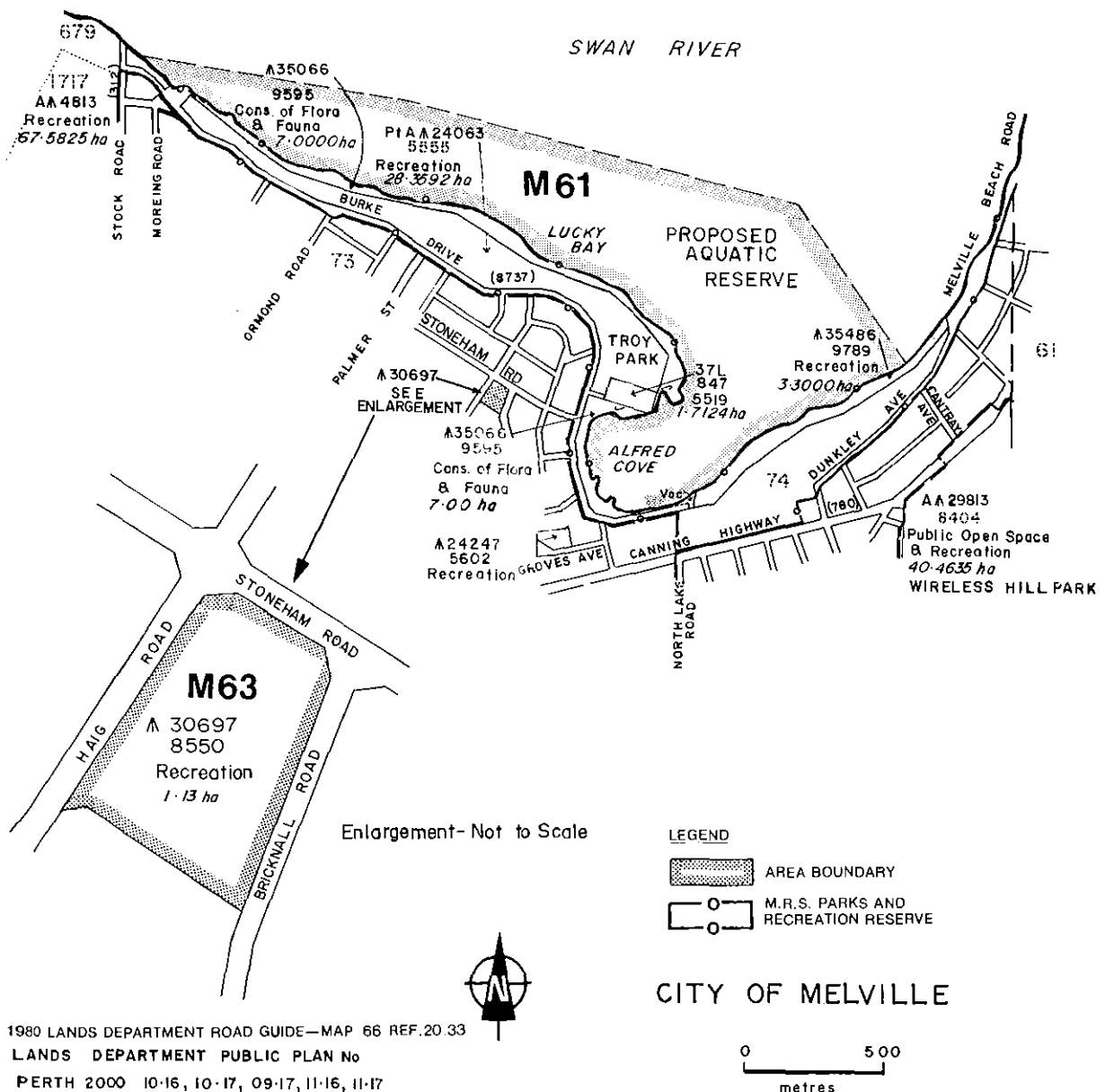


Figure 133

M62 PELICAN POINT, CRAWLEY

The area comprises part of Reserve A17375, for Recreation, vested in the National Parks Authority, and tidal flats, lake and marsh at Pelican Point, Crawley (Figure 134).

A large section of Pelican Point is covered in sedgeland of *Scirpus nodosus* and giant rush, with a few emergent shrubs of wattle. Near the lake there are a few small clumps of saltwater paperbark, a tree of minor occurrence along the Swan River. Further inland, near the fence around Reserve A17375, there is a clump of swamp sheoak.

Recommendations

M62.1 Subject to the agreement of the controlling body, the bird sanctuary should be excised from Reserve A17375 and be declared a Class A Reserve, for the purpose of Conservation of Flora and Fauna, and the Reserve should be vested in the National Parks Authority.

M62.2 The area of water, as shown on Figure 134, should be declared a Class C Aquatic Reserve, and the Reserve should be vested in the National Parks Authority.

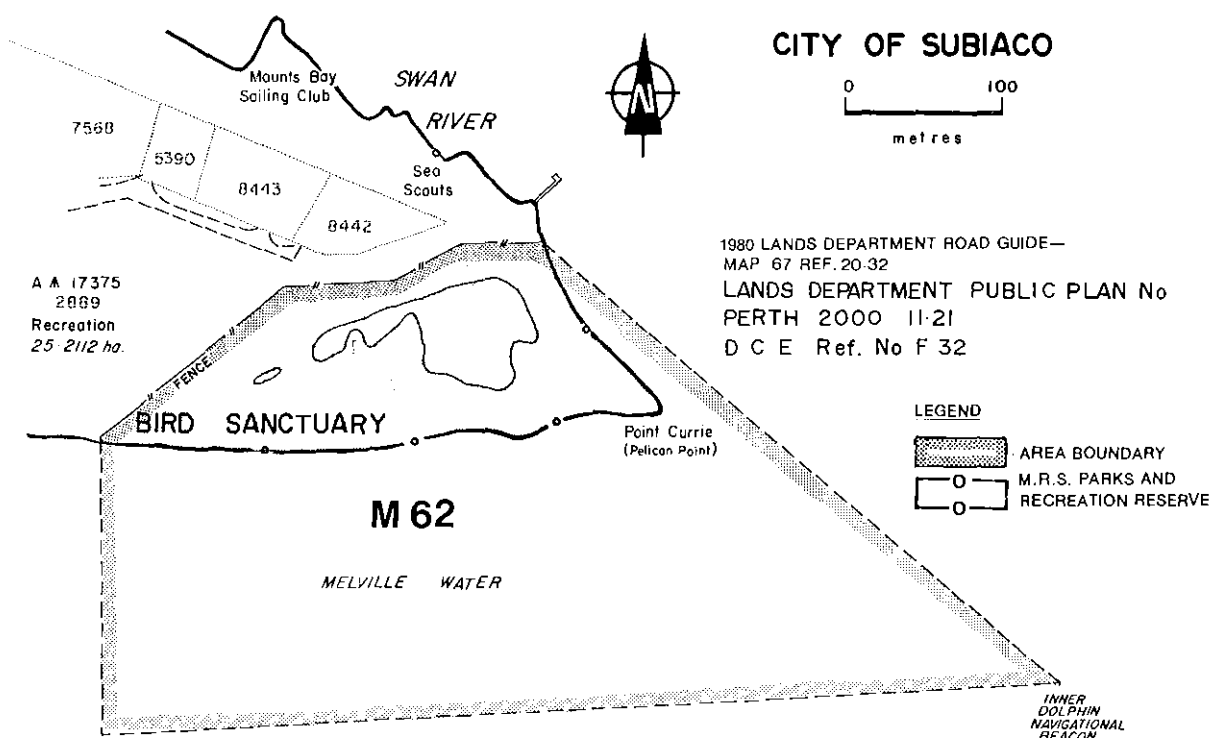


Figure 134

M63 HARRY SANDON PARK, ATTADALE

Reserve C30697, for Recreation, vested in the City of Melville, is situated in the eastern section of Attadale (Figure 133).

The Reserve (Harry Sandon Park) is flat and sandy, and carries a low woodland of marri with an understorey of banksia, sheoak and *Acacia saligna*, and a shrub storey of tree smokebush, zamia and stinkwood. Veldt grass and other weeds occur on the Reserve, but the vegetation is generally in good condition. There is a small playground at the northern end of the Reserve.

This Reserve and Reserve C35066 at Alfred Cove (see M61) are the only Reserves in Attadale which retain natural vegetation.

Recommendations

M63.1 Subject to the agreement of the controlling body, the purpose of Reserve C30697 should be amended to Parkland.

M63.2 The Melville City Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- encouraging the growth and regeneration of local indigenous flora;
- retaining the Reserve in its natural condition as far as possible.

M64 WIRELESS HILL PARK, ARDROSS

Reserve A29813, for Public Open Space and Recreation, vested in the City of Melville, is situated immediately south of the Canning Highway between Alfred Cove and Ardross (Figure 135).

The Reserve covers most of Wireless Hill, which is a high, consolidated dune. In the south-eastern section there is woodland of marri and jarrah, with a second storey of banksia and sheoak, and an understorey which includes blueboy, *Jacksonia sericea* and bacon-and-eggs. Other species include kangaroo paw and cats' paw, which make good displays in spring. Geraldton wax has been extensively planted around the lookout.

Much of the rest of the vegetation has been disturbed to some extent. There is a heavy infestation of perennial veldt grass which is unlikely to be reduced since the open habitat encourages its growth. The Reserve is the only large uncleared area remaining in the district.

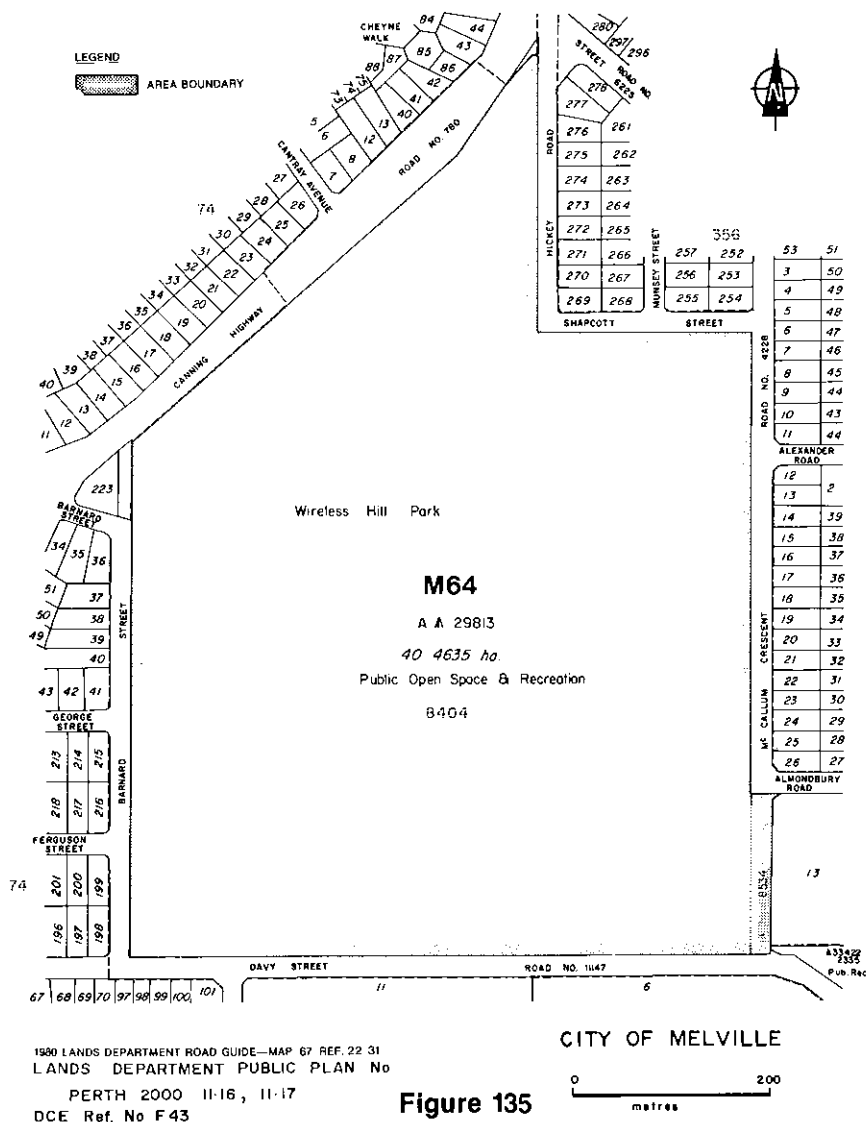
The Reserve has several roads leading to the summit, several lookout towers and a children's playground. The Telecommunications Museum has been established here.

There are drainage works in the Reserve.

Recommendation

M64.1 The Melville City Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:

- encouraging the growth and regeneration of local indigenous flora, especially in the south-eastern portion, and retaining the natural vegetation as much as possible;
- only allowing recreation activities which are compatible with the conservation of flora and fauna.



M65 POINT HEATHCOTE FORESHORE, APPLECROSS

The area comprises Reserve C32738, for Recreation, and part of Reserve C29604, for Hall Site, both vested in the City of Melville. It is situated on the shore and the steep slope behind Point Heathcote (Figure 136). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Point Heathcote is a rocky headland of coastal limestone, which carries native shrubs including *Acacia saligna*, *Scaevola nitida* and cockies' tongues. There is a tuart tree, and, on the foreshore, swamp sheoak. A low open-woodland of banksia and sheoak, with shrubs such as parrot bush, tree smokebush and woollybush, occurs along Waylen Bay.

Recommendation

- M65.1 The Melville City Council, in consultation with the Department of Conservation and Environment, should prepare a management programme giving consideration to encouraging the growth and regeneration of local indigenous flora.

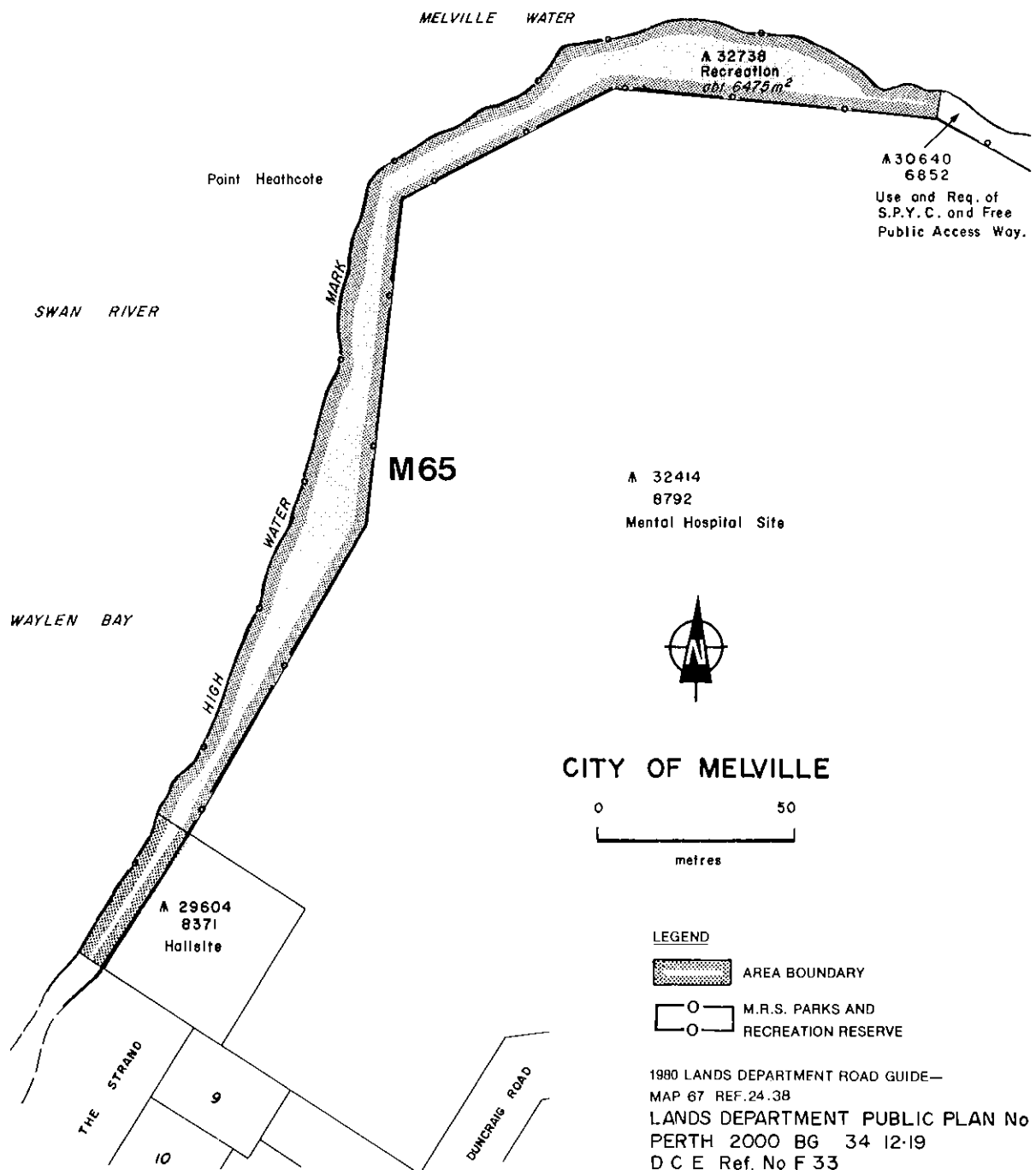


Figure 136

M66 MOUNT HENRY, MANNING

The area comprises the whole of the Mount Henry Peninsula, being lot 2 and part of lots 1 and 5 (Location 37), freehold land owned by the Christian Brothers (Figure 137). The foreshore is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Mount Henry occupies a prominent headland with limestone outcrops. It is covered by open-woodland of tuart, merging into low open-woodland of marri, jarrah and Christmas tree, with a very varied understorey including woollybush, *Adriana quadripartita* and *Daviesia juncea*. At the base of the hill there is a small stand of swamp cypress. Along the river bank there is a different range of flora, including *Juncus kraussii*, *Scirpus nodosus* and *Suaeda australis*. The area supports over a hundred native species in all.

Aquinas College uses the area extensively for biological studies, and Mount Henry itself is an important feature of the Canning River landscape.

Sewerage works have been proposed for the area which is affected by the Kwinana Freeway extension.

Recommendation

M66.1 The Metropolitan Region Planning Authority and the Christian Brothers, in consultation with the Department of Conservation and Environment, should prepare a management programme giving consideration to encouraging the growth and regeneration of local indigenous flora.

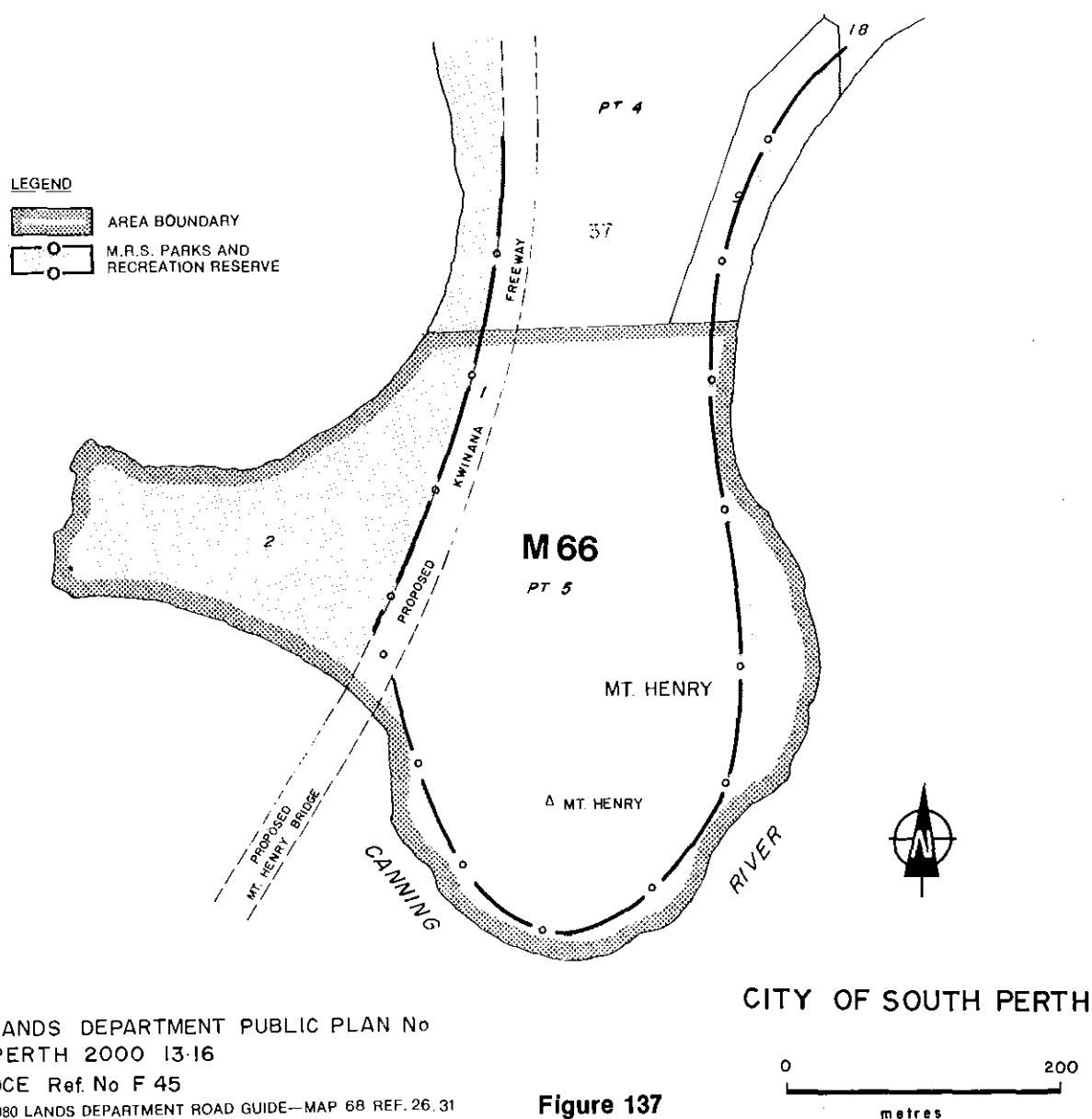


Figure 137

M67 CANNING RIVER FORESHORE, SALTER POINT TO CLONTARF

The area comprises Reserve C23967, for Recreation, vested in the City of South Perth, and part of lots 14 to 17 and 58 (Location 37), privately owned freehold land. It is situated on the northern shore of the Canning River, near Manning (Figure 138). The foreshore strip is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

In the centre of Salter Point, at the south end of Reserve C23967, there is a lagoon which is connected to the river by a narrow channel. The lagoon is surrounded by a dense band of sedges, consisting mainly of *Juncus kraussii* and some *Gahnia trifida*, with *Suaeda australis*, *Atriplex* species and samphire in more open spaces. There are several areas of salt water couch, sometimes mixed with *Samolus repens* and *Scirpus nodosus*. There are also several stands of swamp sheoak and some paperbarks. Behind the shore there is a low, sandy rise which carries native plants, including Christmas tree, stinkwood and *Dasypogon bromeliaefolius*. A narrow fringe of the sedges, samphires and paperbarks extends north along the foreshore, but landfill has destroyed it next to Salter Point Parade and in areas north of Howard Parade.

The northern portion of Reserve C23967 carries dense swamp vegetation dominated by myrtles with other species including swamp tea-tree, *Astartea fascicularis*, and the rare *Melaleuca leptoclada*. There are also several stands of salt water paperbark.

The lagoon is unique on the Swan and Canning Rivers and although the remaining vegetation is limited in extent, it contains an interesting complex of species. The area contributes significantly to the appearance of the river, and the vegetation protects the banks.

The Clontarf foreshore is flat, low-lying and swampy with a low sandy ridge just behind the shore in some parts. There are many stands of saltwater paperbark and other paperbark, which become very dense towards the eastern end. Sedges such as *Juncus kraussii* are common in the understorey and there are several shrub species, including prickly moses and *Hakea varia*.

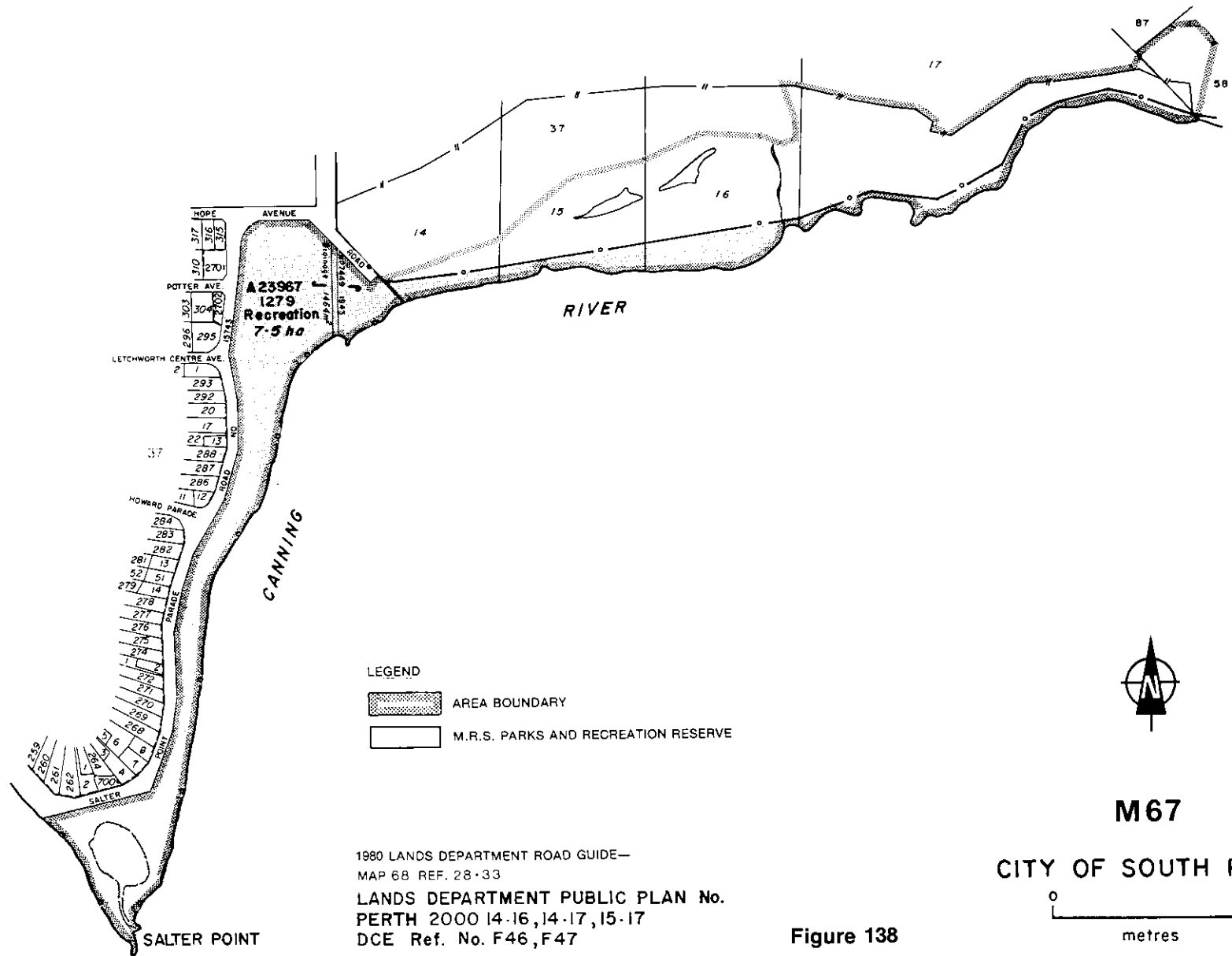
Some areas are dominated by sedges. There are also areas of samphire which include an uncommon herb of the leschenaultia family. On the shoreline there are a few swamp sheoaks. Over thirty species of plant communities have been recorded. There is no similar foreshore vegetation elsewhere on the Canning or Swan Rivers.

The variety of vegetation and water bodies, including swamp and tidal marsh, provides several faunal habitats. There are many groups of species, including amphipods, copepods and water-snail.

The area has been disturbed by drains, landfill and trail-bikes. The South Perth City Council and the Department of Conservation and Environment have discussed various ways to preserve the natural environment. The area is affected by sewerage and drainage works.

Recommendations

- M67.1 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.
- M67.2 The South Perth City Council and the W.A. Wildlife Authority, in consultation with the Department of Conservation and Environment and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) preventing land uses which may adversely affect the environment;
 - (c) only allowing recreation activities which are compatible with the conservation of flora and fauna, to be restricted to disturbed areas.



M68 CANNING RIVER, RIVERTON BRIDGE TO NICHOLSON ROAD BRIDGE

The area comprises Reserves C7773, for Parks and Recreation, C26103, for Public Recreation, C27604, for Recreation, all vested in the City of Canning; C1289, for Landing Places, under the control of the City of Canning; C24717, C24973, C25474 and C28740, all for Recreation, and C20265, for Public Utility, all not vested; and freehold land, some of which is owned by the MRPA (Figure 139). The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The section downstream from the Kent Street Weir consists of the best estuarine vegetation of the Canning and Swan Rivers. It supports halophytic (salt tolerant) plants which are absent upstream. The margins of the river banks and islands carry low open-forest and low closed-forest of swamp sheoak and paperbark species, with a varied understorey of sedges, rushes, shrubs and small trees. The saline river flats carry mainly samphire dominated by *Arthrocnemum bidens* and two types of sedgelands. Beyond the wetland vegetation there is an area of low open-forest of flooded gum and paperbark, with a few swamp sheoaks. The whole area was originally surrounded by species such as marri, jarrah and pricklybark, but now only remnants remain, on the higher, better drained land.

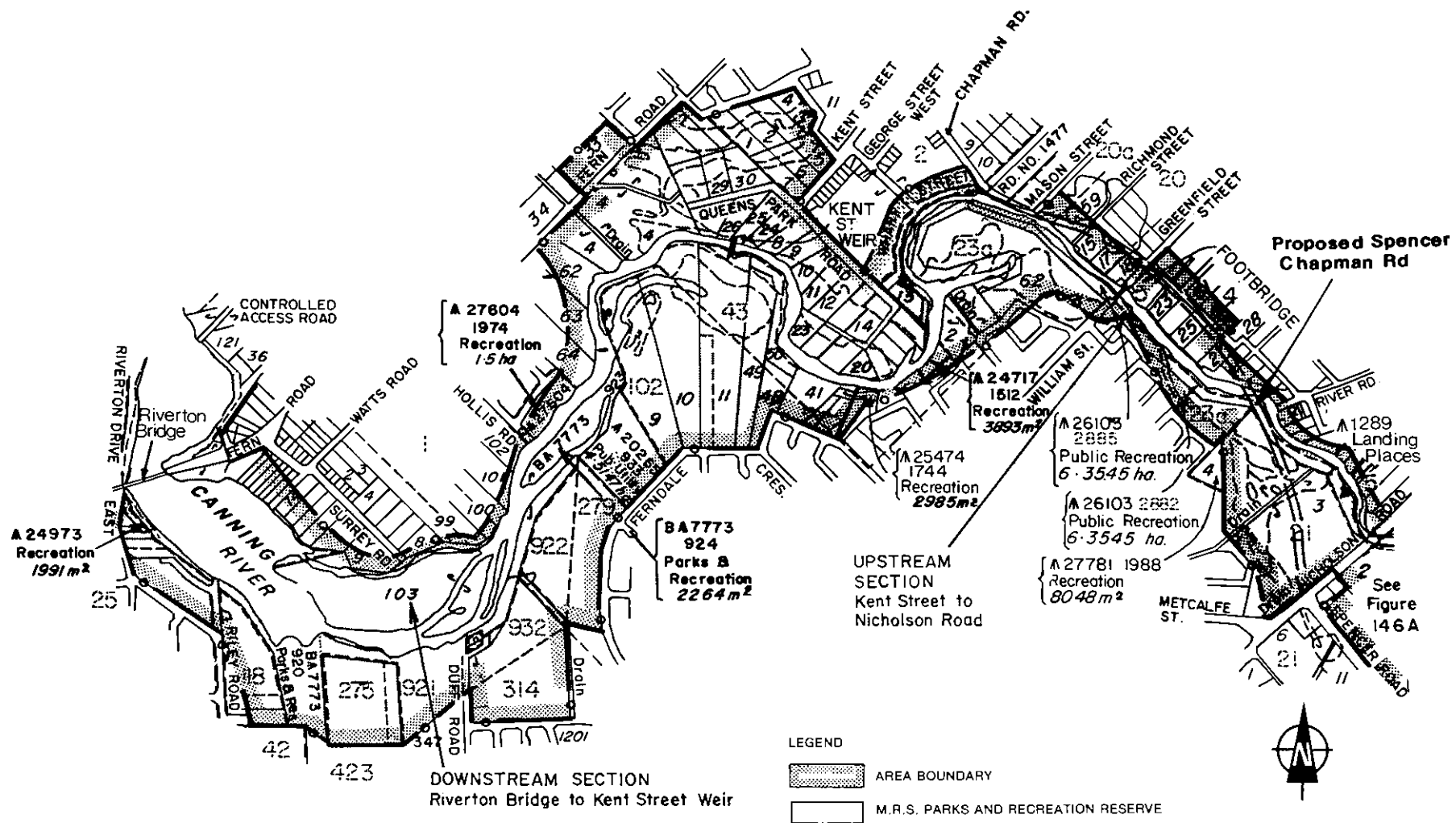
The area is inhabited by about eighty-five bird species, of which sixty are likely to nest there. They include seven duck species and five species of birds of prey. Freshwater soaks on the edge of the wetland are important as a supply of drinking water for birds.

In the section upstream from the weir, the vegetation is mainly confined to trees along the river bank, including flooded gum and swamp paperbark. Bulrushes occur in damp, low-lying places near the river, and there is a dense growth of native water plants. Between the weir and the footbridge, which connects Willcock Street to Greenfield Street, there is a backwater with extensive fringing vegetation which affords refuge to large flocks of birds. This backwater, together with the area downstream from Kent Street Weir is particularly valuable for conservation. The section upstream from the footbridge is more suitable for parkland.

There are existing drainage works. The area may be affected by proposed sewerage and drainage works, and by the proposed Chapman Road – Spencer Road connection. The conservation value of any conservation reserve would be significantly decreased by road developments.

Recommendations

- M68.1 Subject to the agreement of the Canning City Council, the section from the Riverton Bridge to the footbridge, should be declared a Class A Reserve, for Conservation of Flora and Fauna, and the Reserve should be vested jointly in the City of Canning and the W.A. Wildlife Authority.
- C68.2 Subject to the agreement of the Canning City Council, the section from the footbridge to the Nicholson Road Bridge, should be declared a Class A Reserve, for Parkland and Recreation, and the Reserve should be vested in the City of Canning.
- C68.3 The Canning City Council and the W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) allowing only pedestrian access and non-motorised boats in the section downstream from the footbridge;
 - (c) only allowing recreation compatible with the conservation of flora and fauna;
 - (d) providing pathways along the foreshore;
 - (e) maintaining the Kent Street Weir;
 - (f) preventing sanitary landfill and dumping;
 - (g) maintaining the flow of water in the Canning River.



M68

CITY OF CANNING



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 69 REF. 33.33

LANDS DEPARTMENT PUBLIC PLAN No.
PERTH 2000 16.16, 16.17, 17.16, 17.17
17.18, 18.16, 18.17
DCE Ref. No. 49

Figure 139

M69 KENWICK SWAMP

The area comprises lots 9 to 16, 77 and 78 (Location 382), owned by the University of Western Australia and used for botanical research and teaching. It is situated in Kenwick on Bickley Road (Figure 140).

Most of the land is low-lying and seasonally damp or inundated. There is a sandy rise across the block towards the north-eastern end. Low heath occurs on the swamp flats, where changes in elevation are reflected in changes in species. In the lowest areas the heath is open, with shrubby species such as *Hakea sulcata* and *Petrophile longifolia* and many herbaceous species. Where the soil is slightly saline, the samphire *Arthrocnemum halocnemoides* and the unusual *Selenothamnus squamatus* have become established, and there are small meadows of sedges. On the slightly higher areas the heath is denser, and includes *Beaufortia squarrosa*, *Verticordia lindleyi*, *Baeckea tenuifolia*, undescribed species of *Banksia*, *Grevillea* and *Calothamnus*. The last is found only in this area. Swamp cypresses emerge above the low shrubs. The sand ridge supports low woodland, dominated by banksia and pricklybark, with an understorey which includes *Jacksonia floribunda*, woollybush and buttercup.

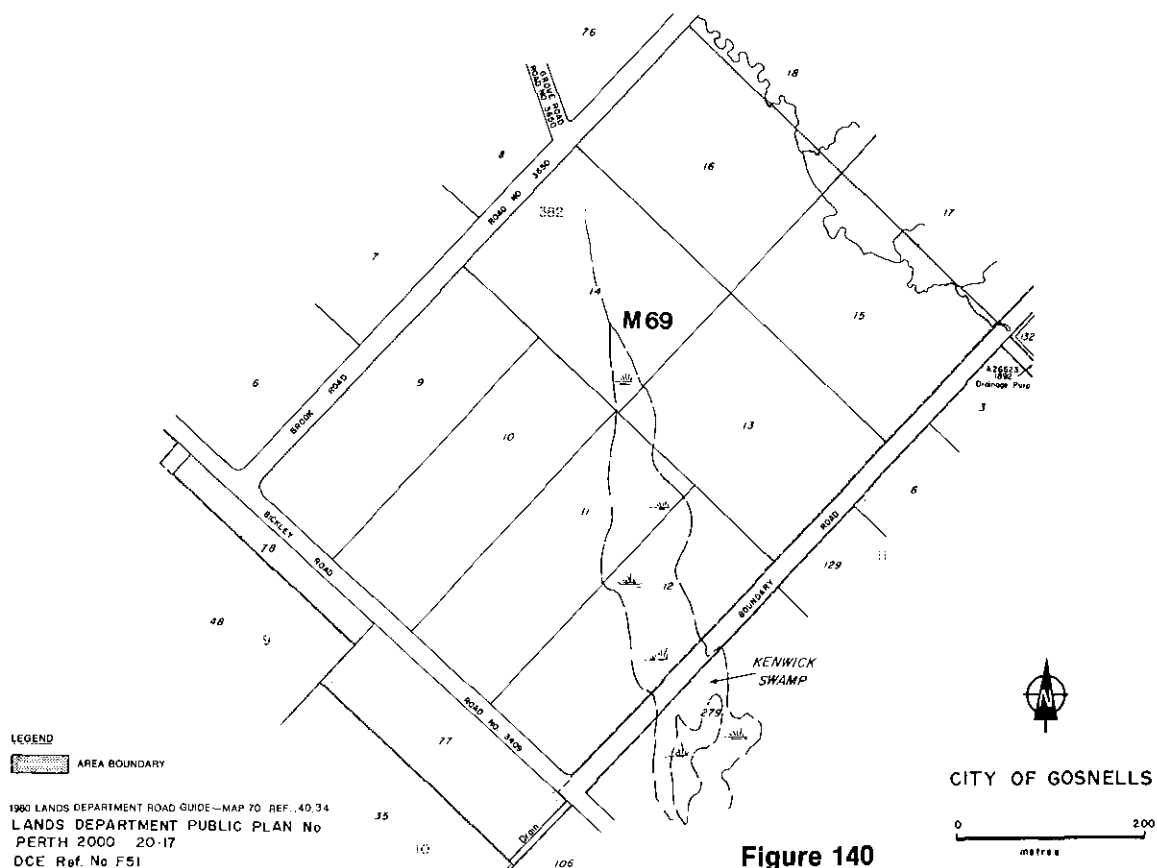
Kenwick Swamp is the only surviving area of its kind and its exceptional concentrations of unusual plants makes it very attractive to botanists. The associations of plants which occur there are unique, and several species are unknown outside the area. The swamp is threatened by a falling water table. Private groundwater extraction may affect water levels, and there may be pollution due to drainage from local septic systems. The area may be affected by future sewerage and drainage works.

Recommendations

M69.1 The University of Western Australia, in consultation with the Department of Fisheries and Wildlife, should prepare a management programme giving consideration to:

- (a) minimising the impact of surrounding development on the swamp's water level;
- (b) fire control;
- (c) reducing weed infestation.

M69.2 If the University of Western Australia wishes to dispose of the land in the future it should be purchased when available and declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna and Water, and the Reserve should be vested in the W.A. Wildlife Authority.



M70 HEATHLAND, WATTLE GROVE

Lot 211, of Canning Location 3, privately owned freehold land, is situated about 2 km west of the foot of the Darling Scarp (Figure 141).

The land is almost flat. It consists of pale brown sandy clay, which in winter becomes damp but without surface water. This landform is poorly represented in existing reserves.

The vegetation is a low closed-heath which is rich in species, with several rare plants including an unnamed species of dryandra, known only in one other locality (which is not a reserve), a low variant of *Jacksonia floribunda* and rainbow plant. There is also a scattering of marri, woody pear, Christmas tree and black gin. Other species include *Lambertia multiflora*, *Verticordia densiflora* and *Cyathochaete avenacea*. The area is in good condition, with little weed infestation.

Recommendation

M70.1 The W.A. Wildlife Authority, in consultation with the land owner, should define management objectives for the area and seek ways and means of achieving those objectives.

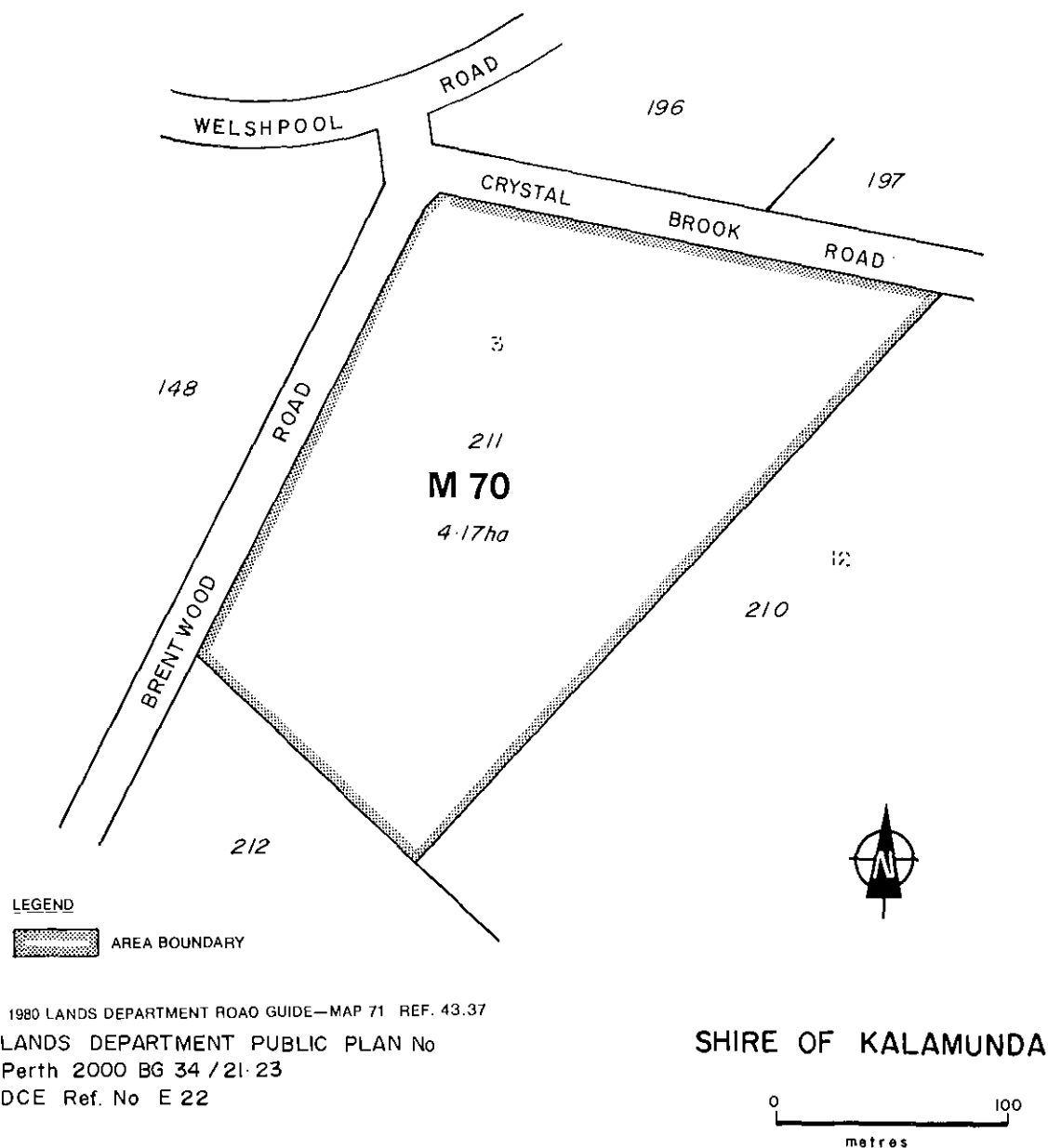


Figure 141

M71 CANTONMENT HILL, FREMANTLE

The area comprises Cockburn Sound Location 371 and part of Cockburn Sound Locations 270, 1367 and 1633, owned by the Commonwealth of Australia and the City of Fremantle. It is situated at the southern end of the Fremantle Bridge (Figure 142).

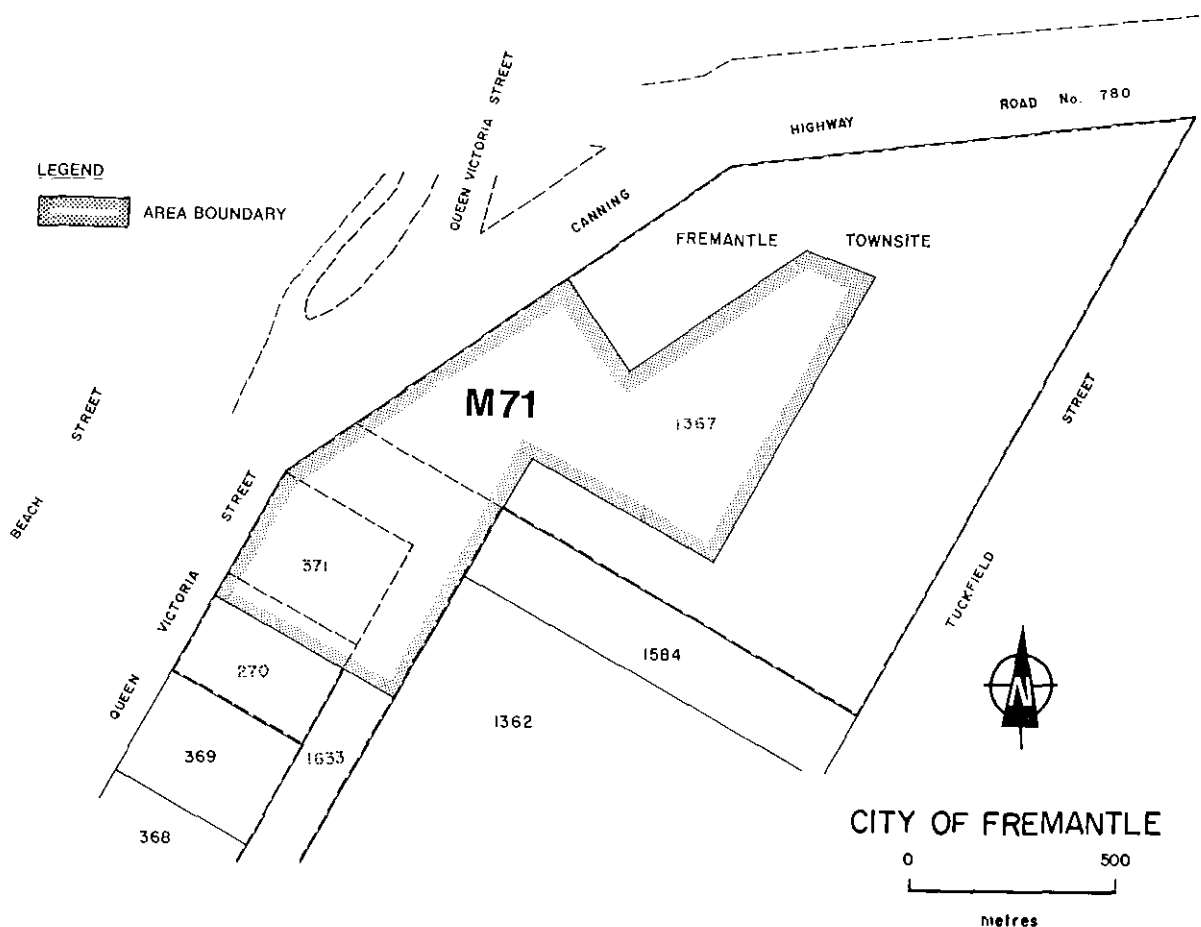
The vegetation is a tall open-shrubland of wattle, cockies' tongues, *Melaleuca acerosa* and a number of other species. An unusual occurrence is a possible hybrid between *Melaleuca acerosa* and chenille honeymyrtle. The block is one of the few pieces of land in Fremantle to retain any natural vegetation and is a natural museum which provides an example of the Fremantle landscape at the time of settlement.

Cantonment Hill is a significant historic site. It was one of the earliest named sites in the region and was the eastern end of early Fremantle. Early settlers embarked at the Cantonment on ferry for Perth, and for many years the hill was used as a signal station for vessels entering and leaving Fremantle Harbour.

Recommendations

M71.1 The Commonwealth of Australia and the Fremantle City Council, in consultation with the Department of Conservation and Environment, should prepare management programmes for their respective portions of Cantonment Hill, giving consideration to encouraging the growth and regeneration of local indigenous flora.

M71.2 The portion of Cantonment Hill owned by the Commonwealth of Australia should be managed for the preservation of landscape and vegetation.



1980 LANDS DEPARTMENT ROAD GUIDE — MAP 75 REF. 13.28.

LANDS DEPARTMENT PUBLIC PLAN No

PERTH 2000 7-14

DCE Ref. F 41

Figure 142

M72 SIR FREDERICK SAMSON PARK, SAMSON

The area comprises Reserve C34233, for Public Recreation, not vested; and lots 578 and 629, freehold land, owned by the City of Fremantle. It is situated a few kilometres north of Coolbellup (Figure 143).

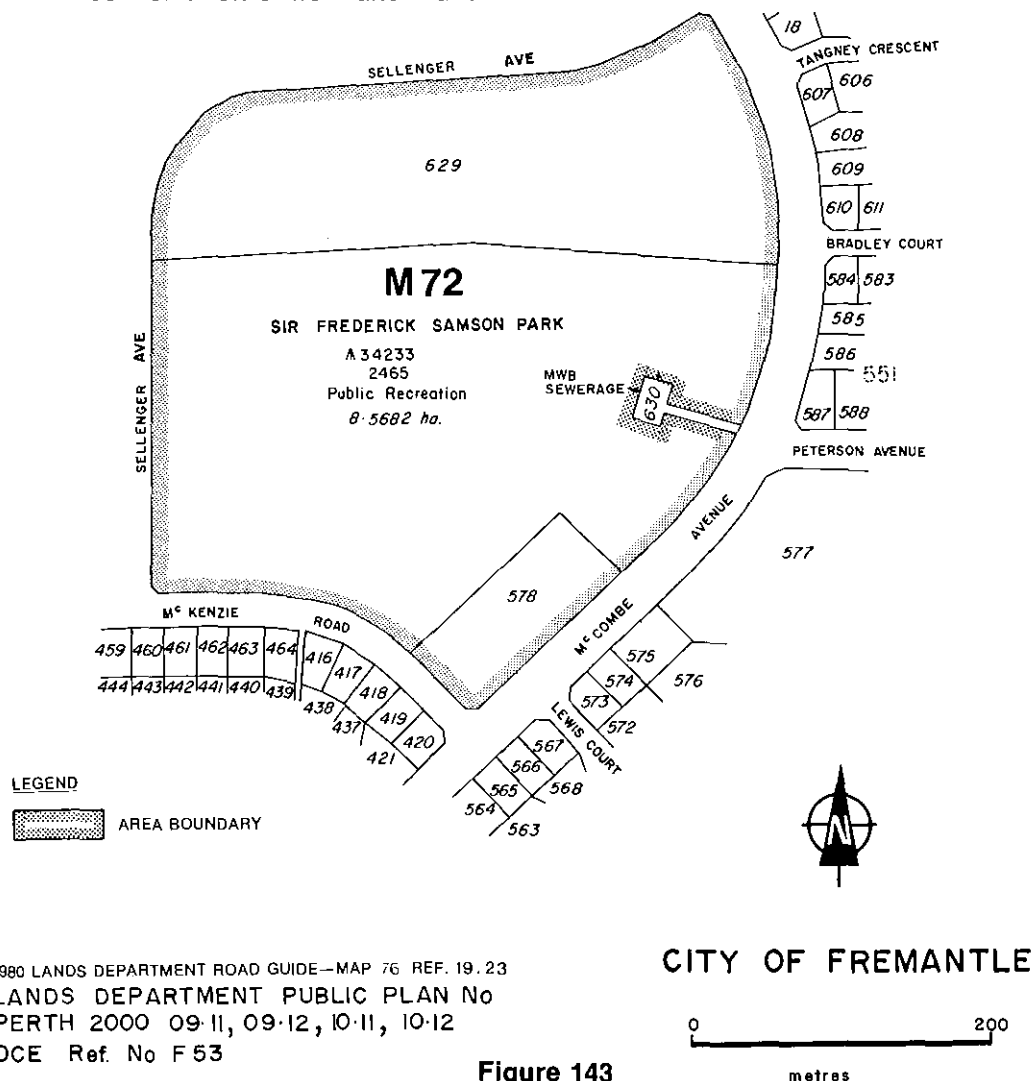
The Park lies in a valley, and a strip of vegetation in the south-east has been cleared. The remainder supports woodland, mainly of jarrah with some tuart and marri and a few understorey trees of banksia species and sheoak. The groundstorey is dominated by blackboy, mixed in places with zamia, and other species include yellow pea, red runner and bacon-and-eggs. The area contains sixty species and presents one of the few opportunities in Fremantle to set aside an area of bush. However, the area is currently under pressure from off-road vehicles and is deteriorating.

The area is currently zoned Public Open Space in the Town Planning Scheme, and is intended for passive recreation. The Fremantle City Council is considering preserving the vegetation, fencing the area, and providing footpaths.

The area is affected by sewerage works and more have been proposed.

Recommendations

- M72.1 The purpose of Reserve C34233 should be amended to Public Recreation and Parkland and the Reserve should be vested in the City of Fremantle.
- M72.2 Subject to the agreement of the controlling body, the freehold land should be added to Reserve C34233.
- M72.3 The Fremantle City Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:
- encouraging the growth and regeneration of local indigenous flora;
 - giving priority to passive recreation activities which are compatible with the conservation of flora and fauna.



M73 BOORAGOON LAKE

The area comprises Reserve C25318, for Public Recreation and Drainage, vested in the City of Melville. It is situated immediately north of the Leach Highway in Booragoon (Figure 144).

Unlike most metropolitan lakes, Booragoon Lake's surrounds are well covered with natural vegetation. Round the margin there is a low woodland and low open-forest of flooded gum and paperbark. The centre contains dense thickets of *Melaleuca teretifolia*.

The lake provides a habitat for coot, crane, rail and swamphen. Ducks nest in the lake, and are protected by its good cover of vegetation.

The Melville City Council maintains the lake's water level and does not allow the waters of nearby Blue Gum Lake to flow into Booragoon Lake. This has led to a marked increase in numbers of gilgies, a freshwater crayfish, which in turn has resulted in three species of cormorant nesting permanently at the lake.

There are drainage and sewerage works in the area.

Recommendation

M73.1 Subject to the agreement of the controlling body, the purpose of Reserve C25318 should be amended to Parkland, Public Recreation and Drainage.

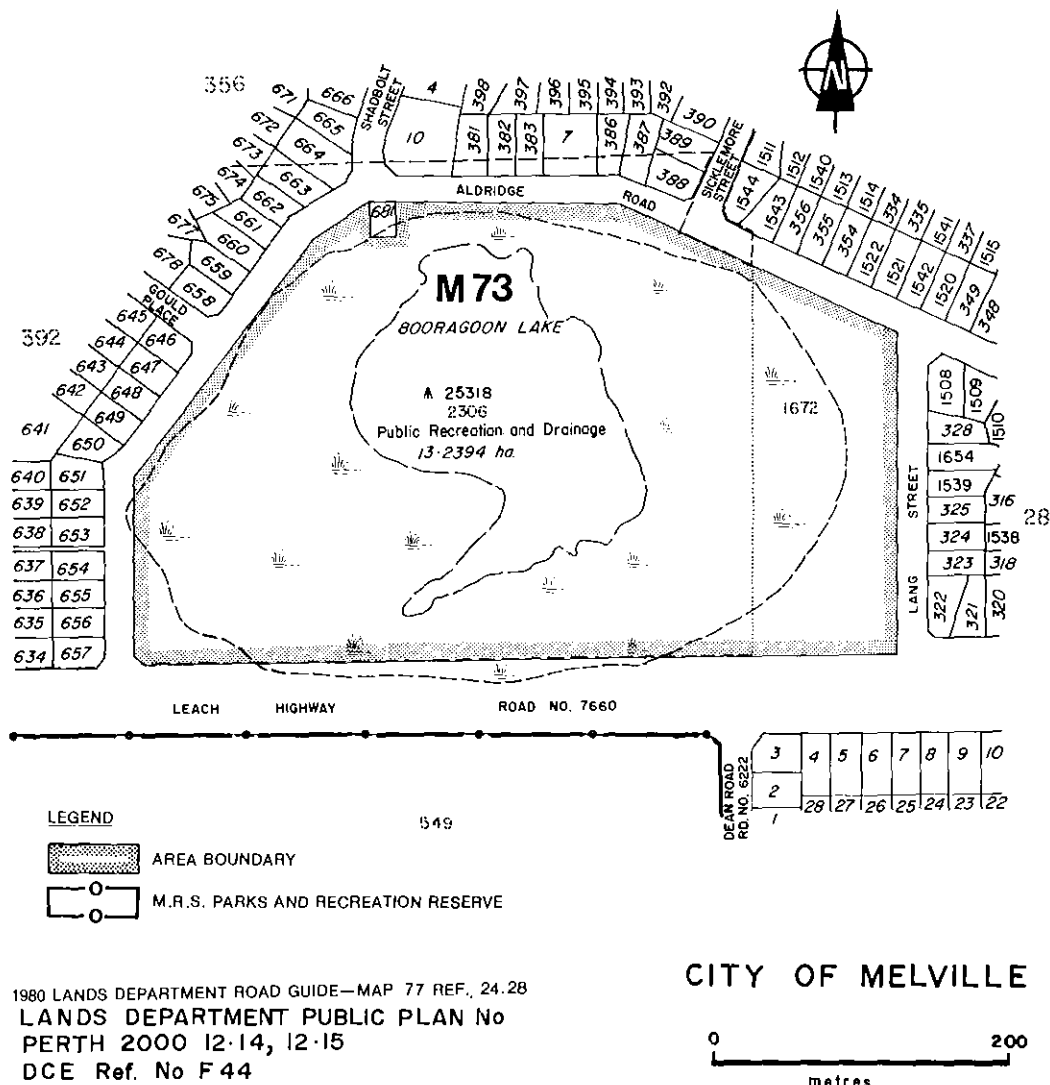


Figure 144

M74 BULL CREEK

The area comprises Reserves C29130, for Public Recreation, vested in the City of Canning; C32563 for Recreation, vested in the City of Melville (Figure 145). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

North of Leach Highway the creek is hidden in a dense growth of paperbark and flooded gum with shrubs such as *Astartea fascicularis*, *Agonis linearifolia* and bracken fern. Where the creek widens into the Canning River, it is fringed with a dense growth of *Juncus kraussii*. Upstream from Leach Highway the creek occupies a narrow gully with the same species, although the paperbark and flooded gum are less frequent. Beyond Rossmoyne Senior High School other shrubs are present, including *Albizzia lophantha* which is rare on the Coastal Plain. The sandy rises on each side of the creek support a low woodland of banksia, sheoak and jarrah, with an understorey which includes woollybush and spearwood, and a variety of smaller shrubs. On the southern side of the creek, just south of Leach Highway, there is a raised swamp with a number of orchid species, and the creek itself contains an uncommon form of *Eriochilus scaber*.

One of Western Australia's largest dragonflies, *Petalura hesperia*, has been collected from the swampy ground alongside Bull Creek. This insect is very rare and has not otherwise been collected for a number of years.

Bull Creek is an interesting natural pocket in the midst of suburbia. It serves as a natural drain, but since it contains many species of native plants it also serves as a green belt. The vegetation is too dense for recreation, and opening it up for this purpose would destroy its conservation value.

As activities on adjacent privately owned land may adversely affect the area, the concept of a 'conservation buffer zone', as discussed in Chapter 5 of this Report is relevant to Bull Creek.

The area is affected by sewerage and drainage works.

Recommendations

- M74.1 Subject to the agreement of the controlling body, the purpose of Reserve C29130 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested jointly in the City of Canning and the W.A. Wildlife Authority.
- M74.2 Subject to the agreement of the controlling body, the purpose of Reserve C32563 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested jointly in the City of Melville and the WA Wildlife Authority.
- M74.3 The W.A. Wildlife Authority should approach Rossmoyne Senior High School and the Anglican Church to help ensure that the management of the portions of Reserves C28309 and C32454 abutting Reserves C29130 and C32563 is compatible with the conservation of flora and fauna.

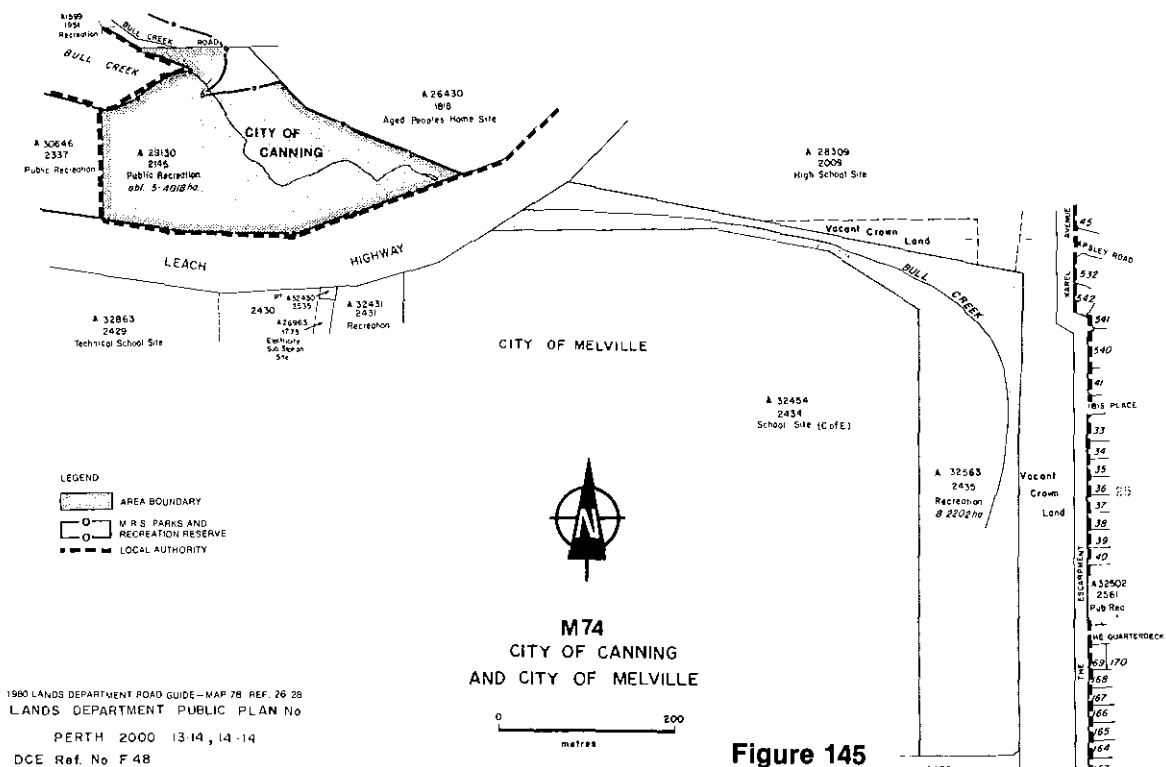


Figure 145

M75 UPPER CANNING AND SOUTHERN RIVERS

The area comprises the Canning River and its fringes, from the Nicholson Road Bridge to the boundary of the State Forest, together with those parts of the Southern and Wungong Rivers within the City of Gosnells (Figures 146A and 146B). Much of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme or is being considered for possible future 'reserves'.

The west bank of the Canning River is well fringed with flooded gums and paperbarks between Nicholson Road Bridge and Royal Street, and the east bank is thickly fringed near Yule Brook and Bickley Brook. Native species have been almost entirely lost from the ground flora. Between the river's confluences with Bickley Brook and the Southern River, both banks are well covered, mainly with flooded gum, but also with a few paperbarks. Horses, cattle and sheep have eliminated most of the ground cover, but there are seedlings of flooded gum and the shrub species *Labichea punctata*, *Acacia saligna* and prickly moses. Grasses and weeds abound.

The Southern River, from its confluence with the Canning River to its continuation as the Wungong River, is fairly well wooded with flooded gum on both banks, although the ground flora has been mostly lost. Along the lower reaches there are paperbark and *Acacia saligna*, and patches of *Juncus* and *Baumea* species. Along the Wungong River remnants of woodland of jarrah and marri occur in places on the slopes above the banks, with an understorey which includes large clumps of *Cyperus vaginatus* and occasional *Lobelia olata* and *Acacia saligna*. Grasses and weeds predominate.

Several concepts discussed in this Report are relevant: 'pathway systems' (Chapter 5) and 'riverine linear parks' (Chapter 6).

The area is affected by sewerage, drainage and pumping works. More works have been proposed and a pipehead dam may be built below the junction of Stinton Creek. If the dam is built, public access might be restricted by Catchment Zone regulations.

Recommendations

- M75.1 The Metropolitan Region Planning Authority's proposal to extend the area 'reserved' for Parks and Recreation under the Metropolitan Region Scheme is endorsed.
- M75.2 The Metropolitan Region Planning Authority, in consultation with the Gosnells City and Armadale Town Councils, the Department of Conservation and Environment and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) only allowing recreation activities which are compatible with the conservation of flora and fauna;
 - (c) preventing vehicular access, but providing parking space and access for canoeists;
 - (d) providing pathways along the foreshore;
 - (e) removal of fences which span the rivers.

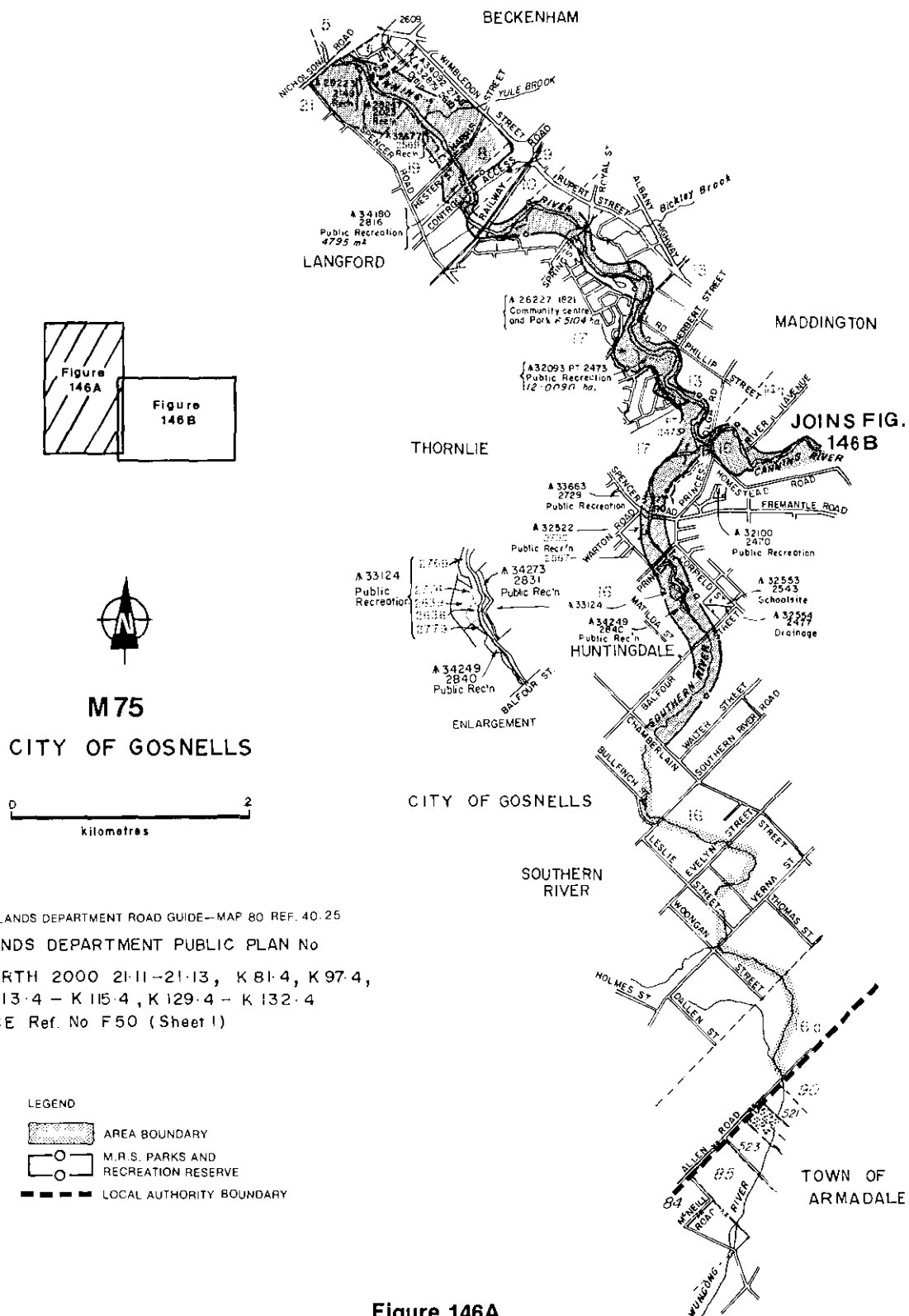
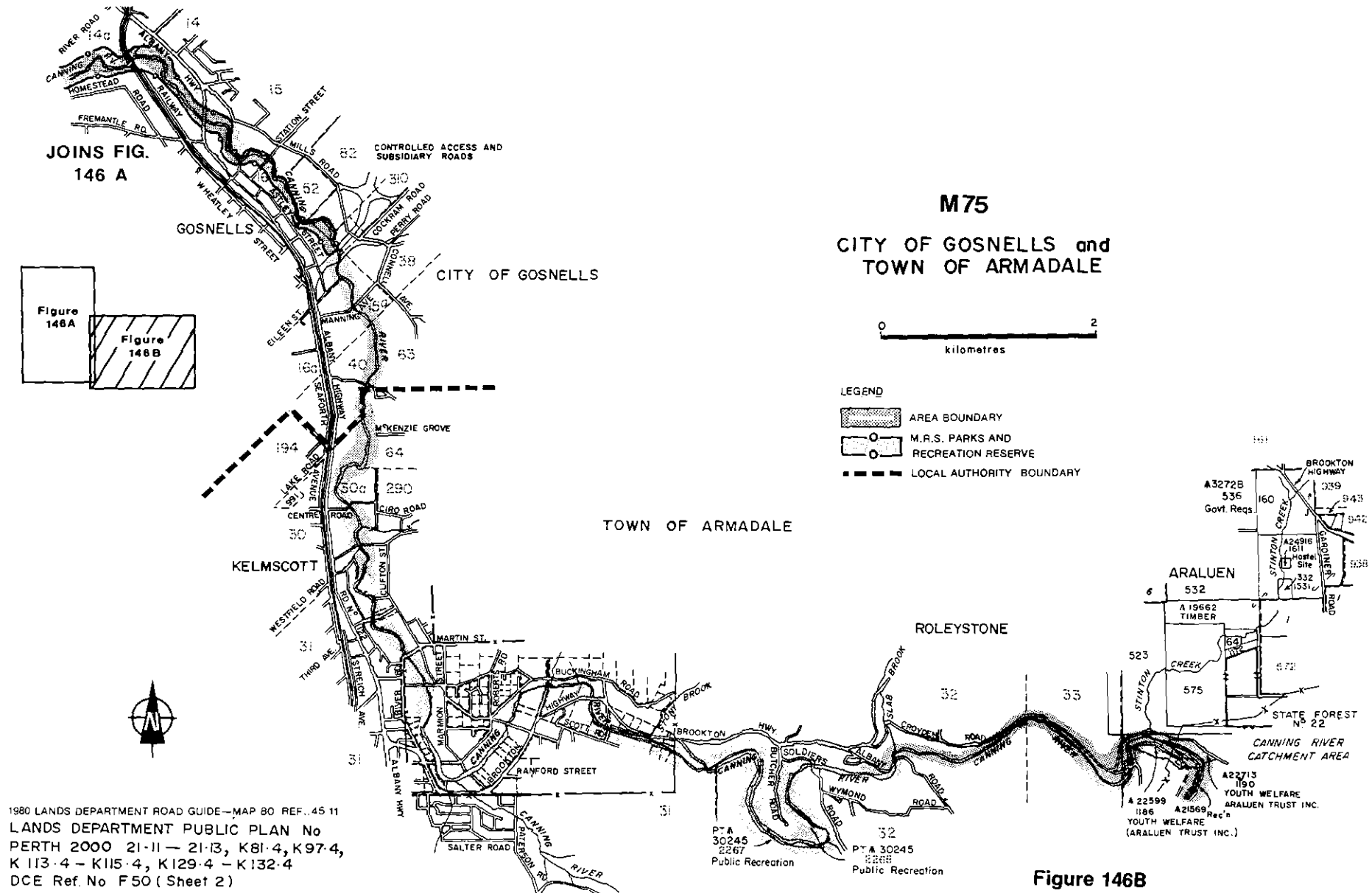


Figure 146A



M76 MARY CARROLL PARK, GOSNELLS

The area comprises Reserves C31993, for Bird Sanctuary and Park, C29919 and C28361, both for Public Recreation, all vested in the City of Gosnells; C35611, C34696 and C35746, all for Public Recreation, not vested; part of Reserve C24998 for School Site, not vested; part of lots 4, 8, 9, 22, 23, 31, 47, 49 and 100, lots 2, 3, 5, 6, 12, 14 to 18, 20, 21, 22, 108, 502 to 506, 959, 964 to 966, and lots 9 and 10 adjacent to Percy Street, lots 10, 11, 12 and part of lot 23 adjacent to Eudoria Street, and lots 10 and 15 adjacent to May Street (Location 16), all freehold land (Figure 147). The Gosnells City Council has purchased a considerable amount of the land in the area, prepared a concept plan for it in conjunction with the Department of Fisheries and Wildlife, and has begun major works.

The lake in Mary Carroll Park is fringed with flooded gum and swamp paperbark, except the southern section, which has been developed for parkland including a children's playground.

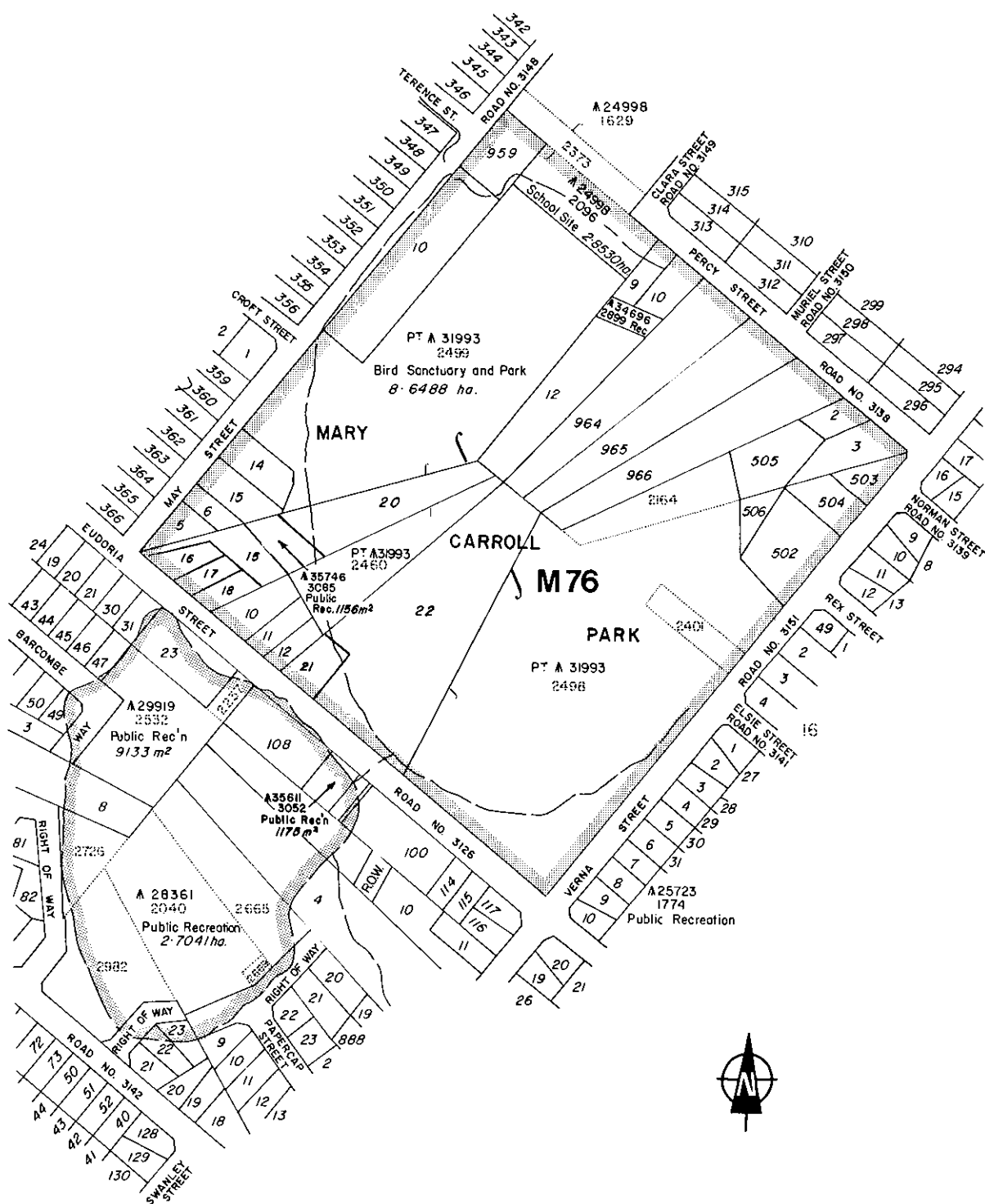
Marri and banksia, remnants of the transition to woodland species, occur in places. There is permanent open water in the northern section of the wetlands, and the remainder is covered with bulrushes.

There is a seasonal swamp in the land to the south-west of Eudoria Street. It is surrounded by a dense growth of paperbark and flooded gum, which merges into woodland of marri and jarrah. There are bulrushes in disturbed places, and an infestation of salvinia has been reported during several wet seasons. This swamp forms a contrast to the permanent water in Mary Carroll Park. It provides sanctuary for a variety of birds and is a reservoir of wetland flora in the area.

Private groundwater extraction may affect water levels, and there may be pollution by local septic systems. The area may be affected by future sewerage and drainage works.

Recommendations

- M76.1 Subject to the agreement of the controlling body, the purpose of Reserve C31993 should be amended to Bird Sanctuary and Park, and Water.
- M76.2 Reserves C34696 and C35746 should be cancelled and their respective areas added to Reserve C31993.
- M76.3 The southern portion of Reserve C24998 should be excised and added to Reserve C31993.
- M76.4 Subject to the agreement of the controlling body, the purpose of Reserve C28361 should be amended to Public Recreation and Water.
- M76.5 Subject to the agreement of the controlling body, Reserve C29919 should be cancelled and its area added to Reserve C28361.
- M76.6 Reserve C35611 should be cancelled and its area added to Reserve C28361.
- M76.7 The Gosnells City Council, in consultation with the Department of Fisheries and Wildlife and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) encouraging the growth and regeneration of local indigenous flora;
 - (b) limiting developments to the southern section of the area;
 - (c) maintaining water levels in the wetlands.



LEGEND

 AREA BOUNDARY

CITY OF GOSNELLS



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 81 REF. 43, 20
LANDS DEPARTMENT PUBLIC PLAN No
F 96-4, K 81-4
DCE Ref. No F 52

Figure 147

M77 RESERVE C22865, KALAMUNDA, AND RESERVE C20641, BICKLEY

The area comprises Reserves C20641, for Water Supply, vested in the Minister for Water Resources; and C22865, for Parks and Recreation, vested in the Shire of Kalamunda. It is situated about 2 km east of Kalamunda (Figure 148). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

Reserve C20641 contains a lateritic ridge. The vegetation is open-forest of jarrah with some marri, bull banksia and sheoak, with an understorey which includes *Grevillea wilsonii*, blackboy and *Isopogon sphaerocephalus*. There are also two uncommon plants, *Hemigenia pritzellii* and an unnamed species of *Thysanotus*.

Reserve C22865 rises from Mundaring Weir Road up a gravelly slope to the general level of the Darling Range. The vegetation is open-forest and woodland, dominated by jarrah and marri, with sheoak, bull banksia and a rich understorey of typical forest species, such as couch honeypot, *Hakea amplexicaulis* and *Bossiaea ornata*. The vegetation has been removed in several small areas, two of which have been replanted with pines.

Increasing development around Kalamunda is reducing the natural vegetation, so this area, which provides a good example of natural Scarp vegetation, should be retained. If sections are to be developed for recreation, those which are already disturbed should be used.

The area is within the Lower Helena River Catchment, a source of water supply. There are SEC lines in the area.

Recommendations

- M77.1 Subject to the agreement of the controlling bodies, the purpose of Reserves C20641 and C22865 should be amended to Parkland and the Reserves should be vested in the Shire of Kalamunda.
- M77.2 The Kalamunda Shire Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to:
- encouraging the growth and regeneration of local indigenous flora;
 - restricting recreation activities to areas where the vegetation is already disturbed.

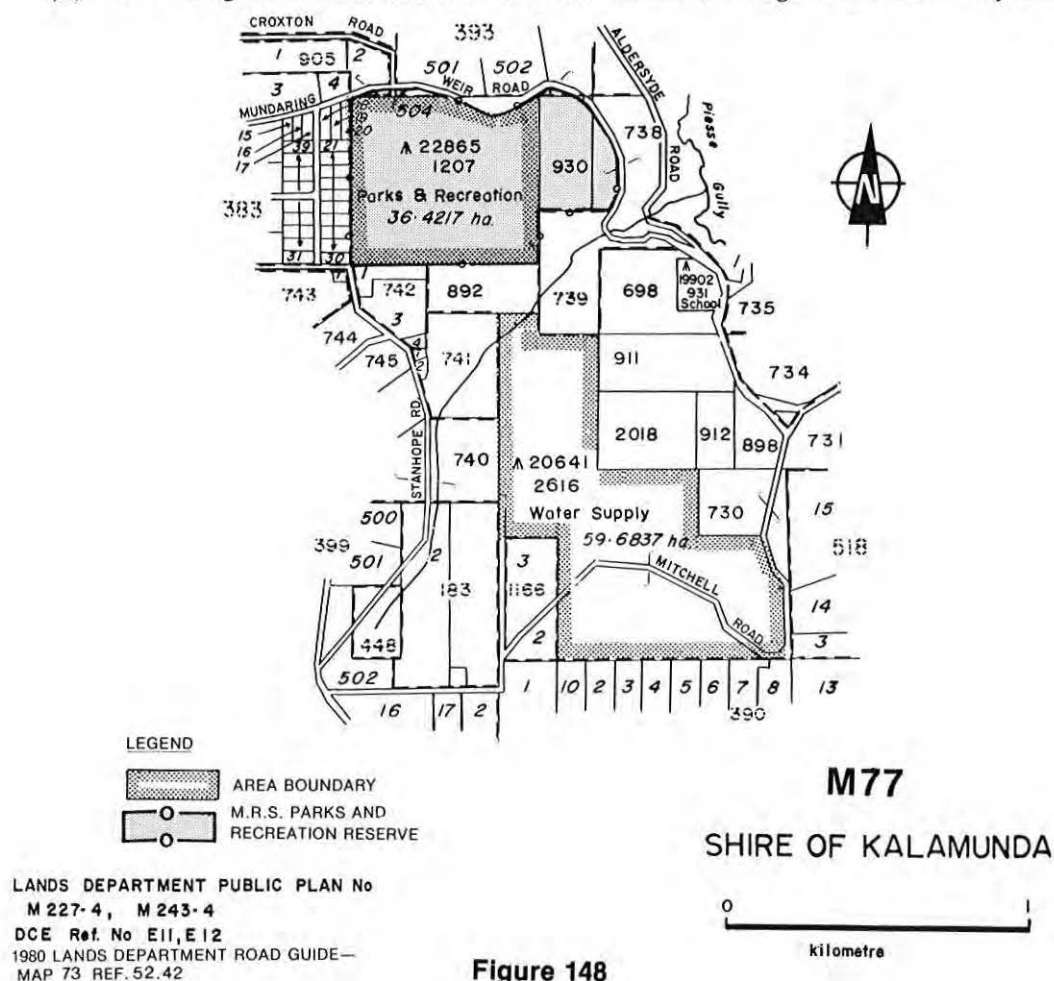


Figure 148

M78 RESERVE C10601, CARMEL

Reserve C10601, for Timber, not vested, is situated in Carmel (Figure 149).

The Reserve contains a high lateritic ridge on the east side of Canning Road beyond the head of Bickley Brook. The vegetation is open-forest of jarrah and marri, which has been partly disturbed by tracks and gravel pits. The undisturbed vegetation is in good condition. From the highest point, there are views across the Bickley Brook valley to the Coastal Plain.

The Reserve is within the Bickley Brook Catchment. It is affected by organic pollution, and public access may be restricted by Catchment Zone regulations. It may be affected by a proposed dam and pumpback station, and improvements to Canning Road. There are SEC lines in the area.

Recommendations

M78.1 The purpose of Reserve C10601 should be amended to Water, and the Reserve should be vested in the Metropolitan Water Board.

M78.2 The Metropolitan Water Board should prepare a management programme, giving consideration to the conservation of flora and fauna.

M79 RESERVE C21172, CANNING MILLS

Reserve C21172, for Water, vested in the Minister for Water Resources, is situated about 3 km south of Carmel (Figure 149).

The Reserve rises from the bed of Munday Brook to the lateritic capping of the Darling Range. There is an open-forest of jarrah and marri on the higher slopes. The understorey includes *Agonis linearifolia*, swishbush, and *Trymalium ledifolium*, and there is an unusual herbaceous flora on the open winter-wet areas near the brook.

The Reserve is within the Victoria Reservoir Catchment, a source of water supply. There are SEC lines in the Reserve, which may be affected by future improvements to Canning Road.

The Study endorses the present purpose and vesting of Reserve C21172, Canning Mills.

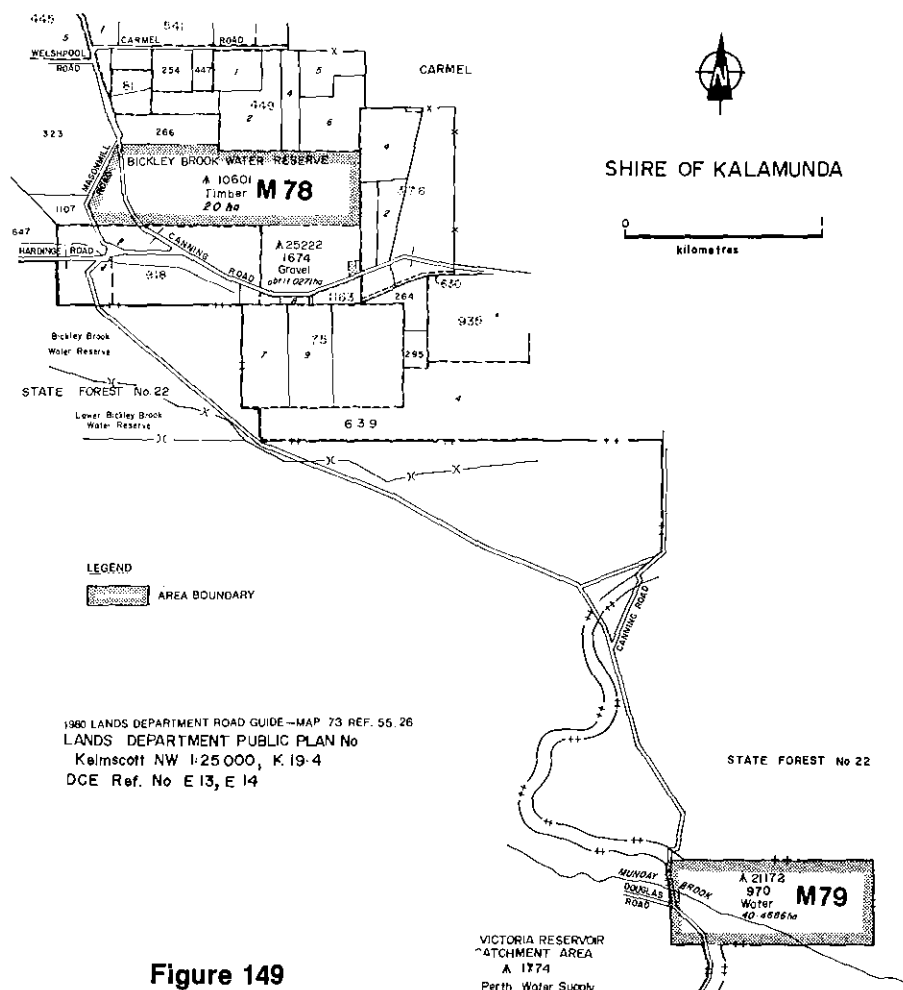


Figure 149

M80 DARLING SCARP

The area extends from Kalamunda Road in the north almost to Wungong Brook in the south. It includes the Scarp face itself, portion of the Darling Range immediately east of the Scarp, and portions of the upper slopes and ridges above the south of the Canning River (Figures 150A to 150F).

The area runs north-south for a distance of about 24 km. It comprises numerous Land Act Reserves, and freehold land, owned privately and by the MRPA. Most of it is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. Additional land has been proposed for 'reservation' in the Stage A South-East Corridor Report.

In the area from Kalamunda Road in the north almost to Brookton Highway in the south, the land outside the existing Parks and Recreation boundary comprises: lot 8 (Location 222), lot 5 (Location 300), part of Reserve C12083 (near Albert Road), part of Armadale AA Lots 453 and 467, Locations 450, 451 and land to the north-west of these, Locations 1, 2, 3, 5, 6 and 23 (near Gosnells Road), the western portion of Location 338 and part of a subdivision south of Armadale AA Lots 134 and 135 (adjacent to Brookton Highway) (Figure 150A to D).

Further south, to the east of Armadale and north of Albany Highway is an area often known as the 'Armadale Common', consisting of Reserves C4127 for Common and Timber for Settlers, C25022, C25023, C25024, C25025 and C25026, all for Gravel, all vested in the Town of Armadale; and C33742, for Public Recreation, not vested; lot 4 (Location 31) owned by the MRPA; Part lot 188, lot 189 (Location 31), lots 3 and 91 (Location 631), and Locations 1357 and 2004, privately owned freehold land, (Figure 150F).

Further east from the 'Armadale Common' area described above is an area consisting of the slopes on either side of Churchman Brook. This area comprises lots 10 and 50 (Location 31), part of Part Lots A and 1, lots 1, 3, 4, 10, 11, 12, 36, 37, 40, 41 and 103 and part of lots 1 and 100 (Location 32), all owned by the MRPA; and lot 4 and part of lot 1 (Location 31), part of lot 1 (Location 681), freehold land mostly owned by the MRPA (Figure 150E).

To the south of the 'Armadale Common', in Bedforddale, is Bungendore Park. This area comprises Reserves A4561, for Parklands, vested in the Town of Armadale; C10433 for Gravel, not vested; and vacant Crown land (See Figure 150F).

The Scarp is the most prominent landform in System 6, rising to a maximum height of 300 m. It consists of granite outcrops, ridges, valleys supporting winter-flowing creeks, several 'hanging' swamps, dolerite dykes, laterite scree and the laterite capping of the western edge of the Darling Range.

Most of the Scarp flora is represented in the areas described above. There are open-forests of jarrah and marri, marri and wandoo woodlands, small areas of paperbark, and flooded gums along the creeks. There is a stand of the very rare salmon white gum (*Eucalyptus lane-poolei*) above the Sixty Foot Falls on Ellis Brook. The second storey includes such species as bull banksia, rock sheoak and parrot bush. Bungendore Park supports a rare species of dryandra (*Dryandra praemorsa*). Throughout the area are blackboy and zamia as well as several stands of black gin. The heath and groundstorey are very rich in species, which include hairy jugflower, acacia, Wilson's grevillea, *Grevillea endlicherana*, and an unnamed species of buttercup which is restricted to the top of the Scarp east of Perth. There is a variety of herbaceous plants, including orchids, trigger plants, lilies and small sedges. Bracken is common on the southern slope of Bungendore Park, above Wungong Gorge.

The most important areas floristically are the spur and valley to the south of Crystal Brook, the northern side of Bickley Valley, the Ellis Brook Valley above the Sixty Foot Falls and the spur to the north of this valley, the valley through which Mills Road passes, and the western and southern slopes of Bungendore Park. These areas all require particularly careful management, with the control of bush fires requiring special attention, and they should be managed primarily for conservation, with some provision (e.g. narrow walking paths) for recreation activities. The impact of trail-bikes is currently a problem.

The high recreation value of the area stems from the variety of activities for which it is attractive. These include walking, picnicking, sight-seeing, nature study, rock climbing on both natural and man-made rock faces, and the use of trail-bikes in disused quarries. Currently popular areas include Lesmurdie Falls and the Bickley Valley. The rock faces at Churchman Brook provide a valuable resource for rock climbers, both in rescue training and for recreation. The portions of the Scarp under consideration are particularly important in that they provide an almost continuous north-south open space link, adjacent to major residential areas, and within easy access by major roads and by public transport.

Scenically, these portions of the Scarp contrast with other areas which have been partly cleared, developed for residential use, or which are dissected by east-west or north-south roads. The Scarp

forms a natural skyline behind much of the city, and provides panoramic views over the city and the Coastal Plain and even as far as Garden Island. The 'Armada Common' area provides a visual backdrop to the rural holdings of the valleys to the north and south. From the ridges and spurs along the Scarp there are attractive views into adjacent valleys, for example, Ellis Brook and the Sixty Foot Falls, Mills Road Valley, the Canning River and Churchmans Brook, Neerigen and Carradine Brooks, and the rugged Wungong Gorge.

The concept of a 'regional park', as discussed in Chapter 5 of this Report is relevant. The Scarp is extremely valuable to the entire Perth region as a resource for conservation and recreation, and its scenic value is very high. As it falls within a number of local government areas, overall co-ordination of management is necessary.

Although much of the vegetation is in its natural state, ground flora has been disturbed or destroyed in places, as a result of clearing, grazing, gravel extraction and rubbish disposal. However, revegetation of some of the gravel pits in Bungendore Park has already begun. Some of these sites may be suitable as picnic areas.

There are several SEC powerlines in the area, and more are proposed. The area may also be affected by proposals for a gas pipeline, a tunnel from Wungong dam, which may have its exit within Reserve A4561 (Bungendore Park), and the upgrading of Welshpool Road. Roads in the area should be excluded entirely from the valley south of Crystal Brook and the Ellis Brook Valley and no further roads should be constructed in the Bickley Valley and the Mills Road Valley. Portion of the area is within the Alcoa Mining Lease but has no potential for bauxite mining. There are deposits of white clay immediately south of Bungendore Park. Portions of the Scarp are affected by prime aggregate quarries, the aggregate being important for concrete production, building and road construction. There is currently some pressure by quarry companies to expand, especially into the ridge between Ellis Brook Valley and Mills Road Valley. Although this land is 'reserved' by the MRPA under the Metropolitan Region Scheme, there is some doubt about the legalities concerned. The MRPA's Basic Raw Materials Resources Committee is currently investigating quarrying on the Scarp, for the Minister for Urban Development and Town Planning. In investigating alternative quarry sites the Committee should take into account several criteria including cost of extraction of rock, visibility from the Coastal Plain and from other locations on the Scarp, effect on recreation use patterns and the floristic value of any uncleared land.

The MRPA, following its Stage A South-East Corridor Report, is 'reserving' western and southern extensions to Bungendore Park to include Wungong Gorge, comprising Locations 49, 54, 59, 62, 93, 94, 97, 98, 144, 196, 198 to 202, 239, 291, 307, 309, 538, 553 and 632, all freehold land (Figure 150F). This 'reservation' would enhance the value of the Scarp as a potential regional park, as the valley floor would provide an area suitable for more intensive recreational use than is desirable elsewhere along the Scarp.

The discussion of the Darling Scarp in Chapter 6 is relevant.

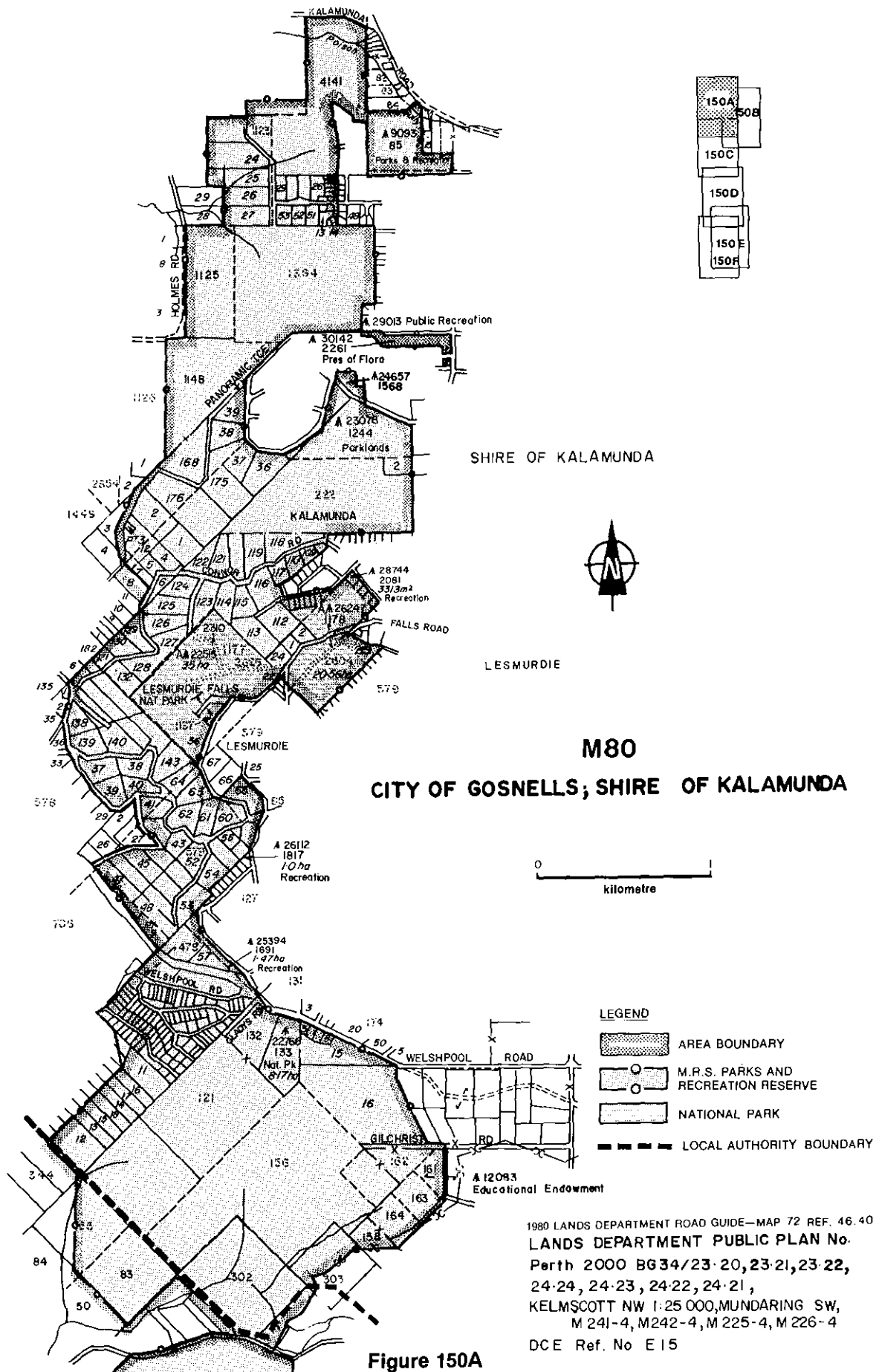
Recommendations

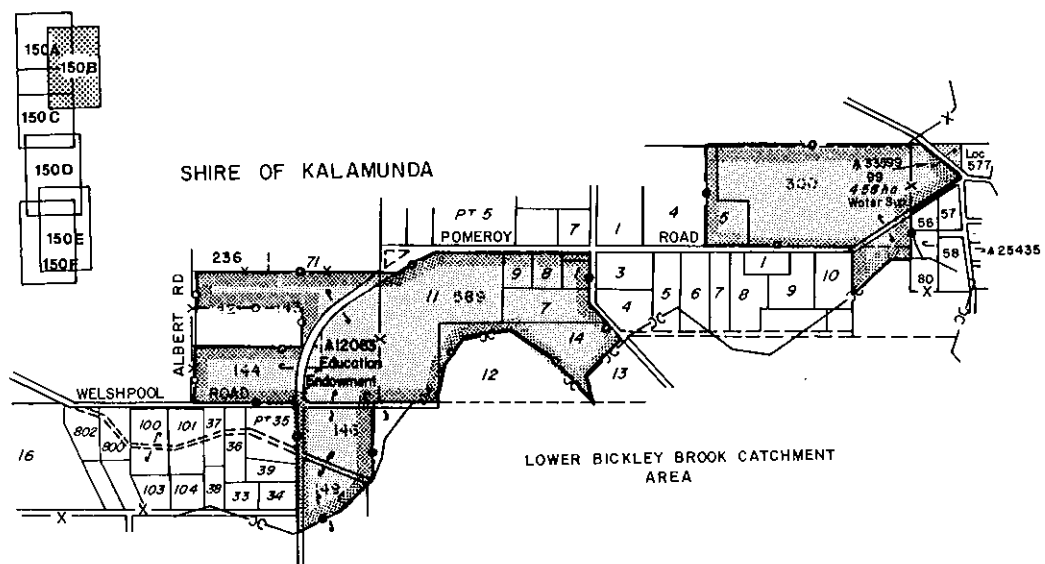
- M80.1 The area within the stippled boundaries shown in Figures 150A to F should be considered as a potential regional park.
- M80.2 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.
- M80.3 The Metropolitan Region Planning Authority, in consultation with the relevant authorities and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) concentrating recreational activities and vehicular access away from floristically important localities, for example, at the top and base of the Scarp;
 - (b) ensuring that vehicular access is not continuous north-south along the Scarp and that only non-motorised activities are permitted off any sealed roads;
 - (c) developing narrow walking paths but not horse riding trails in floristically important areas;
 - (d) developing disused quarries and gravel pits either for recreational use (e.g. picnic sites) or through rehabilitation of their native flora;
 - (e) ensuring that no more gravel is extracted from Reserve A4561.
- M80.4 Until such time as the regional park concept may be incorporated in legislation, a committee for the area should be set up by the Metropolitan Region Planning Authority to advise appropriate authorities and interested parties.
- M80.5 The Metropolitan Region Planning Authority's Basic Raw Materials Committee should give consideration to:

- (a) the high conservation, recreation and scenic values of this portion of the Darling Scarp and the planning and management objectives of the managing body/bodies;
- (b) the comparative cost and marketability of aggregate quarried elsewhere on the Darling Scarp;
- (c) the need to limit the visual impact of quarrying and other developments;
- (d) rehabilitation of quarry sites after extraction is complete.

M80.6 The vacant Crown land adjacent should be added to Reserve A4561.

M80.7 The operators of existing and new quarries on the Scarp should be required to present proposals to the responsible authority, outlining options for use of the quarry when extraction is complete, and to implement the option selected in its operation and after closure.





LEGEND

AREA BOUNDARY

M.R.S. PARKS AND RECREATION RESERVE



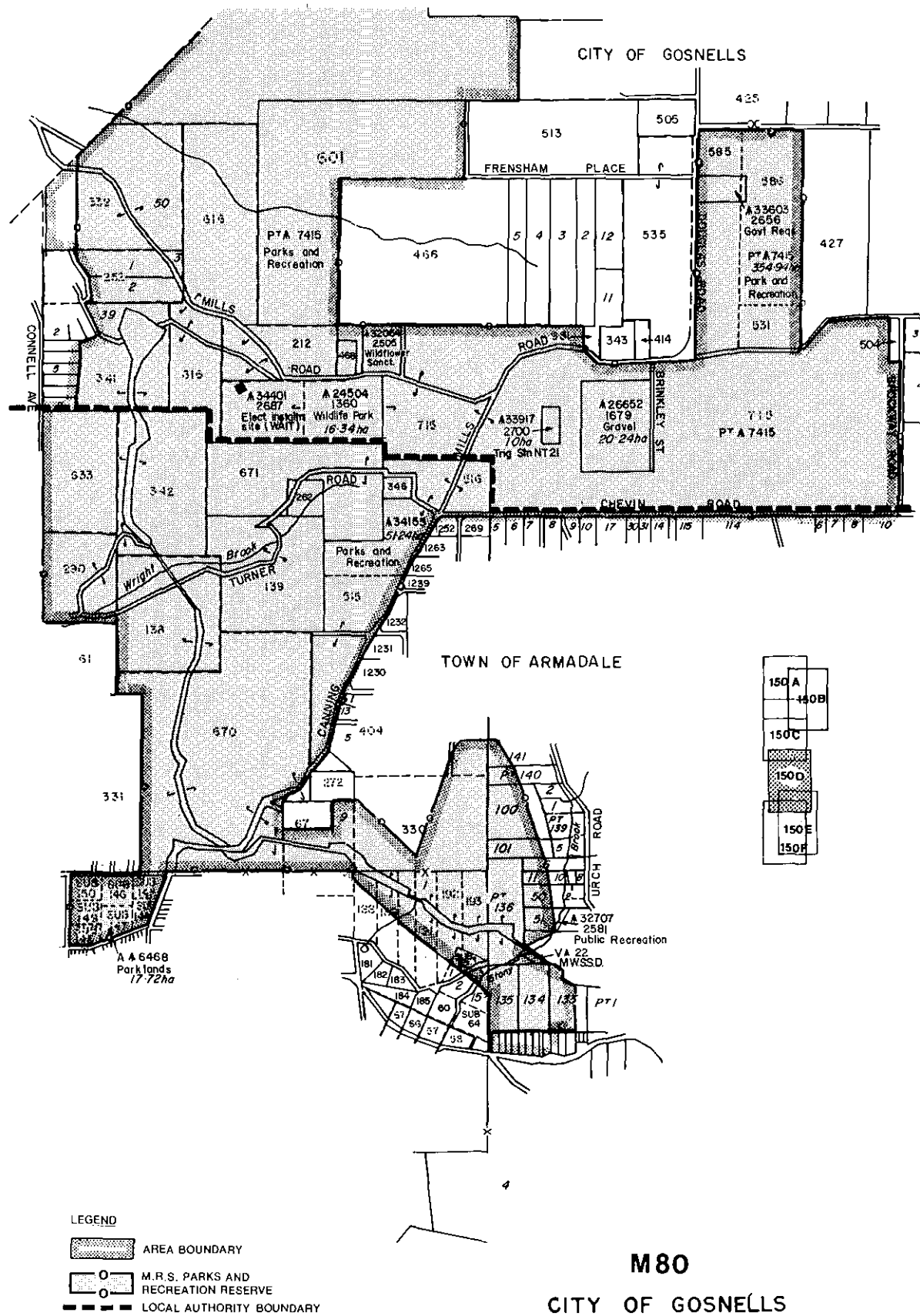
M80

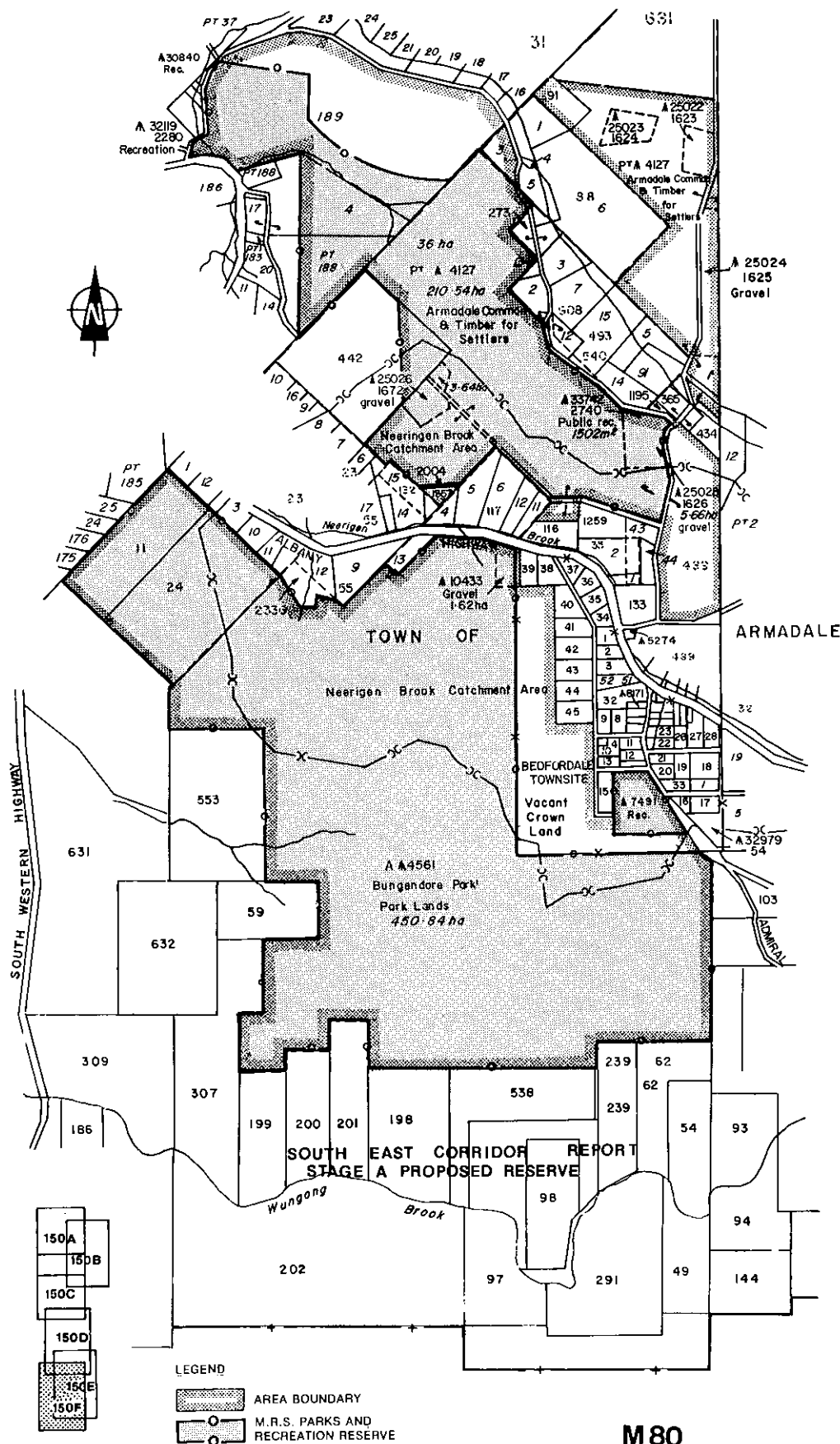
SHIRE OF KALAMUNDA

0 1
kilometre

1980 LANDS DEPARTMENT ROAD GUIDE—MAP 72 REF. 50.36
LANDS DEPARTMENT PUBLIC PLAN N°
K 2-4, K 1-4, K 18-4,
DCE Ref. No E 15

Figure 150B





1980 LANDS DEPARTMENT ROAD GUIDE—MAP 102REF. 46.06
 LANDS DEPARTMENT PUBLIC PLAN No
 K161-4, K193-4
 DCE Ref. No E17

Figure 150F

M80
TOWN OF ARMADALE
 0 1
 kilometre

The area comprises Reserves C19662, for Timber, and C32728, for Government Requirements, both not vested. It is situated south of Karragullen and the Brookton Highway (Figure 151).

Recommendations

- M81.1 The purpose of Reserve C19662 should be amended to Conservation of Flora and Fauna, and the Reserve should be vested jointly in the W.A. Wildlife Authority and the Town of Armadale.
- M81.2 Reserve C32728 should be cancelled and its area added to Reserve C19662.

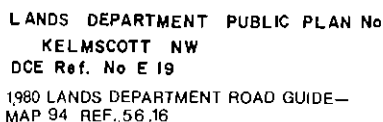


Figure 151

M82 RESERVE C5704, WUNGONG

Reserve C5704, for Timber, not vested, is situated to the east of Wungong Brook dam site and south of Bedforddale (Figure 152).

The Reserve is in a highly dissected area of the Darling Range with several streams passing through it. The predominant vegetation is open-forest of jarrah and marri, which is typical of the area. The creek bank vegetation is an outstanding feature. It consists of a fringe of low-woodland of Moonah paperbark and swamp banksia with a dense understorey. *Boronia molloyae*, a northern outlier of a species found mainly near the south coast, is common. Near the creeks there are several granite outcrops with their associated vegetation, and there are some excellent stands of black gin on the slopes.

A number of species in the area are fire-sensitive and need to be protected. Timber is currently being cut on the higher slopes of the Reserve. Some small areas in the northern end have been cleared, apparently for gravel extraction.

The Reserve is within the Wungong Dam Catchment.

Recommendations

M82.1 The purpose of Reserve C5704 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the Minister for Water Resources.

M82.2 The Minister for Water Resources should consult the Forests Department in regard to possible management of the Reserve by the Forests Department, and consideration should be given to not extending timber cutting downhill toward the valley floor.

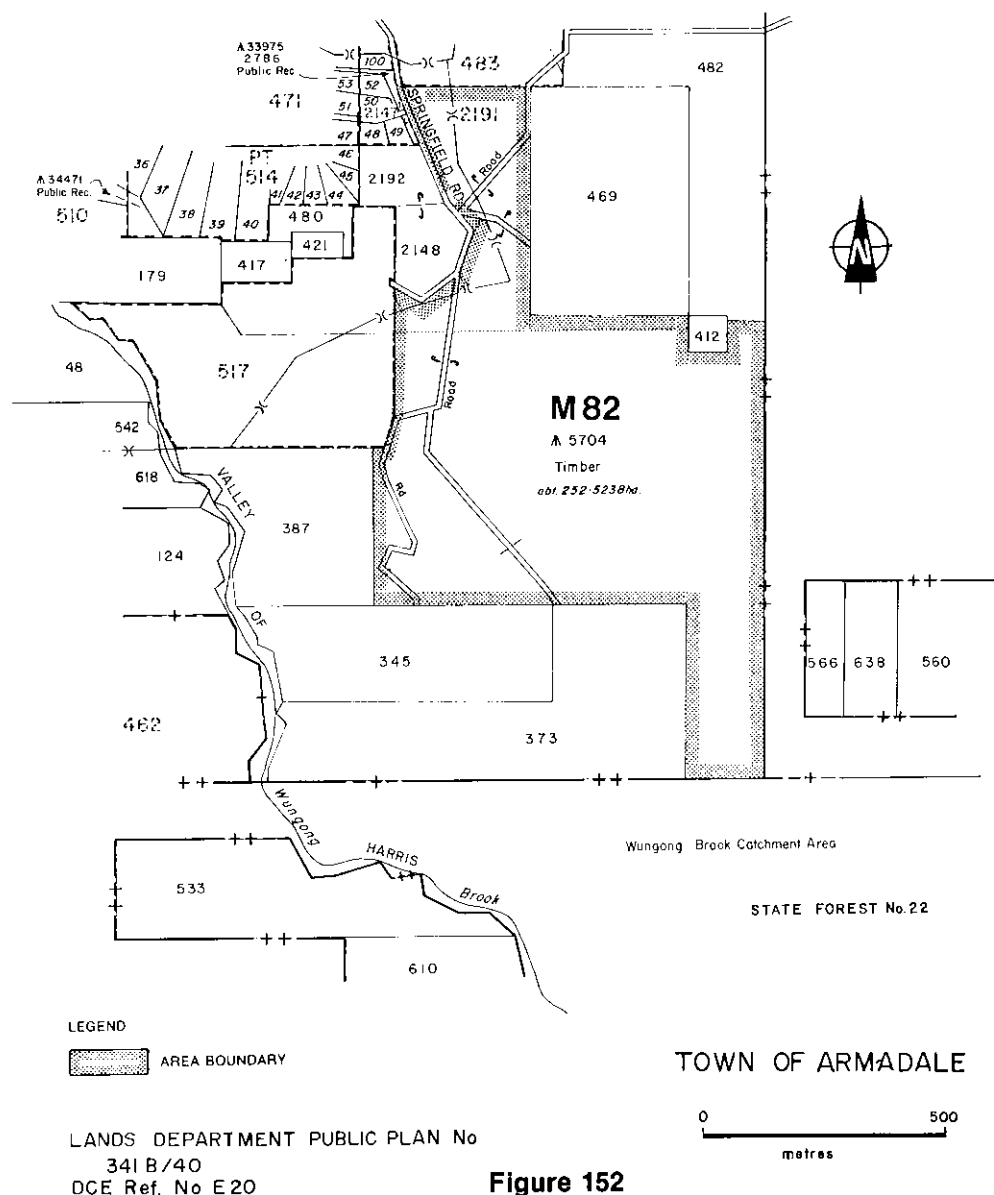


Figure 152

M83 RESERVE C2457, MUNDIJONG

Reserve C2457, for Parkland and Recreation, vested in the Shire of Serpentine-Jarrahdale, is situated about 3 km south-west of Mundijong (Figure 153).

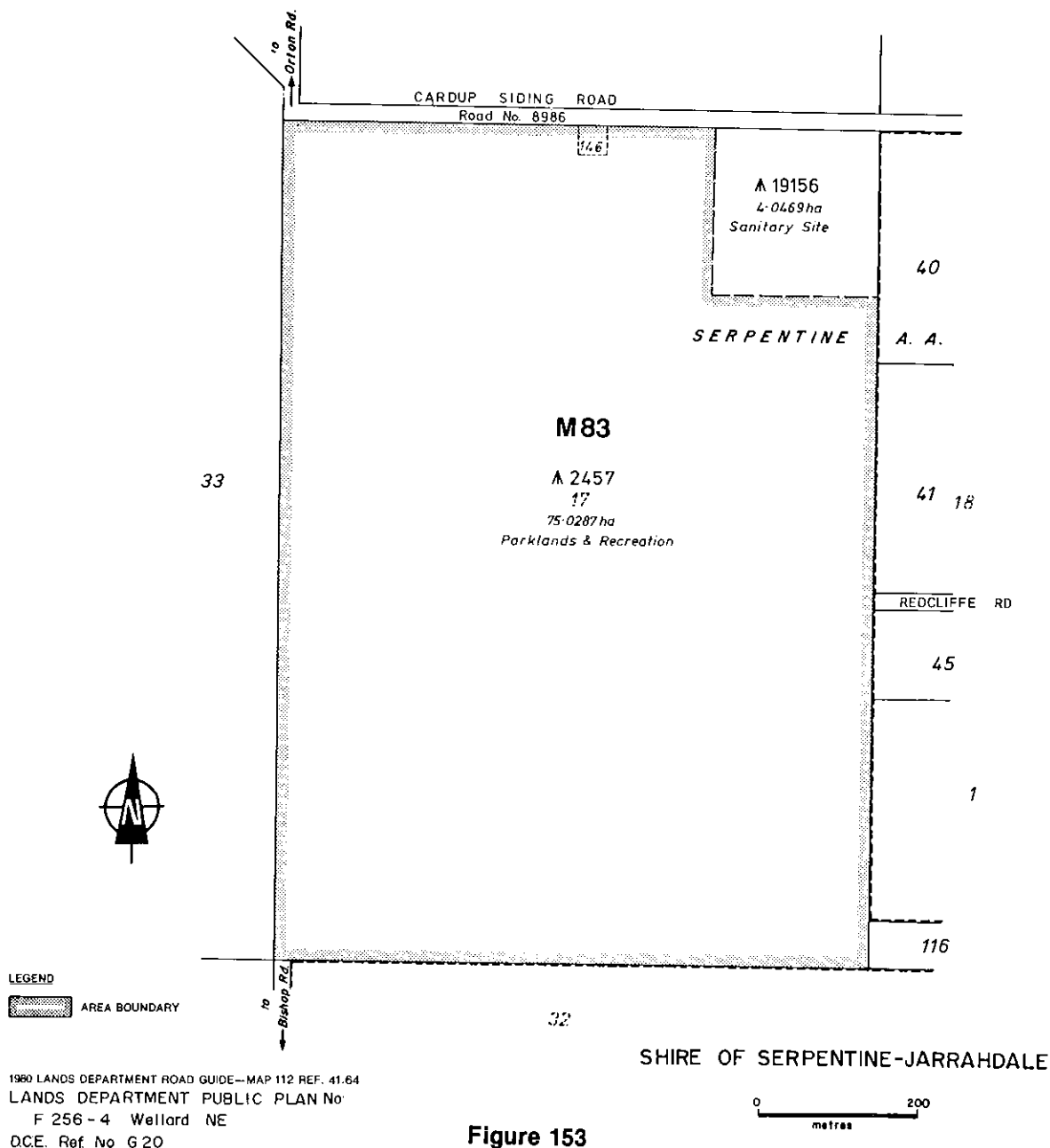
The Reserve is relatively flat. It has alluvial soils, little of which occur in conservation reserves, this being the largest area of that type available for conservation on the Coastal Plain. A low open-forest covers the Reserve, with an upper storey of jarrah, woody pear, slender banksia and bull banksia. The understorey is quite diverse and includes some species that are not common on the Coastal Plain, examples being *Astroloma stomarrhena*, *Gompholobium knightianum* and *Pronaya elegans*.

The Reserve is within a potential artesian intake area and any MWB groundwater extraction may affect water levels. There may be SEC lines in the area, which has potential for clay, loam and sand. However, there are no existing claims.

Recommendations

M83.1 Subject to the agreement of the controlling body, the purpose of Reserve C2457 should be amended to Conservation of Flora and Fauna, and Mining, and the Reserve should be vested jointly in the Ministers for Fisheries and Wildlife, and Mines.

M83.2 The Geological Survey of Western Australia should give a high priority to the early evaluation of the mineral potential of Reserve C2457.



M84 GOORALONG MANAGEMENT PRIORITY AREA (MPA 8.4)

The area comprises Gooralong MPA, managed by the Forests Department for conservation of flora and fauna; Reserves B988, for Rockingham Jarrah Timber Company, not vested; and B990, for Camping, vested in the Shire of Serpentine-Jarrahdale; Cockburn Sound Locations 178, 306, 333 and 624, freehold land held in the name of the Crown; and Cockburn Sound Location 68, privately owned freehold land. It is situated about 40 km south-east of Perth (Figure 154). The area has been used by schools for education purposes and by the army.

The MPA's purpose is to conserve the high quality virgin forest of jarrah-marri and the yarri in the gullies.

The area, which consists of deeply dissected lateritic uplands, is drained by the Gooralong Brook.

The upland vegetation includes open-forest of jarrah and marri, with an understorey of bull banksia and snottygobble. The valleys consist of open-forest of jarrah and marri with some yarri and a shrub understorey. Wandoo woodlands occur on the Darling Scarp. Some of the area within the MPA is uncut and relatively undisturbed. Dieback has been recorded, but is mainly restricted to the valleys.

As the area is readily accessible and close to Perth it is well used by the public. Recreation includes camping and bush-walking.

The area is within the Serpentine River Water Reserve, a source of water supply. A dam is to be built below the junction of Carralong and Gooralong Brooks on the Serpentine River. Public access may be restricted by Catchment Zone regulations.

The area is within the Alcoa Mining Lease, but has little significance for bauxite. Alcoa should consider not mining the area. It is desirable that army training should be relocated elsewhere.

Recommendations

- M84.1 Subject to the agreement of the controlling body, the purpose of Reserve B990 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the Conservator of Forests and managed as if part of Gooralong Management Priority Area.
- M84.2 The purpose of Reserve B988 should be amended to Conservation of Flora and Fauna and the Reserve should be vested in the Conservator of Forests and managed as if part of Gooralong Management Priority Area.
- M84.3 The freehold land held in the name of the Crown should be managed by the Forests Department as if part of Gooralong Management Priority Area.
- M84.4 If Recommendation M84.1 is implemented and if alternative camping facilities are required, the Forests Department should consult the Serpentine-Jarrahdale Shire Council and other relevant authorities for the purpose of land exchange.
- M84.5 Subject to the agreement of the controlling body, that portion of Gooralong Management Priority Area situated between Cockburn Sound Location 361 and 436, should be excised and added to Reserve A28862 (see M85).
- M84.6 The Forests Department, in consultation with the National Parks Authority, the Metropolitan Water Board, the Department for Youth, Sport and Recreation and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) the need for fire protection;
 - (b) only allowing recreation activities which are compatible with the conservation of flora and fauna;
 - (c) the phasing out of army training programmes.

M85 SERPENTINE NATIONAL PARK

The area comprises Reserves A28862, for National Park, vested in the National Parks Authority; C26079 and C26080, for Gravel, both vested in the Shire of Serpentine-Jarrahdale; C32201, for Government Requirements and C32202, for Conservation of Flora and Fauna, both not vested; Cockburn Sound Locations 79, 143, 251 to 257, 260 to 262, 272, 274, 299, 331, 347, 425, 436, 1748, privately owned freehold land; and Cockburn Sound Locations 69, 361 and 463, freehold land held in the name of the Crown. It is situated about 45 km south-east of Perth (Figure 154). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. That part of the area situated on the face of the Darling Scarp is included in an area indicated by the MRPA to have significant landscape merit, which should eventually be 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The area consists of deeply incised lateritic uplands. It is drained by the Gooralong Brook and the Serpentine River. Two rare species of trees occur in the National Park: butter gum on the slopes and salmon white gum at the foot of the Darling Scarp.

The upland vegetation includes open-forest of jarrah and marri, with an understorey of bull banksia and snottygobble. The valleys contain open-forest of jarrah and marri with some yarri and a shrub understorey. Wandoo woodlands occur on the Darling Scarp. Dieback has been recorded, mainly in the gullies.

Cockburn Sound Location 262, which adjoins the Park, provides spectacular views and supports extensive stands of rock sheoak.

The National Park is small and has lengthy and indented common boundaries with cleared and uncleared freehold land. Management difficulties exist as a result of frequent uncontrolled fires, straying stock and the invasion of exotic plant species.

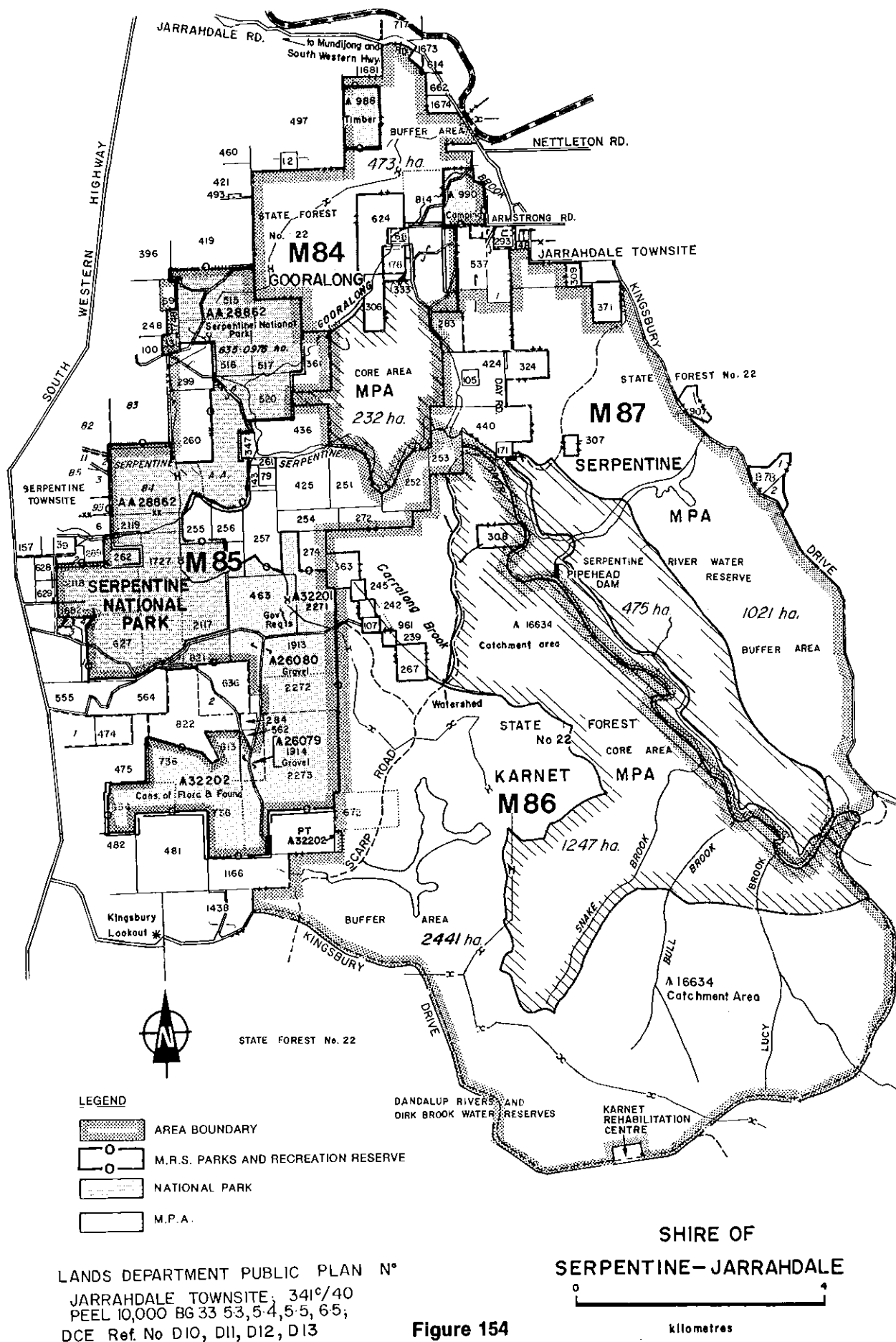
Since the National Parks Authority's manpower is limited, reduction of the ratio of Park boundary to area, through inclusion of adjacent reserves and freehold land in the Park, would make the area more viable as a National Park.

Because of its accessibility and attractiveness, the area is important for recreation and education. Recreational use is currently focussed on the Serpentine Falls, a popular swimming spot. Both conservation and recreation could be accommodated by careful zoning. The concepts of 'regional parks' and 'scenic rivers', as discussed in Chapter 5 of this Report, are relevant to Serpentine National Park.

Most of the northern section of the area is within the Serpentine River Water Reserve, a source of water supply. The area may be affected by a proposed pipehead dam just below the confluence of Carralong and Gooralong Brooks on the Serpentine River. This would inundate Cockburn Sound Locations 79, 143, 251, parts of 254, 257, 347, 425 and 436, and a historic homestead. Public access would be restricted by Catchment Zone regulations. The area may be affected by an SEC combined water supply and pumped storage installation, to be sited south of the proposed pipehead dam. The area is within the Alcoa Mining Lease, but has little significance for bauxite mining.

Recommendations

- M85.1 Subject to the agreement of the controlling body, Reserves C26079 and C26080 should be cancelled and their respective areas added to Reserve A28862.
- M85.2 Reserves C32201 and C32202 should be cancelled and their respective areas added to Reserve A28862.
- M85.3 The freehold land, held in the name of the Crown, should be added to Reserve A28862.
- M85.4 Subject to the agreement of the controlling body, that part of State Forest No. 22, within Gooralong Management Priority Area and abutting Cockburn Sound Locations 361 and 436, should be excised and added to Reserve A28862.
- M85.5 The National Parks Authority and the Forests Department should consider rationalising the boundaries of the Serpentine National Park and the adjacent Gooralong, Karnet and Serpentine Management Priority Areas (M84, M86 and M87) and co-ordinating the management of the whole area.
- M85.6 The National Parks Authority, in consultation with the Forests Department, the Metropolitan Water Board, the Department for Youth, Sport and Recreation and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) the need for fire protection;
 - (b) only allowing recreation activities which are compatible with the conservation of flora and fauna;
 - (c) developing educational programmes;
 - (d) safeguarding the scenic value of the waterfall.



M86 KARNET MANAGEMENT PRIORITY AREA (MPA 3.8)

The area comprises Karnet MPA, managed by the Forests Department for the conservation of flora and fauna; part of State Forest No. 22, adjoining the north-west of the MPA; Cockburn Sound Location 308, freehold land held in the name of the Crown; and Cockburn Sound Locations 107, 239, 242, 245, 267 and 363, privately owned freehold land. It is situated about 55 km south-east of Perth (Figure 154).

The MPA's purpose is to provide representation of three vegetation types of the western margin of State Forest which have been strongly affected elsewhere by human activity.

The area consists of deeply dissected lateritic uplands supporting open-forest of jarrah and marri. The valleys carry a mixture of jarrah, marri and yarri. A small area on the Darling Scarp includes woodland of butter gum, a relatively rare species. The most northerly pocket of mountain gum occurs just east of Kingsbury Lookout. Although the MPA's buffer zone is badly affected by dieback, salvage logging and numerous tracks, the core is relatively undisturbed.

Recreation in the area includes driving for pleasure, picnicking and bushwalking, but as most of Karnet MPA lies within a gazetted water catchment, recreation areas are strictly controlled. Recreation should be restricted to existing facilities below Serpentine Dam.

Most of the area is within the Serpentine River and Dandalup River Water Reserves, both potential sources of water supply. The area may be affected by proposed SEC lines, a proposed dam on the Serpentine below its confluence with Carralong and Gooralong Brooks, and a proposed pipehead dam on Dirk Brook. Public access would be restricted by Catchment Zone regulations. The area will be affected by MRD gravel extraction. It is within the Alcoa Mining Lease, and has high medium term significance for bauxite mining.

Recommendations

- M86.1 The Forests Department should negotiate with the Metropolitan Water Board with a view to Cockburn Sound Location 308 being managed as if part of Karnet Management Priority Area.
- M86.2 That portion of State Forest No. 22 adjoining the north-west of the area should be managed as if part of the Management Priority Area.
- M86.3 The Forests Department, in consultation with the Metropolitan Water Board and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

M87 SERPENTINE MANAGEMENT PRIORITY AREA (MPA 8.7)

The area comprises Serpentine MPA, managed by the Forests Department for conservation of flora and fauna; part of Cockburn Sound Location 537, freehold land held in the name of the Crown; and Cockburn Sound Locations 105, 171, 283, 307, 324, 424, 440, privately owned freehold land. It is located about 50 km south-east of Perth (Figure 154).

The MPA's purpose is to conserve the vegetation types associated with the flooded gullies.

The area is made up of deeply incised lateritic uplands and moderately incised valleys. The uplands carry open-forest of jarrah and marri, while the gullies support a mixture of jarrah, marri and yarri. Along the edge of the pipehead dam there is open-forest of marri and yarri with shrubs including white myrtle. Serpentine MPA carries three rare plant communities. It is affected in places by dieback, but is of high significance for conservation.

Logging occurred in the 1940s and the area is now covered by a series of tracks. Two scenic drives, Day Road and Kingsbury Drive, are frequently used. For prevention of dieback and catchment pollution, recreation is limited to these drives and to bushwalking. Recreational facilities are limited.

The area is within the Serpentine River Catchment, a source of water supply. It may be affected by a proposed pipehead dam, just below the confluence of Carralong and Gooralong Brooks on the Serpentine River. Public access is restricted by Catchment Zone regulations. The area is within the Alcoa Mining Lease, and has high short term priority for bauxite mining.

Recommendations

- M87.1 The freehold land, held in the name of the Crown, should be managed by the Forests Department as if part of Serpentine Management Priority Area.
- M87.2 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

The area comprises Cockburn Sound Locations 320, 321, 479 and 480, privately owned freehold land; and part of the adjacent railway reserve. It is situated between Serpentine and Keysbrook (Figure 155).

The area is within a potential artesian intake area, which may be used after the year 2000. The area will be affected by widening of the Armadale-Bunbury Road.

M88.1 Westrail should liaise with the Forests Department to protect and increase the numbers of salmon white gum within the railway reserve.

M88.2 The Environmental Protection Authority should draw the land owners' attention to the importance of conserving specimens of the rare salmon white gum on their properties.



M89 WOODLAND EAST OF KEYSBROOK

The area comprises part of State Forest No. 22 and Location 1494, privately owned freehold land. It is situated on the Darling Scarp about 2 km east of Keysbrook and about 60 km south of Perth (Figure 155).

The MRPA has indicated that the area has significant landscape value and should eventually be 'reserved' under the Metropolitan Region Scheme.

Most of the area is open-woodland of wandoo, marri and jarrah. There are six eucalypts not normally found together, and three of these, salmon white gum, butter gum and mountain gum, are rare. The understorey includes boronia, hakea and granite petrophile. Although partly affected by grazing and a dam, this unique combination of species is worthy of preservation.

The area provides magnificent views of the Scarp and the Coastal Plain, and is of historical interest as it contains a very early jarrah logging trail.

Recommendations

M89.1 The above-specified part of State Forest No. 22 should be managed by the Forests Department for conservation of scientific and historical aspects, and education of the public.

M89.2 The Forests Department, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

M90 QUARANTINE STATION AND EXPLOSIVES MAGAZINE RESERVE, WOODMAN POINT

The area comprises the Quarantine Station at Woodman Point (Location 1845) owned by the State Government; Reserves C24305, for Explosives Magazine, vested in the Minister for Mines; A24306, for Recreation and Purposes Incidental Thereto, vested in the City of Cockburn; and lots 16 and 17 and part of lot 15, privately owned freehold land. It is situated about 7 km south of Fremantle (Figure 156).

The area has been studied in depth by the MRPA which has proposed, in its Jervoise Bay Rationalisation Plan, that a botanical reserve should be created incorporating portions of both the Quarantine Station and Reserve C24305; and that the remainder of Reserve C24305 be developed for various recreational purposes.

The vegetation is of outstanding importance as an example of undisturbed coastal vegetation. Garden Island and the coastal strip between Coogee Beach and Woodman Point are now the only places in System 6 that carry significant areas of Rottneest cypress, which was once widespread along the coast on the lee side of the stable dunes. Because of the low incidence of fire in the Quarantine Station, Rottneest cypress is well developed there, since it regenerates rapidly in the absence of fire. The Quarantine Station vegetation consists mostly of low closed-forest of Rottneest cypress, both in pure stands and mixed with acacia and chenille honeymyrtle. A few scattered specimens of quandong are present in the low closed-forest, which has little understorey. In the northern part the structure is open-forest and woodland dominated by tuart. The woodlands contain tall stands of acacia with some quandong and Rottneest cypress.

The vegetation in Reserve A24306 consists of low open-forest of Rottneest cypress, mostly in pure stands but in parts mixed with other shrubs that attain a similar height, such as chenille honeymyrtle. Other species, including berry saltbush, occur as a sparse understorey or round the edges of the woodland. The vegetation in the Reserve, which is readily accessible to the public, is more disturbed than that in the adjacent Quarantine Station area.

Two mammals, the quenda and the western grey kangaroo, are known to occur within the Quarantine Station area.

The concept of a 'regional park', as discussed in Chapter 5 of this Report, is relevant to the area. There are SEC lines in the area and the Quarantine Station contains buildings, roads and grassed areas.

The Department of Resources Development has proposed that Woodman Point should be developed for recreation and Jervoise Bay for ship building.

Recommendations

- M90.1 Subject to the agreement of the controlling bodies, the most biologically important portions of Reserve C24305 and Location 1845 should be excised and declared a Class C Reserve, for the purpose of Conservation of Flora and Fauna, and Recreation, and the Reserve should be vested jointly in the City of Cockburn and the W.A. Wildlife Authority.
- M90.2 Subject to the agreement of the controlling body, the purpose of Reserve A24306 should be amended to Parkland and Recreation.
- M90.3 Subject to the agreement of the controlling body and Recommendation M90.1, the remaining portion of Reserve C24305 should be cancelled and added to Reserve A24306.
- M90.4 The Cockburn City Council and the W.A. Wildlife Authority, in consultation with the Department of Conservation and Environment and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- preserving the indigenous vegetation communities, particularly Rottnest cypress;
 - locating recreation facilities away from vegetated areas;
 - reducing the fire risk.
 - the area's potential for parks and recreation.

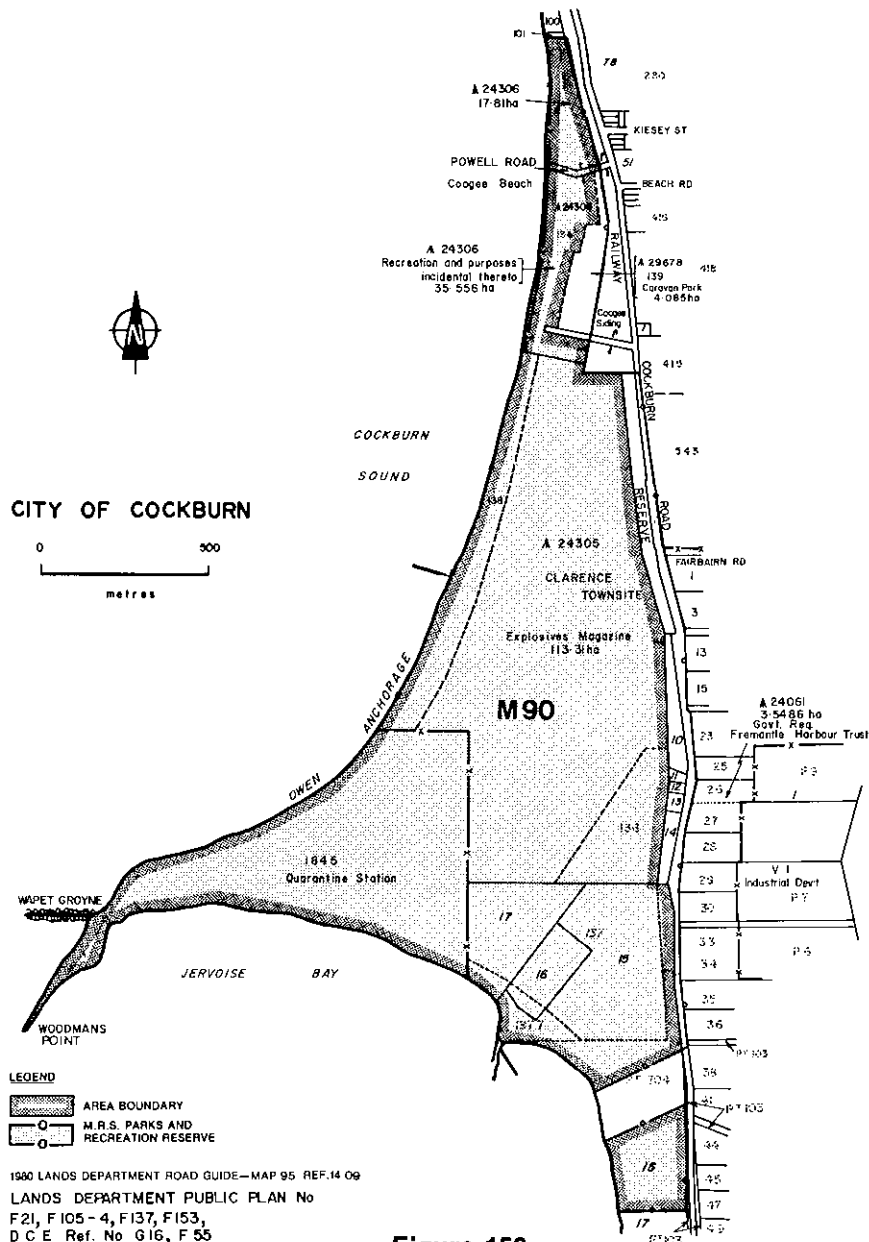


Figure 156

M91 RESERVE A24309, COOGEE

The area comprises part of Reserve A24309, for Recreation and Camping, vested in the City of Cockburn. It is situated about 12 km south of Fremantle (Figure 157B).

The area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

The shore is a limestone cliff up to 6 m high, with several sandy beaches at its base. The land on top of the cliff is gently undulating and has shallow sand overlying the limestone. The northern section has been severely degraded by limestone extraction. The remaining vegetation is mostly low closed- to open-heath, with some emergent trees, including slender banksia and limestone marlock, and at least fifty species of native plants, including parrot bush, spider-net grevillea and coral vine. A few areas on top of the cliff carry a very low heath. The vegetation is mostly in good condition, and in spring makes a colourful display.

Use of the area is largely confined to a few picnic spots and access tracks.

Recommendations

M91.1 Subject to the agreement of the controlling body, the purpose of the southern portion of Reserve A24309 should be amended to Recreation.

M91.2 The Cockburn City Council, in consultation with the Department of Conservation and Environment, should prepare a management programme, giving consideration to encouraging the growth and regeneration of local indigenous flora.

M92 COCKBURN WETLANDS — WESTERN CHAIN

The area comprises Reserve C26870, for Recreation, not vested; part of Location 83, lot 9 (Location 3), lot 61 (Location 81), lot 10 (Location 84), part of lots 11 and 65 (Location 109), part of lot 2 (Location 102), lots 1, 21, 27, 37, 50, 78 and part of lots 35 and 36 (Location 280), lot 38 (Location 150), and part of Location 133, freehold land mostly owned by the MRPA (**Manning Lake**); Reserve C22227 for Drainage, not vested; part of lots 1 to 4, 7 to 9, 14 to 19, 23, 50 and 505 (Location 2), lot 23 (Location 951), lots 1 and 3 and part of lot 4 (Location P18), part of lots 1, 2, 9, 11 Rockingham Road, 2 and 12 Mayor Road (Location 300), part of lots 19 to 21 (Location P11), lot 23 and part of lots 22 and 24 (Location 154), part of lot 503 (Location P10), part of lots 1 Rockingham Road, 3, 21 to 27, 1 Hamilton Road, 33 to 36 and 52 to 54, all of Location 264, part of lots 17, 18, 21 to 23 (Location 150), privately owned freehold land (**the Market Garden Swamps and surrounding land**); Reserve C30861, for Recreation, vested in the City of Cockburn and part of lots 26 and 27 (Location 404) privately owned freehold land (**Lake Coogee**); Cockburn Sound Locations 1843 and 2197, land owned by the Department of Industrial Development; and part of Locations P13 to P17, privately owned freehold land (**Mt. Brown, Mt. Brown Lake and Brownman Swamp**). It is situated about 12 km south of Fremantle (Figures 157A and 157B).

The MRPA has 'reserved' Manning Lake and surrounding land and most of the Mt. Brown, Mt. Brown Lake and Brownman Swamp area for Parks and Recreation under the Metropolitan Region Scheme. The MRPA has recognised that other land in the area may be suitable for 'reservation' for Parks and Recreation under the Metropolitan Region Scheme.

Manning Lake

The land surrounding Manning Lake has been cleared to within twenty metres of the foreshore. The remaining vegetation consists of swamp paperbark, some tuarts and *Melaleuca teretifolia*. The understorey mainly comprises species of saltmarsh reeds. Samphire covers the lake bed at the northern end of the lake. Manning Lake has been polluted by fertilisers and possibly by horse manure entering the lake, causing a build up of bacteria and an excess of nutrients.

The Market Garden Swamps

The three Market Garden Swamps, which are small, seasonal and highly eutrophic, are all vegetated with paperbark, the structure varying from low closed-forest to low woodland. The predominant understorey species are saltmarsh reeds. The swamp bed of the southernmost swamp is almost covered by two water plants, while those of the other two are partially covered with saltmarsh plants. The Market Garden Swamps are comparatively unimportant for water-birds, but the vegetation is worth preserving since it includes several stands of *Melaleuca cuticularis*, which is rare in the metropolitan area.

Lake Coogee

Lake Coogee is shallow and nearly as saline as sea water. It is also highly eutrophic, the main

source of nutrients probably being fertilisers from nearby market gardens. Except for a narrow strip 5 to 10 m wide little vegetation remains around the lake. It consists mostly of low woodland and low open-forest of saltwater paperbark with some understorey. Wattles and young tuarts are scattered amongst the paperbark along the western shores.

The population of water-birds in Lake Coogee includes grey teal, mountain duck and black duck which loaf on the lake. The great crested grebe and the hoary-headed grebe are also present; the lake's expanse of open, brackish water is ideal for the latter, which appears to breed there. Waders include the white-headed stilt, the red-necked stint and the white-faced heron. A small fish that can tolerate high salinity inhabits the lake.

Brownman Swamp, Mt. Brown Lake and Mt. Brown

Brownman Swamp is a series of seasonal paperbark swamps, surrounded by extensive open-forests of tuart of good quality. To the west is woodland of tuart and banksia with open-heath and shrubland on low limestone hills. The wetlands and the tuart forest have high conservation values.

Mt. Brown Lake is small, saline and usually dry in late summer, but supports several species of water-birds for most of the year. It is fringed with stands of paperbark and tussock sedge, while woodland of tuart and banksia and shrubland dominated by chenille honeymyrtle surround the wetland vegetation.

Mt. Brown and the low limestone hill to the north are covered by open-heath with many species, some rare, typical of the coastal limestone. On the slopes and in the valleys there is deep sand, which supports low woodland and low open-woodland mainly of banksia with some jarrah and limestone marlock. The understorey contains a good variety of species.

The Cockburn Wetlands Study and Woodman Point-Jervoise Bay Study both recommend that the Brownman Swamp, Mt. Brown Lake and Mt. Brown area should be retained for recreation and conservation. The Coogee Air Pollution Study had earlier concluded that this area was not suited for urban use.

As activities on adjacent privately owned land are adversely affecting several of the wetlands, the concept of 'conservation buffer zones', as discussed in Chapter 5 of this Report, is relevant. The concept of a 'regional park' would also be applicable, particularly if the wetland areas form continuous open space. The area is located within the South-West Corridor and will be readily accessible for recreational use.

The MRPA, in its Jervoise Bay Rationalisation Plan, recommended that Cockburn Road should be relocated to pass through the area, essentially along the divide separating the wetlands from the coastal region.

There are SEC lines in the area, and a section north of Naval Base is used for motor sports.

Recommendations

- M92.1 The area within the stippled boundary should be considered as a potential regional park.
- M92.2 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.
- M92.3 The Metropolitan Region Planning Authority, in consultation with the relevant authorities and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
 - (a) preserving the wetlands and fringing vegetation;
 - (b) rehabilitating the Market Garden Swamps and Manning Lake;
 - (c) linking the wetlands by open space;
 - (d) preventing activities (e.g. off-road vehicles) likely to adversely affect the flora and fauna.
- M92.4 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority to include representatives of appropriate authorities and interested parties.

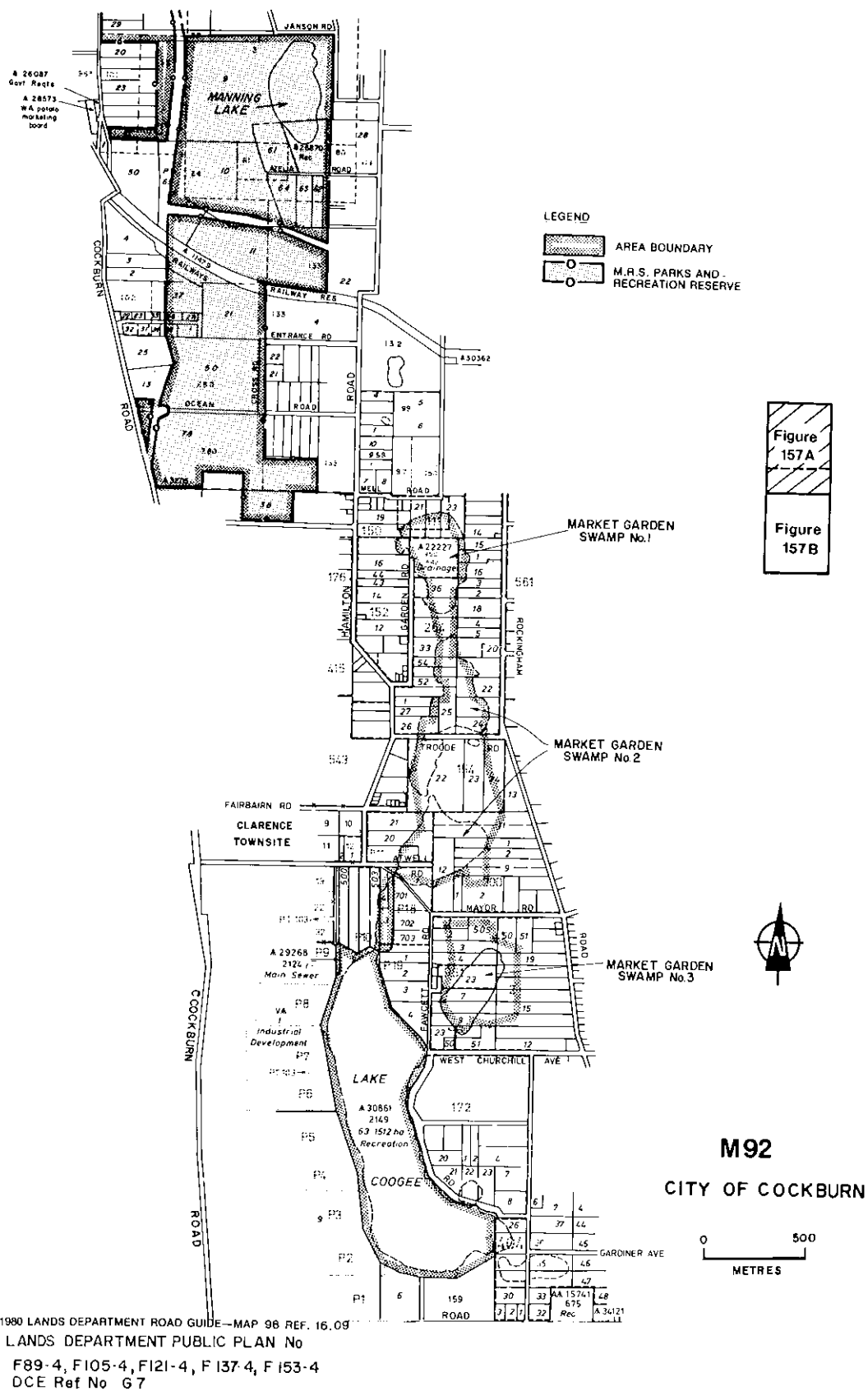
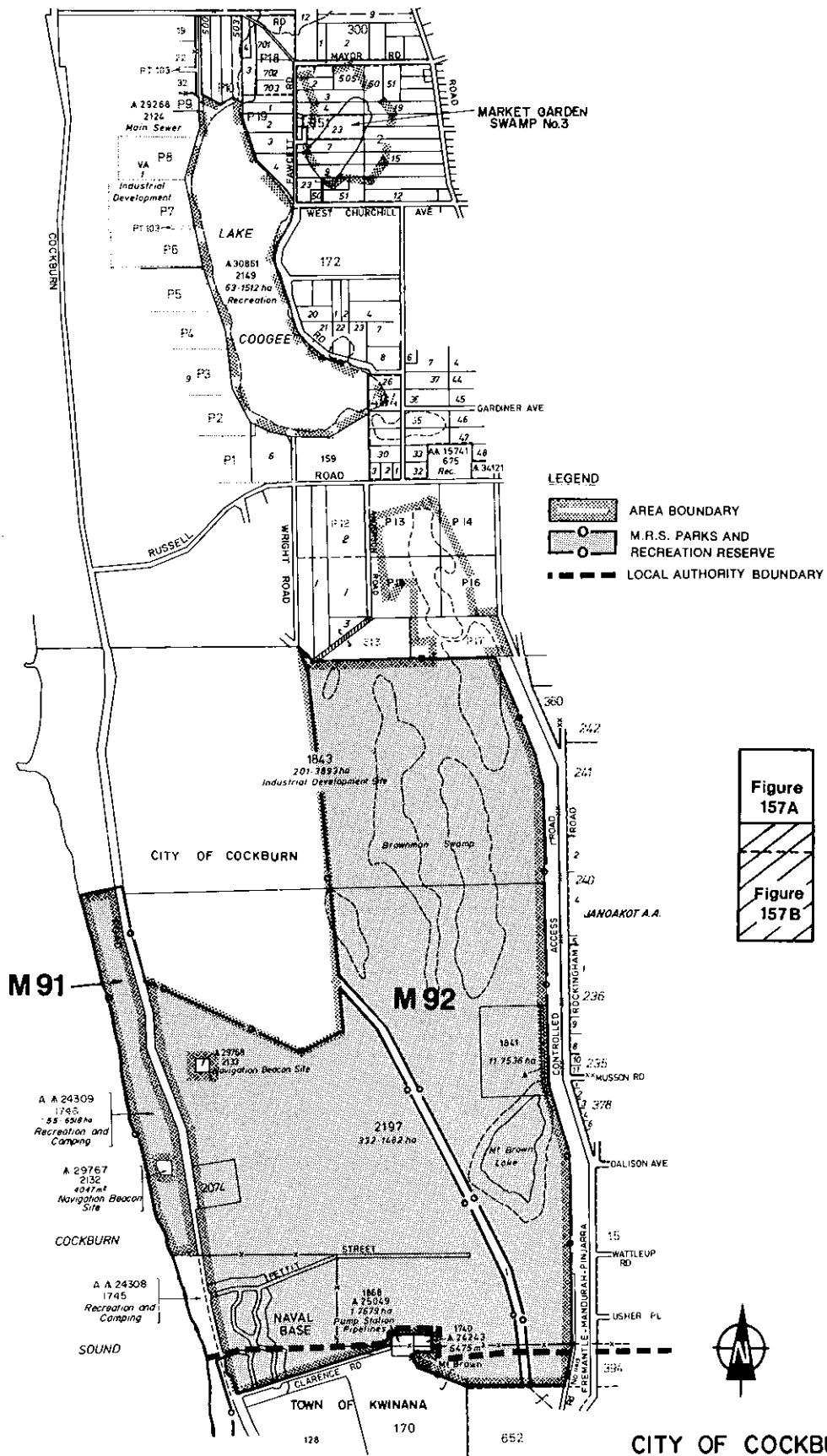


Figure 157A



1980 LANDS DEPARTMENT ROAD GUIDE—MAP 96 REF. 17.02
 LANDS DEPARTMENT PUBLIC PLAN Nos
 F121-4, F137-4, F153-4, F169-4
 DCE Ref. No G8, G24

Figure 157B

M93 COCKBURN WETLANDS — EASTERN CHAIN

The area comprises Reserves A6208, for Recreation, under the control of the Cockburn City Council; C27488, for Hall Site, and part of Reserve C31968, for University Site, both not vested; lots 38, 39, 54 to 59 and part of lot 37 (Location 235), part of lots 1, 4, 7, 52, 53 (Location 10), lots 1 and 2 (Location 405), part of Locations 21, 35, 50, 65, 179, 387, 393, 438, 485, 552 and 772, freehold land mostly owned by the MRPA (**North Lake and Bibra Lake**); lots 2 to 6 (Location 541), part of lots 9, 10, 20 (Location 21), and part of Locations 21 and 542, freehold land mostly owned by the MRPA (**South Lake and Little Rush Lake**); lot 1 and part of lots 2, 5 and 7 (Location 406), and part of Location 298, freehold land partly owned by the MRPA (**Yangebup Lake**); part of Reserve C31829, for Drain, vested in the City of Cockburn; lots 1 to 4, 6 to 9, 12 to 15 (Location 391), lots 1, 7 and 8 (Location 677), Locations 756, 759, 763 and 766, and 769 to 771, and part of Locations 433 and 751 to 755, privately owned freehold land (**Kogolup Lake**); Reserves A15556, for Fauna Conservation and Research and Drainage, vested in the W.A. Wildlife Authority; C29241, for Conservation of Fauna (University Marsupial Research), vested in the Minister for Fisheries and Wildlife; C31882, for Recreation, vested in the City of Cockburn; part of lot 1 (Location 464) and Location 2017, privately owned freehold land (**Thompson Lake and Banganup Lake**); lots 63 to 65, 86 and part of lots 57 and 59 (Location 15), and part of lots 1, 2, 3, 612 and 615 (Location 16), privately owned freehold land (**Wattleup Lake**). It is situated in the City of Cockburn (Figure 158).

Much of the area from North Lake to Yangebup Lake has already been 'reserved' for Parks and Recreation in the Metropolitan Region Scheme. The section from Kogolup Lake to Wattleup Lake is recognised by the MRPA as suitable for possible future Parks and Recreation 'reserves' under the Metropolitan Region Scheme.

Most of the land around the wetlands is uncleared. However, there are areas of pasture, cleared land and market gardens around the wetland fringes. Extensive residential development is planned east of Bibra Lake and west of Yangebup Lake. North, Bibra, South, Kogolup and Thompson Lakes have high conservation value, while Little Rush and Wattleup Lakes and the western shore of Bibra Lake have recreational value.

As the lakes are close to Perth and the area is relatively undeveloped, the concept of a 'regional park', as discussed in Chapter 5 of this Report, is relevant. Alternatively, a National Park may be appropriate. Other relevant concepts include 'pathway systems' and 'conservation buffer zones'. The last named concept would be most applicable to those lakes affected by pollutants. The Cockburn Wetlands Study Report⁴⁵ has recommended that the eastern chain of the Cockburn wetlands be declared the 'Beeliar National Park' named after the Aboriginal tribe from the area.

Some of the lakes are subject to pollution caused by drainage from the Jandakot rural areas, an old sanitary landfill site and industrial effluent. Should urban development occur in the vicinity of these lakes it is probable that the MWB will have to utilise some of them as drainage sumps. This could cause some contamination of the lakes.

North Lake and Bibra Lake

North Lake is mostly open water. In the northern section there are a few small patches of jointed twig rush and of paperbark. Around the western and southern sides of the lake there is a fairly broad band of woodland of flooded gum, associated with paperbark around the fringes of the lake. Only in the south-eastern section has extensive clearing taken place right down to the water. East of the lake and north of Hope Road there are two areas of open-woodland, east of which there is low woodland of paperbark.

Bibra Lake is also mostly open water. In the east there are extensive areas of paperbark. Bordering the open water in the northern and south-western sections there are sedgelands of jointed twig rush and bulrush. In the western section between the lake and the road, there is a fringing belt of flooded gum and paperbark and further north there are about 20 ha of open-woodland of jarrah and banksia, with an understorey containing large numbers of blueboy, prickly moses, zamia and blackboy. Most of the remainder of the area is cleared, much of it used for summer pasture.

Both lakes are semi-permanent and important as summer refuges for water-birds. Good numbers of grey teal, pink-eared duck, shoveller, mountain duck, and white-eyed duck use the lakes, far more than are seen on most other metropolitan lakes. The lakes' expanses of open water favour species such as musk duck, blue-billed duck, coot and hoary-headed grebe.

Bibra Lake is the more important lake, owing to its larger size and greater variety of habitat. The large expanses of closed-scrub of paperbark and nearby muddy shallows provide an ideal habitat for a wide variety of wading birds, one of which, the yellow-billed spoonbill, is uncommon in south-western Australia. The paperbark also provides an ideal habitat for a number of bush birds, including willy wagtail, silvereye, splendid blue wren and western thornbill. This area is of prime importance for preservation since it provides one of the few productive breeding habitats for birds in the metropolitan area.

The area is likely to be subjected to increased pressure for recreation as the population increases. At present, part of the wooded area to the west of both lakes is misused by the public for trail-bikes and cutting of wood. Part of Bibra Lake's western shore has been developed into a popular picnic area and children's playgrounds.

North Lake is threatened as an area for conservation and recreation by the proposed extension of Farrington Road as a dual carriageway around the north of the lake. The Cockburn Wetlands Study recommended that the proposed extension should not be built. The proposed Roe Freeway is planned to run between the lakes. The Cockburn Wetlands Study recommended that the Freeway should be modified to reduce its impact on the wetlands in the area.

Private groundwater extraction and stormwater drainage affect water levels in the area and there is evidence of pollution of the lakes as a result of inflow of nutrient from nearby paddocks and septic systems. The area will be affected by drainage and sewerage works proposed by the MWB. The southern end of Bibra lake was used as a rubbish tip, but this has been closed.

South Lake and Little Rush Lake

South Lake is shallow and extensively covered by reed beds. It is surrounded by a diversity of dense vegetation, which provides a habitat for a wide variety of birds. In the open water aquatic weed attracts large wading birds. The area may be affected by the MRD requirements to construct the proposed Albert-Forrest Road link.

Although the vegetation has been cleared around Little Rush Lake, there is a diversity of habitats providing a summer refuge for water-birds. The lake is ideal for passive recreation (e.g. picnic areas, children's playground) and the disused railway line running through the area could be suitable for a cycle track, linked to nearby urban development.

Yangebup Lake

The vegetation surrounding the lake has died. Although the loss of vegetation has obviously affected some populations of water-birds, the lake has particular value in that it is used by two uncommon species, the pink-eared duck and blue-winged shoveller. Other species of water-fowl that use the lake are grey teal, black duck and white-eyed duck. The red-necked stint, a wader that is seen in great numbers at Yangebup Lake, is rarely observed in fresh water environments. It does not use any of the other lakes in the eastern chain of the Cockburn wetlands. Other species of waders at Yangebup Lake include red-necked avocet and white-headed stilt.

MWB groundwater extraction and water drainage may affect water levels. There are SEC lines in the area. A number of industries, including a tannery, discharge effluents into ponds near the lake.

Kogolup Lake

The lake consists of two separate expanses of water, linked by a low-lying area which is subject to winter flooding. The area supports a wide range of vegetation types, with all of the vegetation types of the Cockburn wetlands being represented. The waters of the lake contain sedgeland, mostly of bulrush, but with smaller areas of jointed twig rush and spike rush, the last named being normally found only in the north-west of Western Australia and in the Eastern States.

Bordering the lake are areas of open-forest and woodland of flooded gum associated with paperbarks, or with undershrub acacia. The rare Hackett's hop bush is another shrub of the understorey, as are broom ballart, stinkbush and native broom.

The surrounding woodland vegetation is varied, since the lake is situated at the junction of two major soil associations. The dense vegetation, particularly to the west, and the relative isolation of Kogolup Lake attract birds which prefer seclusion. Uncommon species have been seen in greater numbers at Kogolup Lake than elsewhere in the Cockburn wetlands. The old drain between Kogolup and Thompson Lakes has a high and diverse population of birds. The north-eastern part of the area is suitable for passive recreation, and is at present used by a riding school.

MWB groundwater extraction may affect water levels. The area has potential for diatomaceous and other earths and is affected by existing claims, although a recent claim was rejected in the Warden's Court.

Thompson Lake and Banganup Lake

Thompson Lake is the largest water body of the Cockburn wetlands and contains about 150 ha of semi-permanent open water. Around the margin of the lake is a narrow belt of sedgeland dominated by jointed twig rush. In the east the sedgeland is flanked by open-scrub of stinkbush and prickly moses, and in the south and west by a narrow strip of bare ground.

In low-lying land to the north and east of the lake is a woodland of flooded gum and paperbark. In the north flooded gum also forms an open-forest with orange wattle as an undershrub. Hackett's hop bush occurs in this association and being fire-sensitive it should be reserved in a number of

populations to ensure its survival. It is apparent that frequent burning has reduced the diversity of vegetation surrounding the lake. Retention of an expanse of tuart-jarrah-banksia forest to the west would provide a valuable buffer zone to the lake.

The lake has an abundance of bird life, both water-fowl and bush birds, forty-four species of the latter having been recorded. Many birds of prey use the area, the most note-worthy being the wedge-tailed eagle.

The Department of Fisheries and Wildlife has drafted a management plan which has taken into account the conservation and educational value of the area, while providing for passive recreation. The Department of Conservation and Environment has endorsed the management objectives and strategies set out in the plan.

MWB groundwater extraction will affect water levels. Increasing quantities of pollutants appear to be entering the lake.

Reserve C29241 which contains Banganup Lake is leased to the University of Western Australia and used extensively for the breeding of marsupials, including the grey kangaroo, brush wallaby, short-nosed bandicoot, brush-tailed possum and quokka, for research purposes.

The area's vegetation types are similar to those at the adjacent Thompson Lake. There are more than three hundred and fifty species of plants in the Reserve. They include two uncommon species, babe-in-a-cradle orchid on the swamp margin, and Hackett's hop bush in the sandy rise near the swamp. The lake does not support many water-birds as it almost always dries up in summer.

MWB groundwater extraction will affect water levels. There are SEC lines in the area.

Wattleup Lake

The lake is within freehold land and the surrounding land includes a thoroughbred stud and a piggery. A variety of birds use the lake for summer loafing.

Although most of the lakeside vegetation is cleared, the southern foreshore is grassed. The uncleared eastern shore makes the lake attractive and picturesque and the owners are keen to prevent further deterioration of vegetation. The lake has recreation value, and is included in land which has value for residential development.

Recommendations

- M93.1 The area within the stippled boundary should be considered as a potential regional park.
- M93.2 The Metropolitan Region Planning Authority should consider 'reserving' the area from Kogolup Lake to Wattleup Lake for Parks and Recreation under the Metropolitan Region Scheme.
- M93.3 The Metropolitan Region Planning Authority, in consultation with the relevant authorities and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- (a) ensuring that the lakes are managed primarily for conservation of flora and fauna and/or recreation;
 - (b) encouraging the growth and regeneration of local indigenous flora and preventing further deterioration of the vegetation;
 - (c) retaining the diversity of wetland types;
 - (d) establishing adequate buffer zones around the wetlands, particularly around South Lake to protect it from industrial and major road developments;
 - (e) establishing adequate recreational facilities, and allowing only recreation of low impact consistent with the purpose of conservation of flora and fauna;
 - (f) limiting development on the eastern margins of North and Bibra Lakes to facilities for nature study;
 - (g) providing access appropriate to usage, including walk and cycle tracks linking the lakes as a linear access system;
 - (h) preventing use of any part of the area for sanitary landfill.
- M93.4 Reserves, both existing and future, should include Water as a purpose.
- M93.5 The Nomenclature Advisory Committee should be requested to consider applying the name 'Beeliar' to the above-mentioned area, when it has been declared a regional park.
- M93.6 Until such time as the 'regional park' concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority, to include representatives of appropriate authorities, and interested parties.
- M93.7 The recommendations of the Cockburn Wetlands Study, that Farrington Road should not be extended around the north of North Lake and that the proposed Roe Freeway be modified to reduce its impact on the wetlands in the area, are endorsed.

LEGEND

-  AREA BOUNDARY
-  M.R.S. PARKS AND RECREATION RESERVE
-  LOCAL AUTHORITY BOUNDARY



M93

CITY OF COCKBURN
TOWN OF KWINANA



1980 LANDS DEPARTMENT ROAD GUIDE—
MAP 97 REF. 23.08

LANDS DEPARTMENT PUBLIC PLAN No
F75, 91, 107, 123, 139, 155, 171, 187-4
D C E Ref. No F54, G9, G10, G11, G12

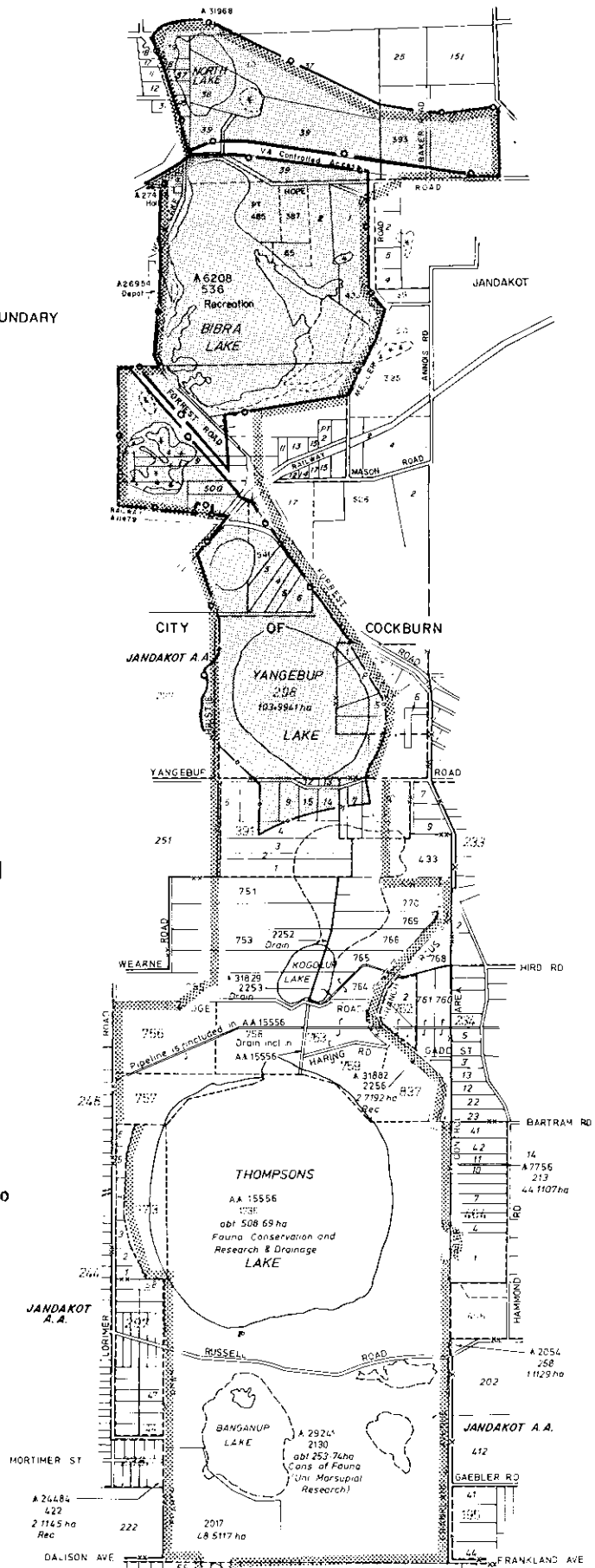
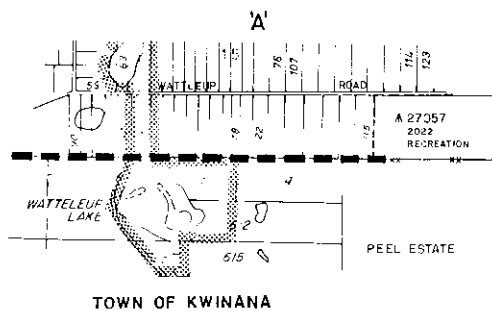


Figure 158

Joins 'A'

M94 JANDAKOT AIRPORT

The area comprises Jandakot AA lots 127, 161 to 165, 295, 411, 438 and parts of Locations 126, 128, 129, 159, 160, 168, 439 and 440, freehold land owned by the Commonwealth of Australia (Figure 159).

Over half of Jandakot Airport is uncleared. The vegetation is predominantly low open-forest of banksia, sheoak, Christmas tree and pricklybark, and in the north-eastern section low woodland of paperbark with swamp banksia and Christmas tree. One of the understorey species, *Leucopogon kingianus*, is an unusual heath known from only three other localities, all of which are vulnerable to surrounding development. The vegetation is undisturbed, with a dense understorey, which is largely due to the effective system of fire breaks within the airport.

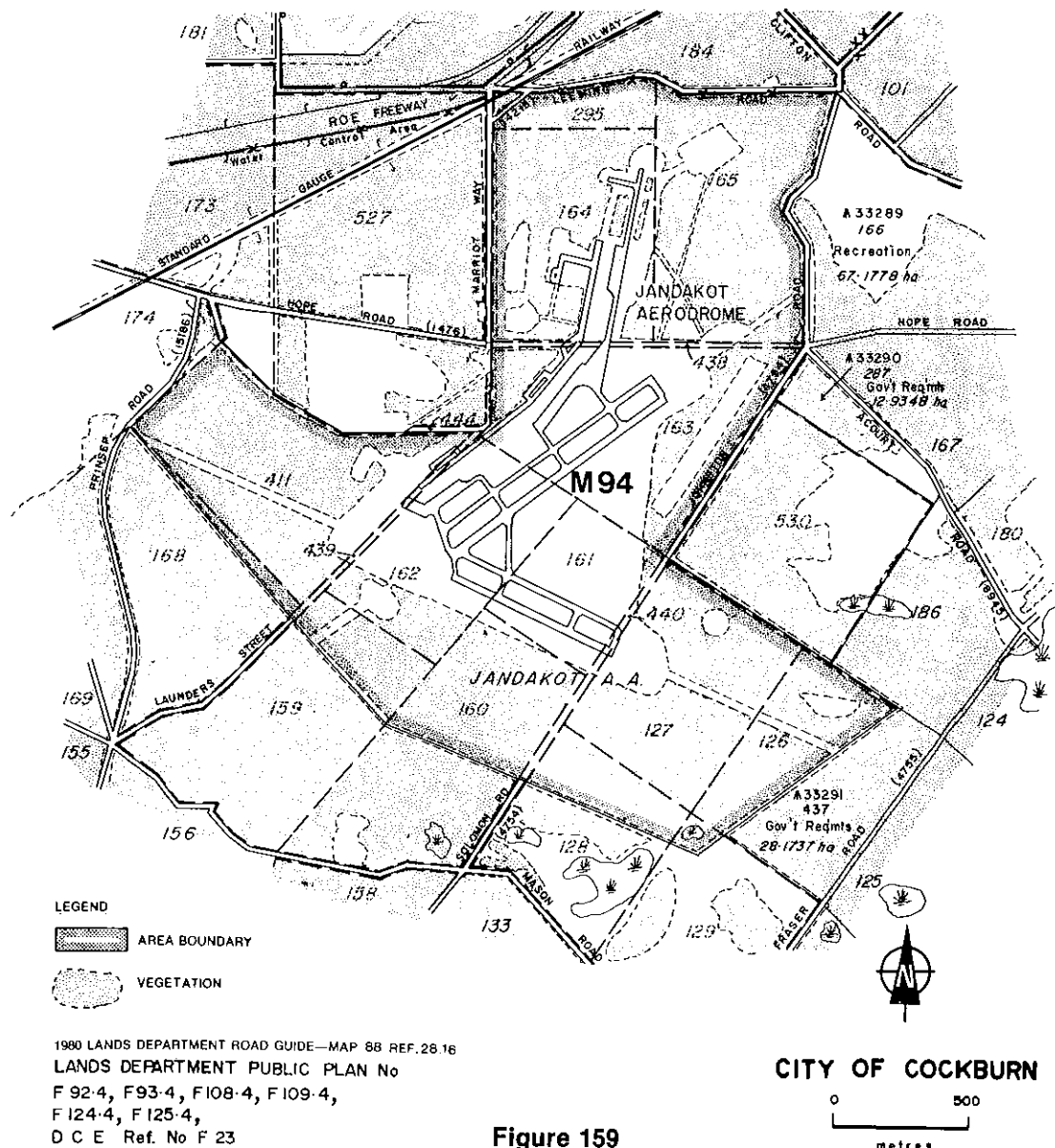
The airport's fauna includes the ant *Iridomyrmex conifer* which has disappeared from many localities around Perth.

Private groundwater extraction may affect water levels. There are drainage works and SEC lines in the area. Further drainage works have been proposed.

Recommendation

M94.1 The Commonwealth of Australia in consultation with the Department of Conservation and Environment should prepare a management programme, giving consideration to:

- the retention, where possible, of uncleared sections of vegetation;
- encouraging the growth and regeneration of local indigenous flora.



M95 FORRESTDALKE LAKE

The area comprises Reserves A24781, for Protection of Flora and Fauna and Recreation, vested in the W.A. Wildlife Authority; and C27165, for Recreation, vested in the Town of Armadale with power to lease; Jandakot AA lots 267, 276 to 284, privately owned freehold land; part of Jandakot AA lots 11, 13 and 15, and lot 7 Location 322, which has been purchased for inclusion in Reserve A24781. It is situated about 7 km west of Armadale (Figure 160).

The vegetation around the lake consists mostly of low closed-forest of swamp paperbark, with some spearwood. There are also patches of open-forest of flooded gum with a few Christmas trees. Lot 7 contains a dense stand of swamp paperbark.

The lake is a valuable water-fowl habitat. Although it has dried out during recent summers, it provides a rich feeding area as it dries and is also used by large numbers of birds during winter and spring.

The inclusion in Reserve A24781 of the seasonal swamps to the west and south would help safeguard the diverse wildlife habitats and water-fowl breeding areas. Long-necked tortoises are common.

Lake Forrestdale and its surrounds are attractive for passive recreation, including some aquatic activities. Due also to the lake's size and proximity to the South-East Corridor, the concept of a 'regional park', as discussed in Chapter 5 of this Report, is relevant.

MWB groundwater extraction may affect water levels. This is being monitored by the Department of Fisheries and Wildlife. There are SEC lines in the area and a main road to the east has been proposed.

Recommendation

M95.1 The W.A. Wildlife Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.

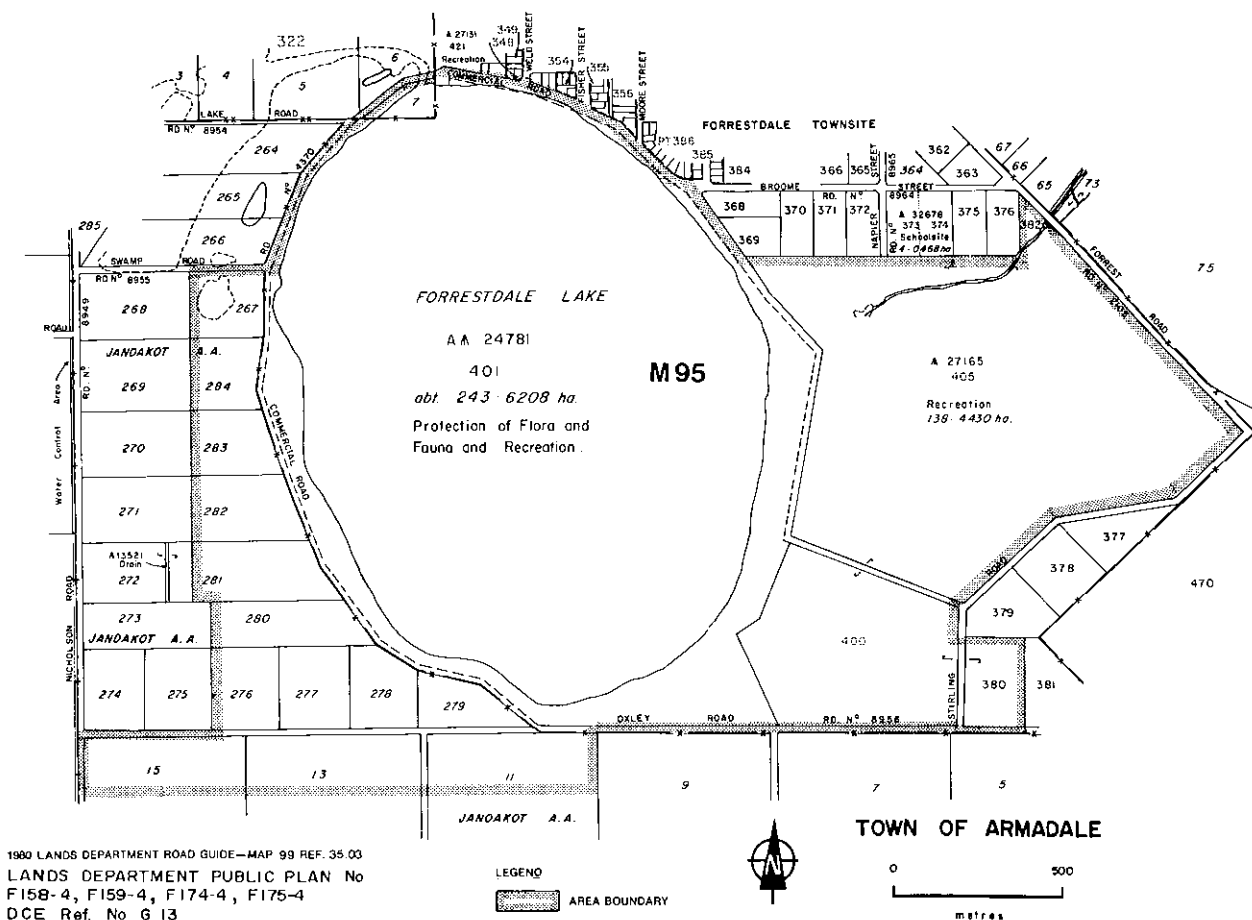


Figure 160

M96 GARDEN ISLAND

Garden Island, owned by the Commonwealth of Australia, is situated a few kilometres north-west of Rockingham (Figure 161). It is being developed as a naval base.

The island consists of a hard core of calcareous dune rock of Pleistocene Age which is largely covered by more recent sand dunes.

In his voyage of exploration in 1827 Captain James Stirling was impressed by the island's potential as a naval station, protecting vessels at anchor in Cockburn Sound. When he returned to the Swan River Colony as its Governor two years later, Stirling selected the whole of Garden Island as part of his land grant. The first settlers landed there and spent the winter of 1829 in huts at Cliff Head before moving to the mainland. The island is therefore very significant historically.

The island's vegetation differs significantly from the mainland in both structure and species representation. The vegetation is remarkable for three reasons. Firstly, certain important families on the mainland are either absent or represented by few species. Secondly, pure stands of Rottnest cypress such as occur on the island are rare. Thirdly, the structure of much of the vegetation with its single storey and closed canopy is rare elsewhere and contrasts markedly with the three distinct storeys of the woodland communities on the mainland.

More than ninety per cent of the vegetated portion of the island is covered in low closed-forest or closed-scrub of acacia, Rottnest cypress, Rottnest tea-tree and chenille honeymyrtle. Most of the cypress and tea-tree occur in the northern half of the island. One section, north of Collins Point, appears not to have been burnt for about sixty-five years and is especially important as an example of undisturbed coastal vegetation. This section is probably similar to the vegetation seen on Rottnest Island by the early explorers. Over half the island is dominated by acacia species, with undergrowth usually present but generally restricted to a few species. Rottnest cypress covers about eight per cent of the island. It forms pure stands as well as mixed stands with Rottnest tea-tree. The undergrowth is very limited, and the ground is carpeted with a thick layer of leaf litter. Rottnest tea-tree occurs as pure stands over about seven per cent of the island, where the formation is similar in character to the Rottnest cypress formation. Along the western side of the island there are small areas of closed-heath, the dominant plants of the various associations including boobialla.

The tammar, a small wallaby, once widespread in the south-west but now rare, is found mainly on Garden Island. Its population, estimated at about seven hundred and seventy, is threatened with possible extinction by feral cats. The island supports a number of species of birds and reptiles which are becoming rare on the mainland. Of importance are the brush bronzewing, which has disappeared from Rottnest Island and from much of its former range in the south-west, the lined skink, which is known only from Rottnest Island, Garden Island and a few southern suburbs of Perth, and the carpet snake.

The conservation value of the island, particularly the northern section, is high because of the undisturbed coastal vegetation with an unusual structure, and because of the rare flora and fauna. There is an increasing demand for greater public access, by ferry and vehicle, and for provision of accommodation on the island. Increased numbers of visitors, if not strictly controlled, will cause further damage to the island's flora and fauna.

Garden Island has limestone deposits and potential for lime sands, but there are no claims. The sand cannot be extracted because of legal problems involved in mining Commonwealth land, and in use of the causeway linking the southern end of the island to the mainland, since access is restricted to naval personnel.

The Commonwealth of Australia has proposed that a large naval munitions depot should be sited on Garden Island to the north of Collins Point.

The Garden Island Environmental Advisory Committee has drafted and initiated a management programme for the island.

Recommendation

M96.1 The Garden Island Environmental Advisory Committee, in its management programme, should give consideration to:

- (a) the conservation of flora and fauna, particularly the outstanding vegetation to the north of Collins Point and the tammar;
- (b) the prevention of fires;
- (c) the elimination of feral cats;
- (d) the provision of suitable recreation facilities, and the control of recreation use of the island;
- (e) the development of and increased public access to the historical site at Cliff Head;
- (f) siting the proposed munitions depot, if developed, to the south of Cliff Head.

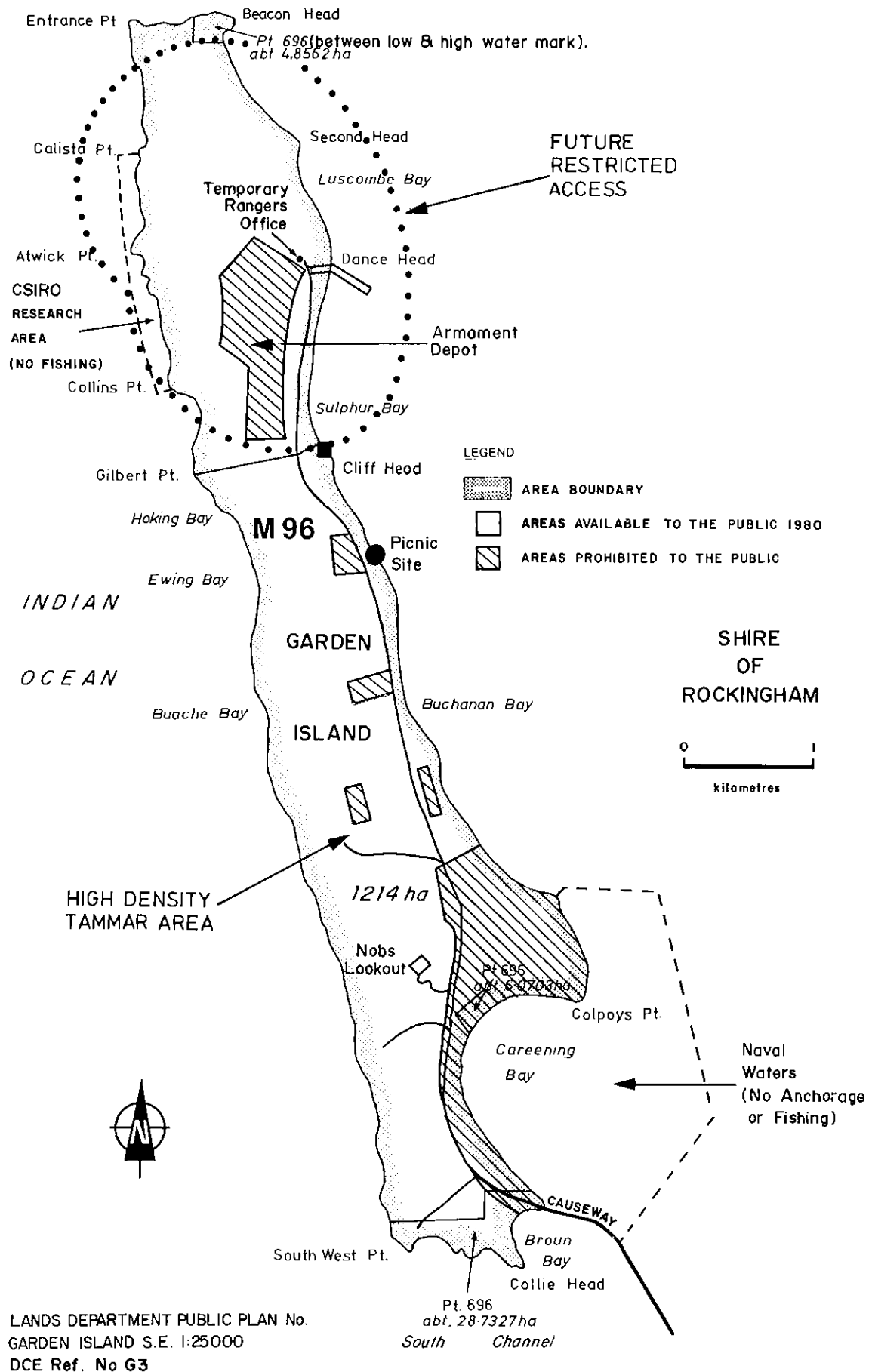


Figure 161

M97 RESERVE C36110, WANDI

Reserve C36110 for Quarry, vested in the Town of Kwinana, is situated about 5 km north-east of Orelia (Figure 162).

The Reserve contains an undulating area of grey sands and is in an undisturbed condition. The vegetation is a low open-forest of jarrah and sheoak with tall shrubs, including stinkwood and spearwood. The lower storey comprises a variety of species, including a number of orchid species and the rare epacrid *Brachyloma preissii*, which is confined to the Coastal Plain near Perth and has not been recorded from any other reserve.

The Reserve is within an area for possible unconfined groundwater extraction. There may be SEC lines in the area and there is a mineral claim for silica sand.

Recommendations

M97.1 Subject to the agreement of the controlling body, the purpose of Reserve C36110 should be amended to Conservation of Flora and Fauna, Water and Mining, and the Reserve should be jointly vested in the Ministers for Fisheries and Wildlife, Water Resources, and Mines.

M97.2 The Geological Survey of Western Australia should give a high priority to the early evaluation of the mineral potential of Reserve C36110.

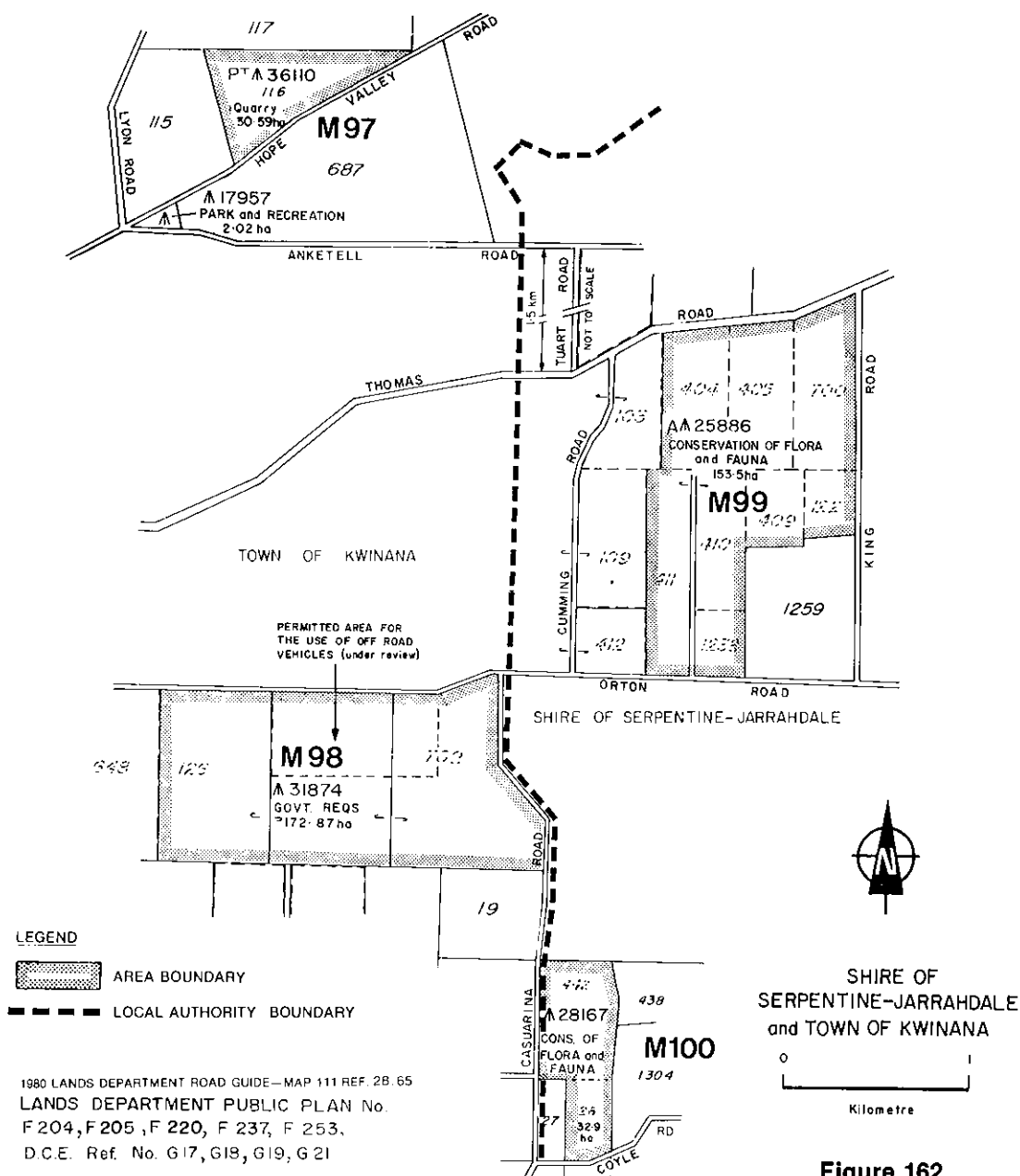


Figure 162

M98 RESERVE C31874, CASUARINA

Reserve C31874, for Government Requirements, not vested, is situated about 4 km east of the suburb of Orelia (Figure 162).

The landform consists of consolidated dunes. The vegetation is open-woodland of jarrah, sheoak, Christmas tree and banksia. The Reserve is a good habitat for orchids and research on orchid pollination has been undertaken nearby. It is important to retain representative habitats to support the insect populations involved in such pollination.

In October 1979 approximately 60 hectares in the north of the Reserve was designated for the use of off-road vehicles. Use of that permitted area has since been suspended, while the effect of the off-road vehicles is further assessed. MWB groundwater extraction may affect water levels. There are SEC lines in the area.

Recommendation

M98.1 The purpose of Reserve C31874 should be amended to Conservation of Flora and Fauna and Water and the Reserve should be vested in the W.A. Wildlife Authority.

M99 RESERVE A25886, WEST OF BYFORD

Reserve A25886, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority is situated about 9 km west of Byford (Figure 162).

The vegetation is mainly open-woodland and is dominated by three species of banksia. Other trees include jarrah, sheoak and Christmas tree, and the understorey includes blackboy and zamia. There are several swampy areas dominated by Moonah paperbark. The vegetation is undisturbed and in good condition.

The Reserve is within a possible artesian intake area. MWB water extraction may affect water levels.

Recommendation

M99.1 Subject to the agreement of the controlling body, the purpose of Reserve A25886 should be amended to Conservation of Flora and Fauna, and Water.

M100 RESERVE C28167, SOUTH-WEST OF BYFORD

Reserve C28167, for Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority, is situated about 10 km south-west of the suburb of Orelia (Figure 162).

The Reserve contains grey sands and vegetation characteristic of the Coastal Plain. The vegetation includes a low open-forest of jarrah and woodland of jarrah and banksia. A small swamp in the southern section contains Moonah paperbark.

The Reserve provides habitats for a variety of wildlife, especially birds. It is important for conservation purposes as it contains vegetation typical of a district which is being increasingly cleared. The Reserve is bounded by partly cleared land on its northern and western sides and by a sand quarry on its eastern side.

The Department of Fisheries and Wildlife has prepared a draft management plan with a view to maintaining the conservation values of the Reserve and establishing it as a research area.

The Reserve is in an area for unconfined groundwater, extraction of which could affect water levels.

Recommendation

M100.1 Subject to the agreement of the controlling body, the purpose of Reserve C28167 should be changed to Conservation of Flora and Fauna, and Water.

M101 CAPE PERON, SHOALWATER BAY AND WARNBRO SOUND

The area comprises Reserves A17070, for Recreation and Camping, vested in the National Parks Authority; and C24204, C31893 and C31894, for Conservation of Fauna, all vested in the W.A. Wildlife Authority; and an island between White Rock and the mainland, Passage Rock, First Rock and Second Rock, being vacant Crown land. It is situated off the coast between Rockingham and Port Kennedy (Figure 163).

The waters around Cape Peron contain a variety of marine habitats ranging from sheltered seagrass meadows to more exposed limestone reefs and cliffs with tidal and sub-littoral reef platforms. The fauna and flora of the reefs exhibit well marked patterns of zonation. The range of reef and seagrass communities are of high value in the teaching of ecological principles, being close to the metropolitan area and easily accessible, in contrast to offshore islands.

Reserve C27853, at Cape Peron, is used intensively for recreational activities most of which are based on the beaches and near-shore waters. With increasing use of the recreation reserve in recent years, there has been severe diminution of rock fish inhabiting the inshore reefs. Abalone, once plentiful on reef platforms, have almost disappeared. There is a need to protect the marine life around the Reserve, with people being free to dive and view the seascape but not to remove fauna or flora, nor to damage the substrate.

Penguin Island has a similar flora to the slightly larger Carnac Island (C46).

The islands of Shoalwater Bay and Warnbro Sound and Carnac Island, are the most northerly nesting area for the little penguin. At least seven other species of birds nest here. The Sisters and Tub Rocks groups are important rookeries for the pied cormorant. Being close to the mainland the islands are convenient for research.

Recommendations

M101.1 The area of water extending seaward 1.5 km from low water mark on Reserve C27853, commencing from the line of Boundary Road and extending northwards around Cape Peron to terminate along the western side of the Causeway, as shown on Figure 163, should be declared a Class C Aquatic Reserve and the Reserve should be vested in the W.A. Wildlife Authority.

M101.2 Reserves C24204, C31893 and C31894 should be classified as Class A.

M101.3 The island between White Rock and the mainland should be added to Reserve C24204.

M101.4 The National Parks Authority should prepare a management programme for Reserve A17070, giving consideration to restricting public access.

M101.5 The Department of Fisheries and Wildlife should investigate the biological significance of Shoalwater Bay and Warnbro Sound, particularly the islands not included in reserves, and report its findings to the Environmental Protection Authority.

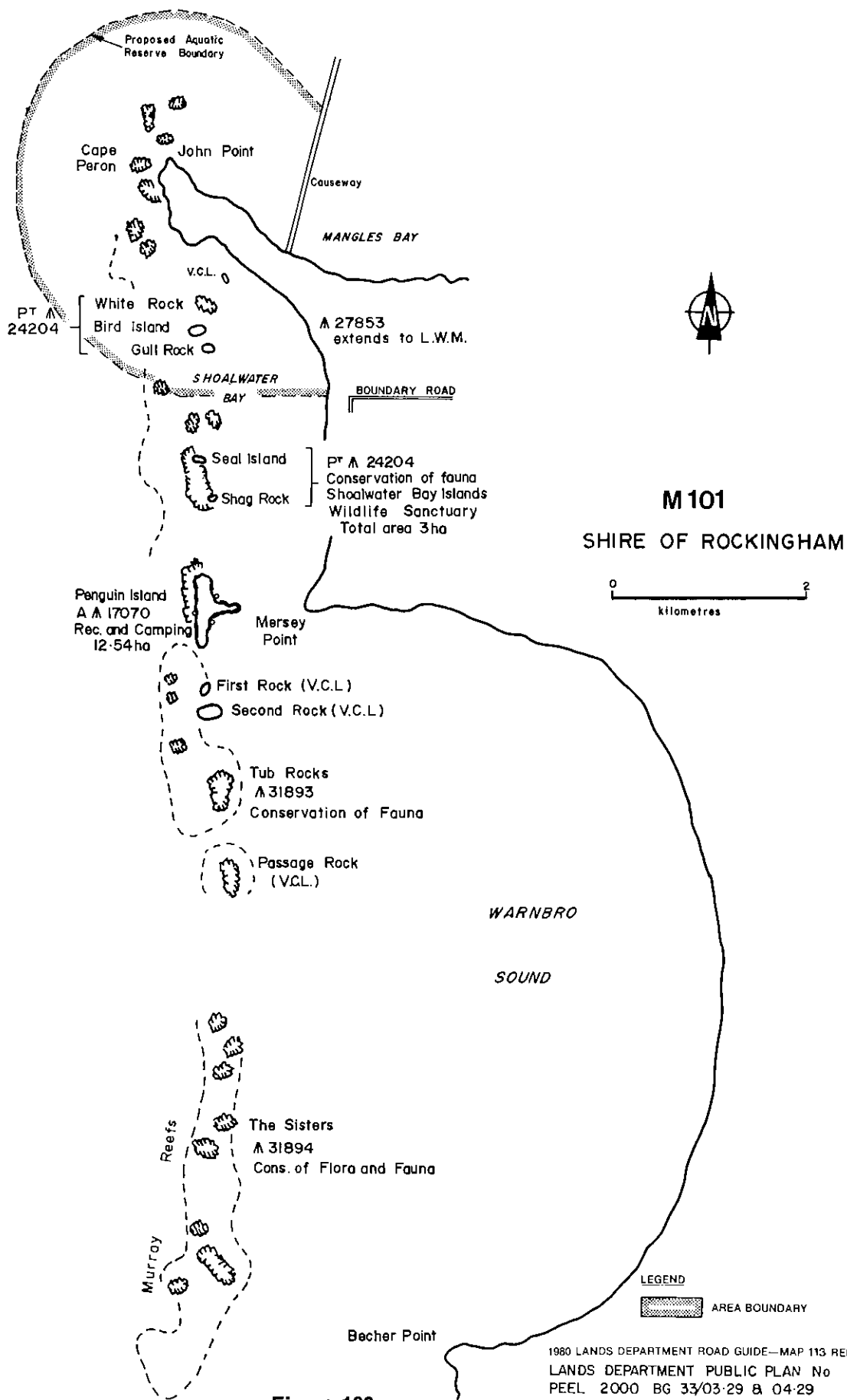


Figure 163

1980 LANDS DEPARTMENT ROAD GUIDE—MAP 113 REF.06.05.
LANDS DEPARTMENT PUBLIC PLAN No
PEEL 2000 BG 33/03-29 & 04-29
D C E Ref. No G 4, G 5

M102 LAKE RICHMOND, ROCKINGHAM

The area comprises Reserves C9458, for Recreation, and C33659, for Public Recreation, both vested in the Shire of Rockingham; vacant Crown land and part of lot 402 (Location 16), privately owned freehold land (Figure 164). The MRPA has 'reserved' part of the area for Parks and Recreation under the Metropolitan Region Scheme.

Lake Richmond is a permanent, fresh lake which was once part of Cockburn Sound, having been cut off during the last four thousand years. It is geologically important because of its unusual origin and because there are well developed stromatolitic structures around the lake edge, particularly on the eastern side.

The shore carries a meadow of sedges and perennial herbs. The lake supports an unnamed species of native mollusc and several species of fish. Gould's monitor dragons and long-necked tortoises occur near the lake. A large variety of birds may be seen on and around the lake. Water-birds include various species of grebes, cormorants, egrets and ducks. Because the lake is permanent it provides a valuable summer refuge for water-fowl. Birds of prey include the osprey, and the peregrine falcon which is scarce in the south-west.

Although surrounded by urbanisation the lake is unspoilt and has high conservation and recreation value. It is used extensively by schools for educational purposes.

Lake Richmond is part of a drainage compensating scheme, with water being pumped from it into Mangles Bay to the north. A controlled access highway is to be constructed over the south-west corner of the area, and a railway line over the north-west section. The area may be affected by water pollution due to storm water drainage from these works.

Recommendations

M102.1 Subject to the agreement of the controlling body, the purpose of Reserve C9458 should be amended to Conservation of Flora and Fauna and the Reserve should be vested jointly in the Shire of Rockingham and the W.A. Wildlife Authority.

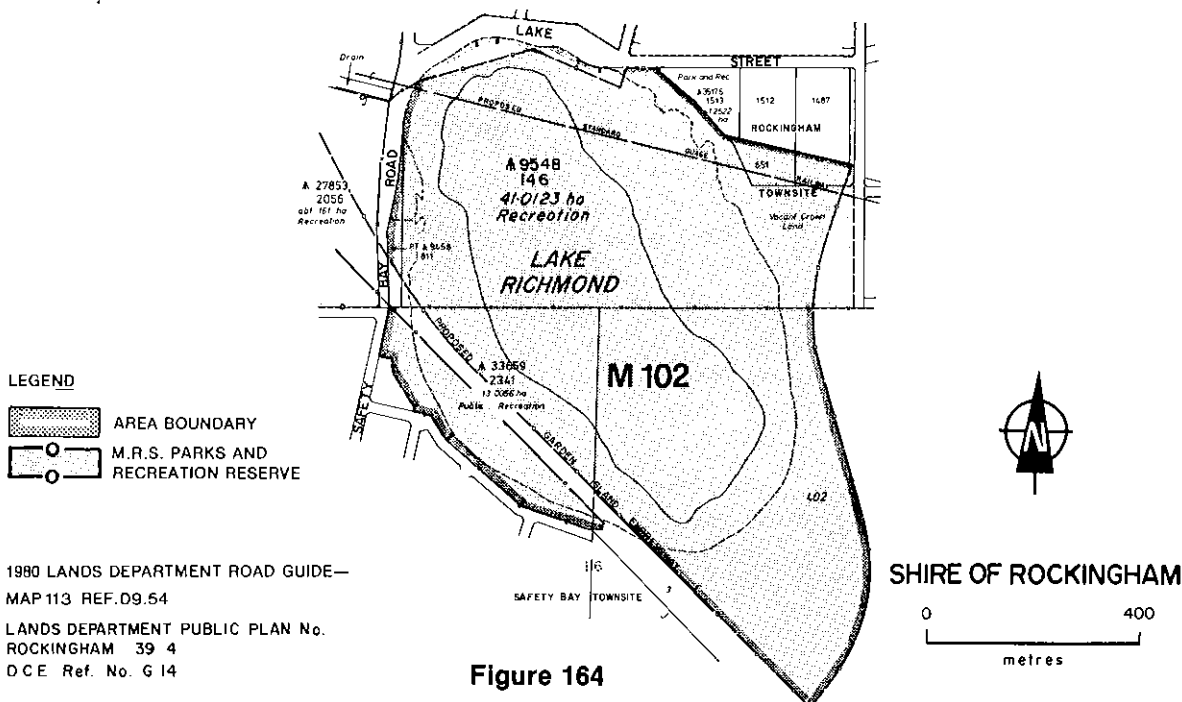
M102.2 Subject to the agreement of the controlling body, Reserve C33659 should be cancelled and its area added to Reserve C9458.

M102.3 The above-specified vacant Crown land should be added to Reserve C9458.

M102.4 The Rockingham Shire Council and the W.A. Wildlife Authority should prepare a management programme.

M102.5 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

M102.6 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



M103 LAKES COOLOONGUP AND WALYUNGUP

The area comprises Reserves A24411 and A23780, both for National Park, and A18452, for Recreation and Picnic Ground, all vested in the Shire of Rockingham; A22429 for Recreation and Parkland, not vested; lots 1 to 21, Dixon Road Subdivision (Cockburn Sound Location 16), lots 1 and 461 (Cockburn Sound Location 16), part of Cockburn Sound Location 16 (to the west of Lake Cooloongup); Peel Estate Lots 314 to 316; 318 to 322, 327, 328 333, 579 to 583, 661, 662, 757, 765, 1127 and part of Peel Estate Lots 317, 334 and 336, all owned by the MRPA; part of Peel Estate Lots 337, 342, 658 and lot 14 of Peel Estate Lot 317, being privately owned freehold land. It is situated about 9 km south-east of Rockingham (Figure 165). Most of the area has been 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. The area is often known as either White Lakes or Rockingham Lakes.

The area includes thirteen different vegetation formations. Lake Cooloongup and the south-eastern section of Lake Walyungup are surrounded by tall open-forest of tuart. On moist soils west and north of Lake Cooloongup the understorey includes swamp paperbark, slender banksia and blackboy. Swamp paperbark also occurs as closed-forest between the two lakes and along their western sides. On dry land south and east of Lake Walyungup there is a large area of tall shrubland and open-heath. The lakes support mixed associations of algae of which stonewort is the most extensive and important. Closed-sedgeland of bare twig rush surrounds both lakes and also covers an extensive area between the lakes. Open-sedgeland dominated by coast saw-sedge extends northwards from Lake Walyungup.

Seventy-three species of birds have been recorded in the area. Species include the little pied cormorant, white-faced heron, grey teal, red-capped dotterel and little grassbird. Water-fowl can be very abundant on Lake Cooloongup during summer. Animal life in Lake Cooloongup includes the water snail, the koonac, an endemic fish and the long-necked tortoise.

Reserve A22429 consists of brown and yellow sand over limestone and the predominant vegetation is tuart woodland. The Reserve has been disturbed and is infested with weeds. It does, however, occupy a high ridge and forms an important backdrop to Lake Cooloongup.

Being a large, attractive area within the South-West Corridor, the recreation pressure on the lakes is likely to increase in the future. The concept of a 'regional park', as discussed in Chapter 5 of this Report, is relevant. The lakes are suitable for a variety of both land-based and aquatic activities. The MRPA has recognised the regional importance of the lakes, and is in the process of defining those areas which have high conservation value and those which could be managed for intensive recreational use.

The lakes are within the area for possible unconfined groundwater extraction which may be used by the MWB before the year 2000. Public access may eventually be restricted by Catchment Zone regulations. Groundwater extraction is likely to affect water levels. There are SEC lines in the area. The Rockingham Shire Council and the MRD currently extract marl from the area and will continue to do this on an occasional basis.

Recommendations

M103.1 The area within the stippled boundary should be considered as a potential regional park.

M103.2 The Metropolitan Region Planning Authority should consider 'reserving' those portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

M103.3 The Metropolitan Region Planning Authority, in consultation with the relevant authorities and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- (a) ensuring that Lake Cooloongup is managed primarily for the conservation of flora and fauna;
- (b) ensuring that Lake Walyungup is managed to permit development for recreational use.

M103.4 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority to include representatives of appropriate authorities, and interested parties.

M103.5 Any future Land Act Reserves should include Water as a purpose.

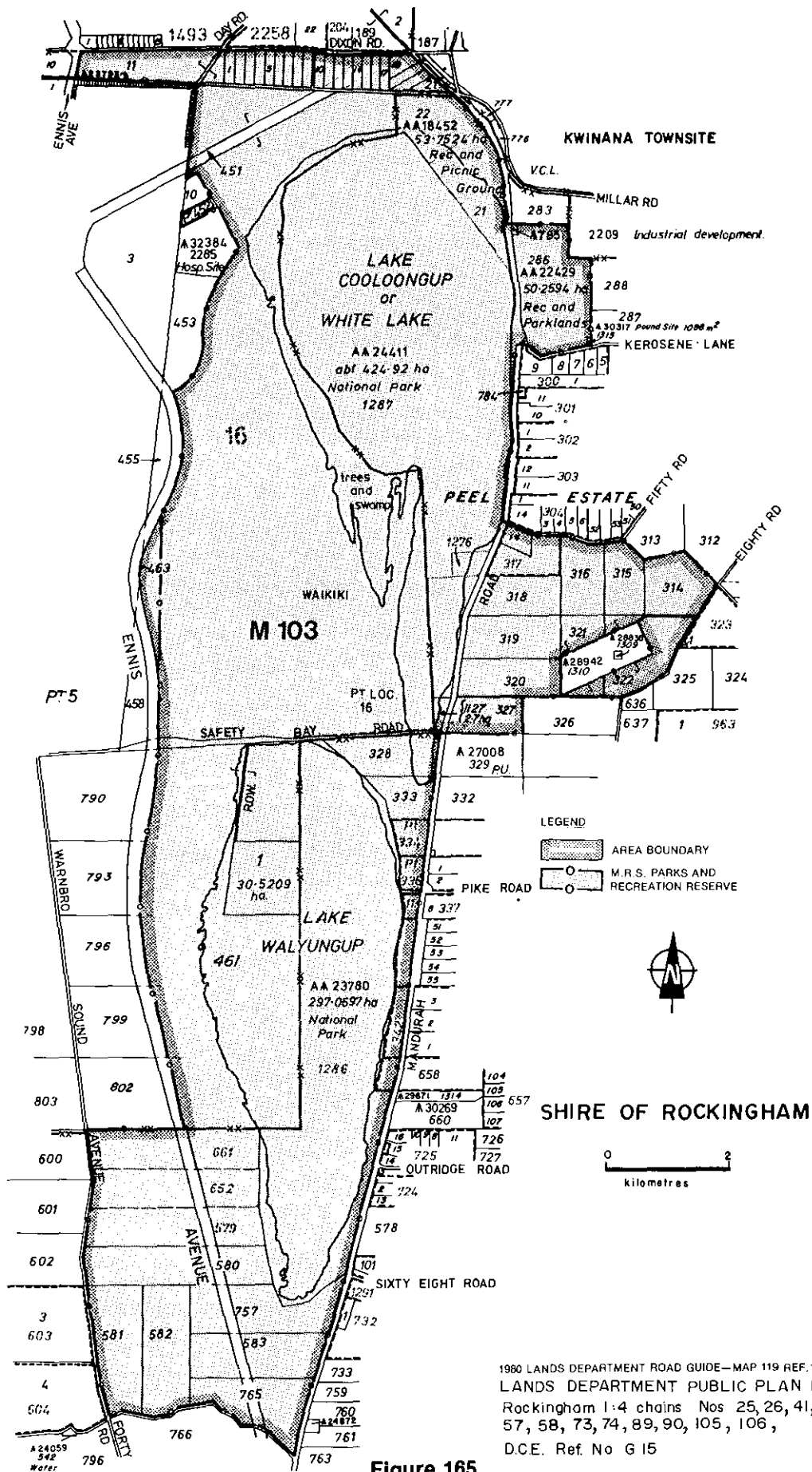


Figure 165

M104 RESERVES C31102 AND C33581, LEDA

The area comprises Reserves C31102, for Cemetery Site, and C33581, for Parks and Recreation, both not vested; vacant Crown land; and Kwinana Lot S33, privately owned freehold land. It is situated about 8 km east of Rockingham (Figure 166).

The area is relatively large in a district where most of the land is freehold and is likely to be developed. Consequently it is valuable for conservation.

The western section contains a ridge of limestone, which carries low open-heath. The land falls away to a north-south line of swamps which are fringed by low woodland of flooded gum and swamp paperbark. Closed-sedgeland of various species of *Cyperaceae* is associated with the swamps. Further east there is an area of consolidated dunes covered by low open-forest of jarrah, banksia, woody pear and sheoak. In each type of vegetation there is a different suite of shrubs and herbs in the understorey, with orchids being especially well represented.

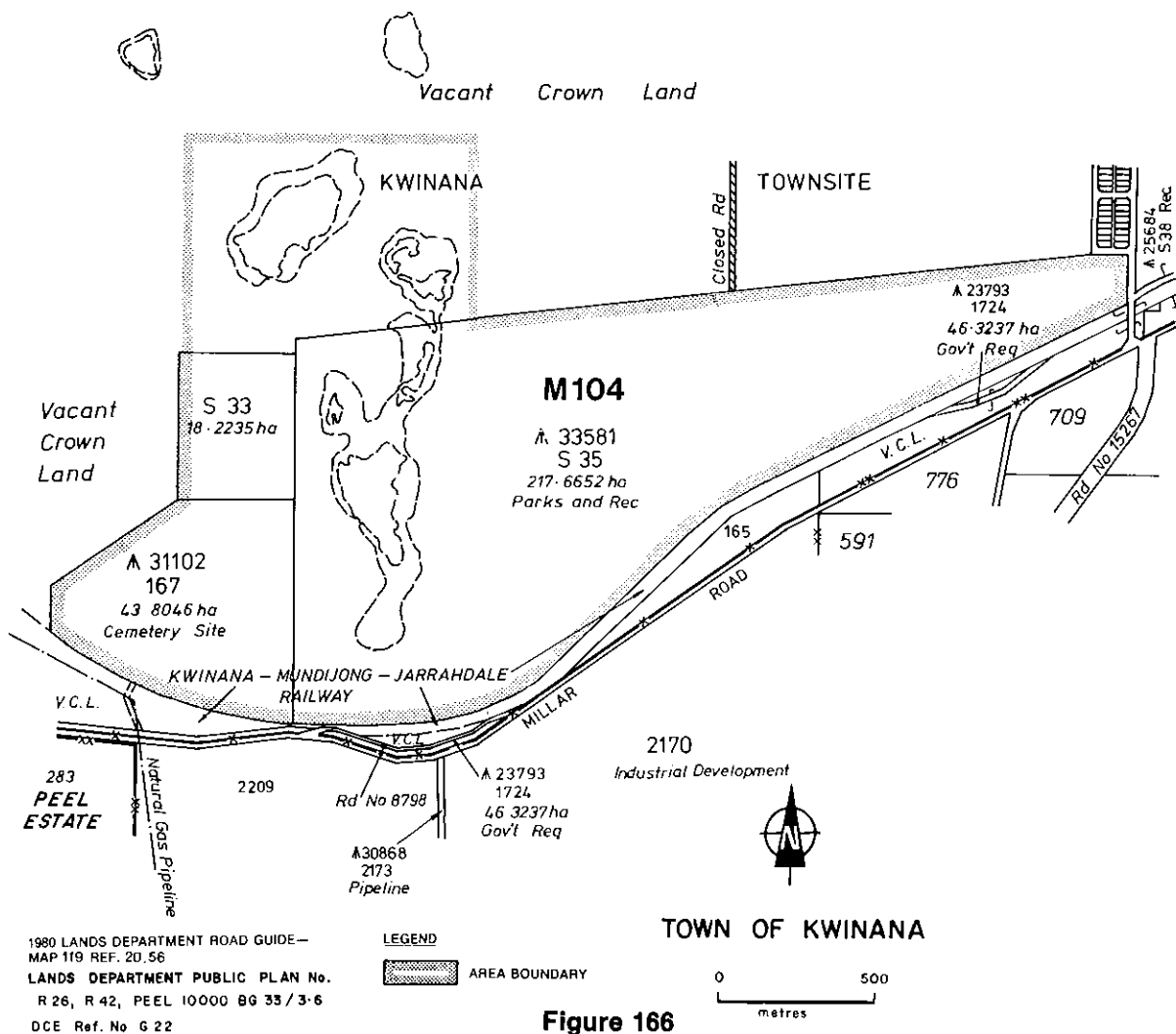
The area may be affected by future groundwater development which could affect water levels. There is potential for good quality limestone in the area, but there are no existing mineral claims.

In its Town Planning Scheme, the Kwinana Town Council has adopted Development Concept Plan No. 8, which plans for development of the eastern portion of the area.

The Conservation and Land Use Committee proposed that the strategy of multiple vesting for the multiple purposes of conservation and/or recreation, water and mining should be applied to the area.

Recommendation

M104.1 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land.



M105 LOWLANDS PROPERTY, WEST OF SERPENTINE

The area comprises part of Cockburn Sound Location 16, privately owned freehold land, situated about 10 km west of Serpentine (Figure 167).

The Lowlands property is a farming property and consists of an historic homestead, the original part of which was built in the 1840s by Thomas Peel Jr., two significant sections of woodland, and farmland. The Serpentine River flows through the property.

The eastern section contains a large area of woodland which, apart from a little clearing and the effects of light grazing, is relatively undisturbed. This section is very valuable since it is the only large area of its type remaining on the Coastal Plain between Perth and Bunbury. Its value is enhanced by the course of the Serpentine River which flows through it. The woodland, much of which is dense, is dominated by *Banksia* spp., of which four — slender, bull, holly-leaf and Menzies' banksia — are present. Marri, jarrah and sheoak also occur in the woodland, an unusual feature of which is the large number of woody pear trees. Much of the understorey is in good condition. There are many shrub species, including the rare *Brachyloma preissii*, and blackboy and zamia are common. Moonah and swamp paperbark are present in low-lying and swampy areas. The Serpentine River here is fringed by woodland of flooded gum, which is outstanding for its height and density, no similar area being known elsewhere. The river banks are stable and erosion is insignificant.

The south-western section also contains extensive woodland, much of it dense. Moonah and swamp paperbarks are common, the land being low-lying with a high water table. A significant feature is the abundance of Christmas trees. The Serpentine River Diversion, which forms the western boundary to the area, has a straight watercourse with high banks. There has been a considerable growth of flooded gum along the banks.

Fifty-seven species of birds, including both bush and water-birds, have been recorded in the area. Grey kangaroos abound and there are also brush wallabies. Pools in the Serpentine River in the eastern section provide a healthy fresh water habitat, as shown by the presence of the fresh water mussel and crayfish.

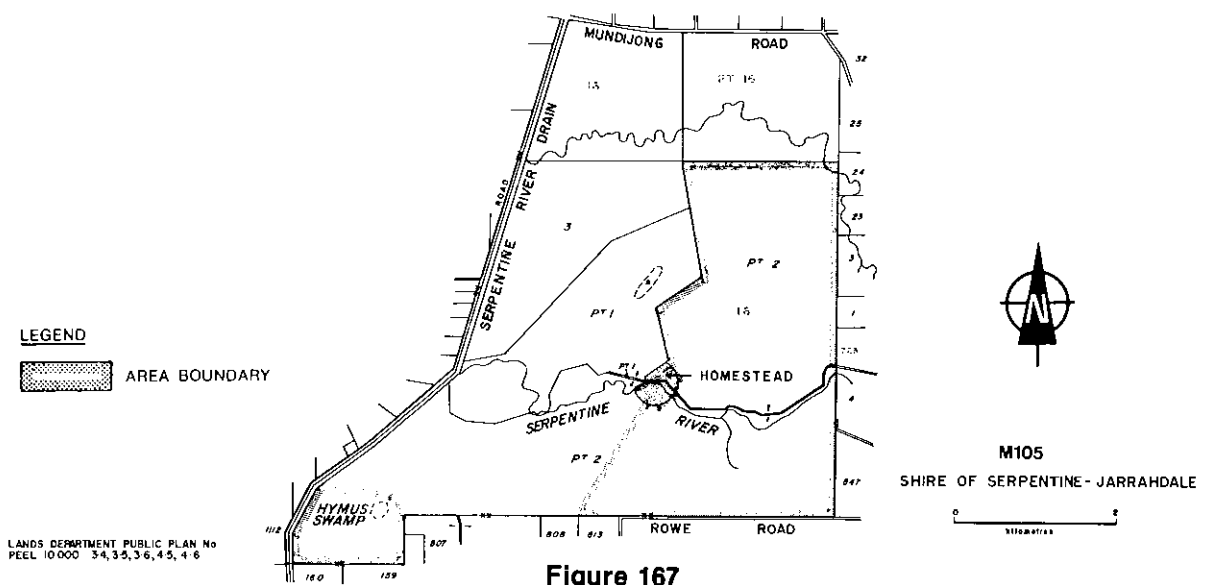
The Serpentine River has been subjected to considerable changes and pressures over the years, and very little of its original fringing vegetation remains. Because of this, every effort should be made to secure the eastern section of the Lowlands property, which has high conservation value, against threats to its preservation. Since the area constitutes a large, attractive remnant of Coastal Plain woodland, containing a major river, the concept of a 'regional park' as discussed in Chapter 5 of this Report, is relevant.

Recommendations

M105.1 The Government should recognise the conservation value of the uncleared woodland of the Lowlands property.

M105.2 The Government, in consultation with the owners, should investigate ways and means of preserving and maintaining in perpetuity the uncleared woodland.

M105.3 In the interim, the W.A. Wildlife Authority should provide assistance in the preparation of a management programme for the woodland areas.



M106 PORT KENNEDY

The area comprises Reserves C20716, Excepted from Sale, not vested; C33837, for Government Requirements (Community Welfare Department), vested in the Minister for Community Welfare; vacant Crown land; and part of Peel Estate Lots 1092 to 1094, privately owned freehold land (Figure 168). Part of the area is 'reserved' for Parks and Recreation under the Metropolitan Region Scheme. Extensions to the 'reserved' area are proposed in the Amendment to the South-West Corridor Report.

The MRPA has recognised the potential for recreation of Port Kennedy and has prepared a design concept for a regional recreation centre, to help cater for the anticipated future development of the district.

The peninsula consists of parallel, curving dunes, typical of the Coastal Plain south of Rockingham. Much of the area retains its natural vegetation, which is quite rich in species. Thickets of wattle are common and there are numerous tall shrubs typical of coastal species. The area's conservation value is high, because there is little similar land available between Fremantle and Mandurah.

The area has obvious potential for recreation, and is already used for fishing, camping and off-road vehicles. An area of 17 ha from lot 606 in the north-east has been designated for the use of off-road vehicles. There are squatters' shacks near the beach. If a link is provided between Port Kennedy and the White Lakes Region Open Space (see M103) the recreation potential could be even greater. The area's conservation value will need to be maintained as its recreational use grows.

The concept of a 'regional park' as discussed in Chapter 5 of this Report, is relevant to the area.

The area may be affected by a proposed MWB sewage treatment plant and outlet. Lots 1092, 1093 and 1094 are subject to a proposal for a small boat harbour development which has been supported by the Rockingham Shire Council.

Recommendations

M106.1 The area within the stippled boundary should be considered as a potential regional park.

M106.2 The Metropolitan Region Planning Authority should consider 'reserving' these portions not already 'reserved' for Parks and Recreation under the Metropolitan Region Scheme.

M106.3 The Metropolitan Region Planning Authority, in consultation with local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:

- (a) encouraging the growth and regeneration of local indigenous flora;
- (b) removing shacks from, and tracks through, the area;
- (c) providing direct public access to the White Lakes Region Open Space (M103).

M106.4 Until such time as the regional park concept may be incorporated in legislation, an advisory committee for the area should be set up by the Metropolitan Region Planning Authority, to include representatives from appropriate authorities, and interested parties.

M107 PEELHURST, SINGLETON AND MADORA

The area comprises Reserve C25043 for Recreation, and part of Reserve C27066, for Recreation, both not vested; lots 2 to 9, 15 and 16 (Mandurah Road sub-division), lots 1, 7, 492 and 688, and parts of lots 2, 3, 4, 10 to 12 and 101 (Cockburn Location 16), privately owned freehold land. It is situated on the coast about 10 km north of Mandurah (Figure 168). Part of the area is 'reserved' by the MRPA for Parks and Recreation under the Metropolitan Region Scheme.

The area has extensive coastal dunes which are very valuable for their coastal vegetation and for recreational and aesthetic reasons. Their appearance and stability have been affected by nearby housing developments. Buffer zones of uncleared land should be left to preserve some segments of the scenery and vegetation near the main Mandurah Road and between areas of housing. These buffer zones would restrict housing to west of the dune ridge, and provide east-west links of vegetation between Mandurah Road and the coast. The present practice of excluding housing from a strip adjacent to the shore should be continued. It is considered that these proposals would be to the benefit of all parties, as an enhanced residential environment has greater monetary as well as aesthetic value. In principle, public access to the reserved land would be unrestricted, but, in practice, some advisory body would have to undertake development and maintenance of paths to avoid dune erosion. The onus would fall initially on the relevant local authority but might later devolve on a Residents' Association.

The MRPA's South-West Corridor Report advocated that the Peelhurst, Singleton and Madora townsites should become one urban settlement and the development of the strip on the west side of Mandurah Road for private recreation is considered a priority for implementation. The Mandurah

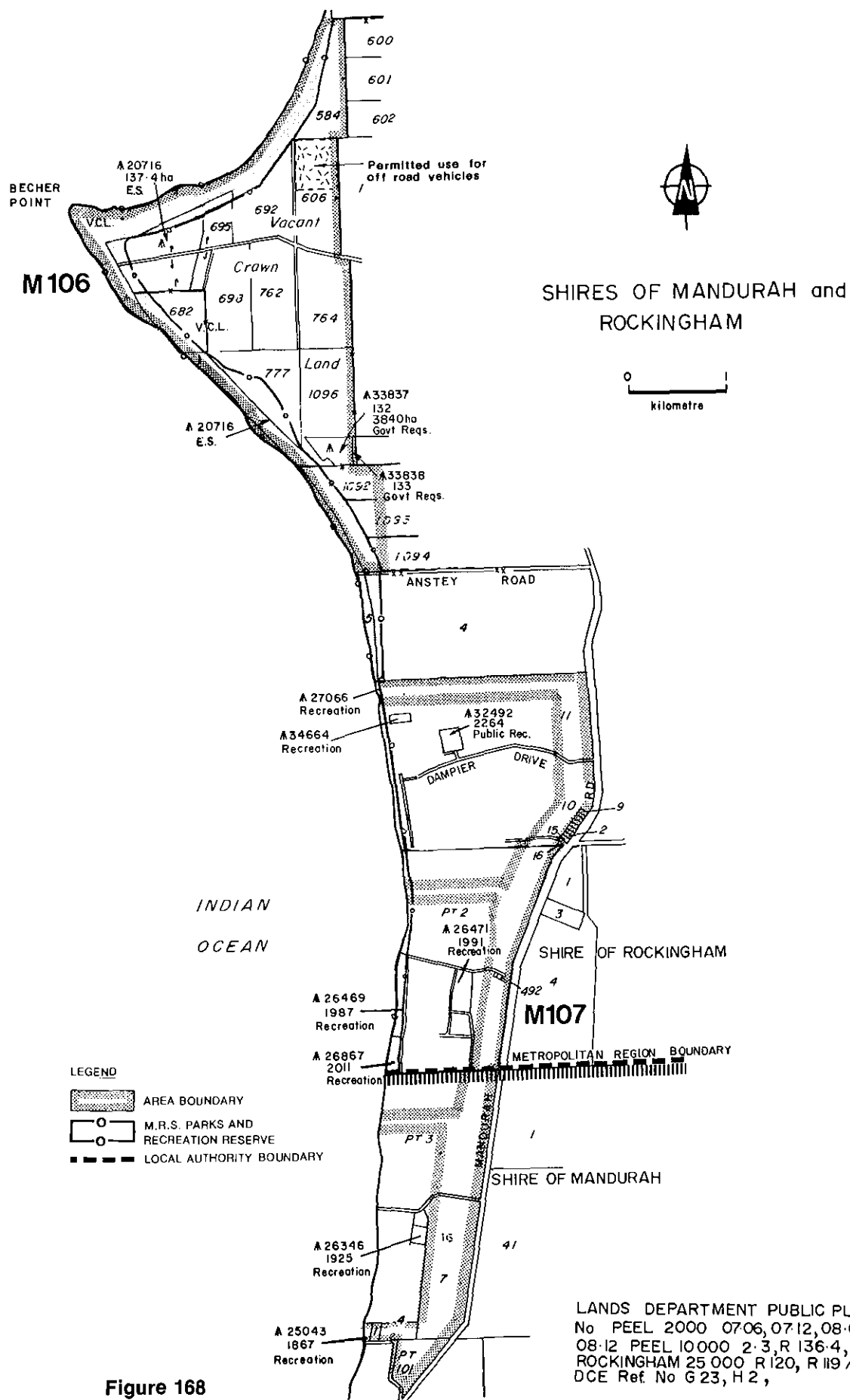


Figure 168

Shire Council has recommended that the proposed east-west link between Singleton and Madora should be relocated further north to coincide with the Rockingham-Mandurah Shire Boundary. The eastern section is within an area for possible unconfined groundwater extraction. Groundwater extraction in the future may affect water levels and could involve the introduction of Catchment Zone regulations to restrict public access.

Recommendations

- M107.1 The purpose of Reserve C25043 should be amended to Landscape and Recreation and the Reserve should be vested in the Shire of Mandurah.
- M107.2 The purpose of Reserve C27066 should be amended to Landscape and Recreation and the Reserve should be vested in the Shire of Rockingham.
- M107.3 The Mandurah and Rockingham Shire Councils, in consultation with the Department of Conservation and Environment and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives, either through joint management arrangements or, where necessary, acquisition of freehold land. Consideration should be given to:
- (a) the provision and maintenance of pathways;
 - (b) the prevention of dune erosion;
 - (c) involving residents of the area in the management of the dunes;
 - (d) the prohibition of active recreation activities which might disturb and inconvenience residents.

M108 GOEGRUP LAKES

The area comprises Reserves C26351 and C35283, both for Public Recreation, C25360 and C25846, both for Recreation, all not vested; Reserve C32726, for Public Recreation, vested in the Shire of Murray; part of lots 1A, 3, 5, 43, 93, 96, 214 and 217 and part of lots 2 and 3 adjacent to Rogers Road (Cockburn Sound Location 16), and part of Peel Estate lots 1088 to 1090, privately owned freehold land. It is situated a few kilometres north-east of Mandurah (Figure 169).

The area provides a major watering and loafing place for water-fowl and an important feeding and breeding ground for mullet, prawns and crabs. Stands of various paperbarks surround the lakes and swamp sheoak, samphire and shore rush grow along the water's edge.

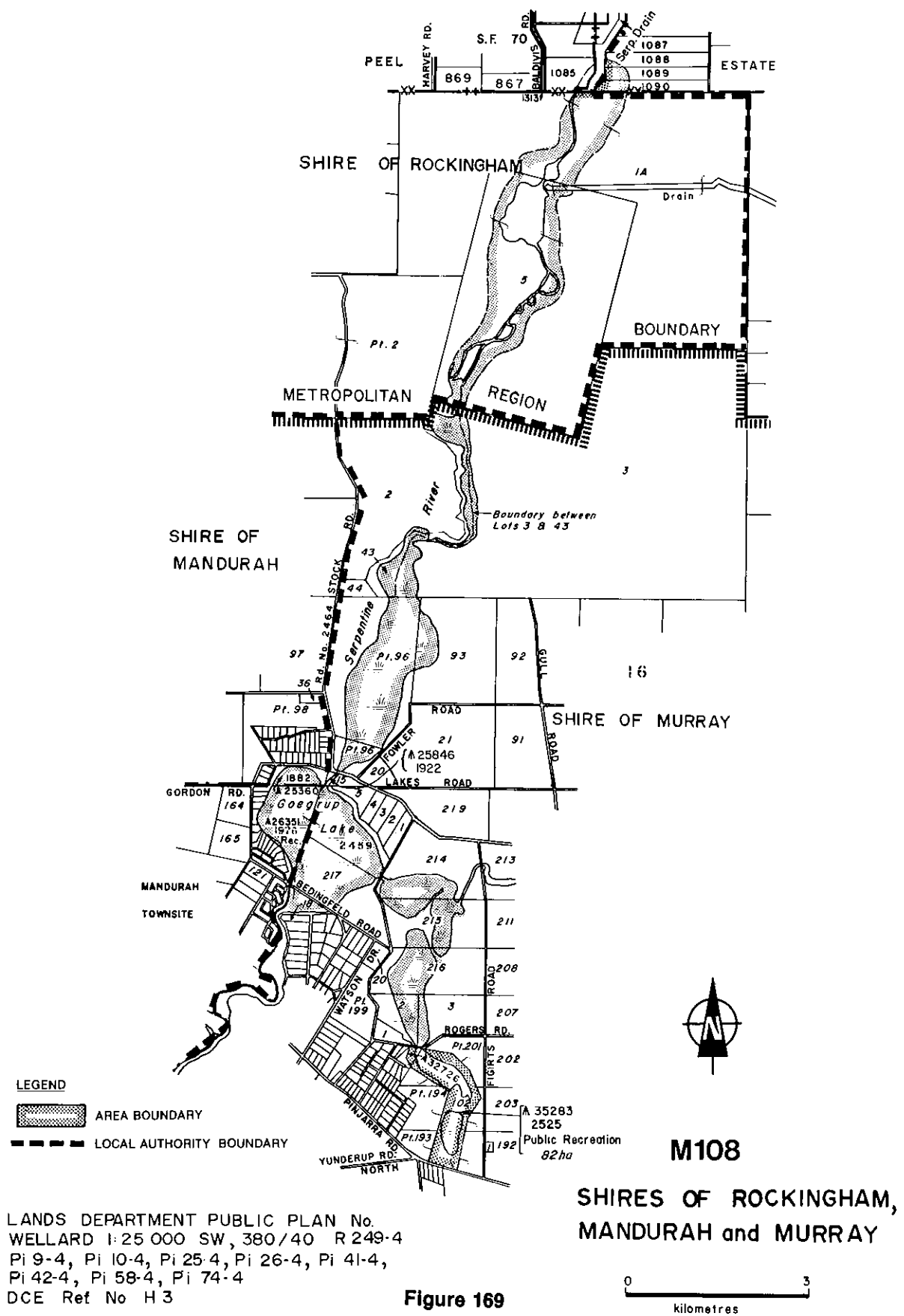
The owners of the unreserved portion of Goegrup Lake reportedly wish to develop the area for housing, a development which would adversely affect wildlife. There has been a proposal to dredge shallow areas for motor-boats. Exclusion of motor-boats in favour of canoeing, rowing and sailing would be more compatible with conservation of the lake's wildlife.

Duck shooting has apparently become popular in the area since the lakes of Yalgorup National Park were closed to this activity.

The concept of a 'conservation buffer zone', as discussed in Chapter 5 of this Report, is relevant. The area could be used as a drainage area for receipt of run-off during winter. Such use would necessitate construction of pipelines and diversion works. The area may be affected by the proposed Perth-Bunbury Highway and by widening of the Old Coast Road.

Recommendations

- M108.1 The purpose of Reserve C26351 should be amended to Conservation of Flora and Fauna, and Water, and the Reserve should be vested in the W.A. Wildlife Authority.
- M108.2 Subject to the agreement of the controlling body, Reserve C32726 should be cancelled and its area added to Reserve C26351.
- M108.3 Reserves C25360, C25846 and C35283 should be cancelled and their areas added to Reserve C26351.
- M108.4 The W.A. Wildlife Authority, in consultation with the Murray Shire Council and local land owners, should define management objectives for the area and seek ways and means of achieving those objectives either through joint management arrangements or, where necessary, acquisition of freehold land.
- M108.5 The Environmental Protection Authority should approach the Murray Shire Council, which controls the unreserved portion of Goegrup Lake, with a view to having dredging halted until an assessment of the effects of dredging has been made.



REFERENCES

1. Western Australian Sub-committee, Australian Academy of Science (1962). Report on National Parks.
2. Conservation Through Reserves Committee (1974). Conservation Reserves in Western Australia, Department of Conservation and Environment.
3. Western Australia, Parliament, Land Act, 1933-1977.
4. Western Australia, Parliament, Forests Act, 1918-1976.
5. Berndt, R.M. & Berndt, C.H. (1977). 'The World of the First Australians', Ure Smith, Sydney.
6. Atlas of Natural Resources, Darling System, Western Australia (1980). Department of Conservation and Environment, Western Australia.
7. Metropolitan Region Planning Authority, Western Australia (1974). South-West Corridor Report.
8. Australian Bureau of Statistics (1976). Social Indicators.
9. House of Lords Report on Sport and Leisure (1973). Her Majesty's Stationery Office.
10. Australian Bureau of Statistics, Western Australian Office. Western Australian Yearbook 1980.
11. Metropolitan Region Planning Authority, Western Australia (1977). Planning Structure for the North-West Corridor.
12. Town Planning Department, Western Australia (1976). Peel Preston Planning Study.
13. Department of Conservation and Environment, Western Australia (1979). The Cockburn Sound Environmental Study 1976-1979. Report No. 2.
14. Public Health Department, Western Australia (1974). Report on Community Waste in Perth Metropolitan Region.
15. Maunsell & Partners (1974). Refuse Disposal in the Perth Metropolitan Area. Report for the Metropolitan Region Planning Authority.
16. Seddon, G. & Polakowski, K.J. (1977). Power Transmission, South-Western Australia: a Review of Route Selection Procedure. Report prepared for the State Energy Commission of Western Australia.
17. Forests Department, Western Australia (1977). General Working Plan No. 86.
18. Layton & Associates (1978). Review and Evaluation of Groundwater Level Monitoring in the Perth Metropolitan Area. Department of Conservation and Environment, Western Australia.
19. Technical Advisory Group (1978). Bauxite Mining in the Darling Range, Western Australia. Department of Conservation and Environment, Western Australia, Bull. No. 44.
20. Environmental Protection Authority (1978). Wagerup Alumina Refinery Proposal by Alcoa of Australia Limited, Report and Recommendations. Department of Conservation and Environment, Western Australia, Bull. No. 50.
21. Hewett, P.N. (1975). Mining in State Forest — a Situation Report. Forests Department, Western Australia Paper No. 17.
22. Western Australia, Parliament, Mining Act, 1978.
23. Western Australia, Parliament, Alumina Refinery (Wagerup) Agreement and Acts Amendment Act, 1978.
24. Western Australia, Parliament, Alumina Refinery (Worsley) Agreement Act and Amendment Act, 1978.
25. Forests Department, Western Australia (1976). A Perspective for Multiple Use Planning in the Northern Jarrah Forest. (unpublished report).
26. Environmental Protection Authority (1976). Conservation Reserves for Western Australia, Systems 1, 2, 3, 5. Department of Conservation and Environment, Western Australia.
27. Patterson, J.C. (1977). Alternative Recreational Use Policies for System 6 Reservoirs. University of Western Australia, Department of Civil Engineering. Report to the Department of Conservation and Environment, Western Australia.
28. Western Australia, Parliament, Metropolitan Water Supply, Sewerage and Drainage Act, 1909-1978.
29. Western Australia, Parliament, State Energy Commission Act, 1945-1978.
30. Western Australia, Parliament, Water Boards Act, 1904-1979.
31. Western Australia, Parliament, Public Works Act, 1902-1974.
32. Commonwealth of Australia, Parliament, Telecommunications Act, 1975.

33. Stephenson, G. & Hepburn, J.A. (1955). Plan for the Metropolitan Region, Perth and Fremantle, Western Australia.
34. Metropolitan Region Planning Authority, Western Australia (1977). Submission to System 6 Study.
35. Western Australia, Parliament, Metropolitan Region Town Planning Scheme Act, 1959-1979.
36. Metropolitan Region Planning Authority, Western Australia (1963). Metropolitan Region Scheme Report.
37. United States Senate and House of Representatives, Wild and Scenic Rivers Act, Public Law 90-542, October 2, 1968.
38. Peck, A.J. & Hurle, D.H. (1973). Chloride Balance of some Farmed and Forested Catchments in South-Western Australia. *Water Res. Research* 9(3): 648-657.
39. Wetlands Advisory Committee (1977). The Status of Wetland Reserves in System 6. Report to the Environmental Protection Authority. Department of Conservation and Environment, Western Australia. (unpublished)
40. Department of Conservation and Environment (1977). Guidelines to the Conservation and Management of Wetlands in Western Australia.
41. Environmental Protection Authority (1977). Guidelines for an Environmental Protection Policy on the Coastal Zone in Western Australia. Department of Conservation and Environment, Western Australia.
42. Alcoa of Australia Limited (1978). Wagerup Alumina Project — Environmental Review and Management Programme.
43. Environmental Protection Authority (1975). Conservation Reserves for Western Australia, Systems 4, 8, 9 10, 11, 12. Department of Conservation and Environment, Western Australia.
44. Burbidge, A.A. & Evans, T. (1976). The Management of Nature Reserves in Western Australia. Department of Fisheries and Wildlife, Western Australia, Report No. 23.
45. Cockburn Wetlands Committee, Western Australia (1976). The Cockburn Wetlands — an Environmental Study.

Appendices

Appendix 1

COMMITTEE STRUCTURE AND MEMBERSHIP

System 6 Committee

Chairman	Mr. C.F. Porter	Director, Department of Conservation and Environment
Members	Mr. E.N. Fitzpatrick	Director, Department of Agriculture
	Dr. M.J. Mulcahy	Chairman, Conservation & Land Use Committee
	Mr. C.C. Cheyne	Member, Metropolitan Region Planning Authority
	Mr. N.J. Semmens	Chairman, Tourism & Recreation Committee
	Mr. D.J. Collins	Chairman, Local Government & Urban Planning Committee
Deputy Members	Mr. L.Y. Hitchen (for Mr. Semmens), Mr. G.W. Spencer (for Mr. Fitzpatrick)	
Former Members	Dr. B.J. O'Brien (Chairman), Mr. D.W.G. Treloar	

Tourism and Recreation Committee

Chairman	Mr. N.J. Semmens, Director Department of Tourism
Deputy Chairman	Mr. A.W. Robinson, Deputy Director Dept for Youth, Sport & Recreation
Members	Mr. T.E. Carstairs Shire of Wanneroo Professor A.M. Kerr Murdoch University Mr. A.R. Lowe, State Manager Caltex Oil (Aust) Pty Ltd Mr. R.D. Taylor Town Planning Consultant Mr. G.E. Rundle W.A. National Parks & Reserves Assoc. Mr. W.G. Schmidt Forests Department Mr. J.R. Sharp Community Recreation Council Ms. J. Verschuer, Landscape Architect University of W.A. Mr. D.A. Jobe Department of Tourism
Former Members	Mr. F.G. Logue (Deputy Chairman) Mr. D.W. Morgan

Conservation and Land Use Committee

Chairman	Dr. M.J. Mulcahy Department of Conservation & Environment
Members	Mr. H.E. Hunt, Chairman Commercial & Productive Use Committee Dr. P.R. Wycherley, Chairman Conservation Reserves & National Parks Committee Mr. C.F.H. Jenkins, President National Parks Authority Dr. D.R. Kelly, Deputy Co-Ordinator Department of Resources Development Mr. B.J. Beggs, Conservator of Forests Forests Department Mr. B.K. Somes, General Manager Bristle Ltd. Mr. R.A. Perry Chief, Division of Land Resources Management, CSIRO
Deputy Members	Mr. T.C. Butterfield (for Mr. Somes) Mr. F.J. Campbell (for Mr. Beggs) Mr. G.P.W. Lowe (for Mr. Hunt) Mr. B.J. O'Leary (for Dr. Kelly) Mr. J.F. Thomas (for Mr. Perry)

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Ecosystem and Land Use Inventory Committee

Chairman	Dr. M.J. Mulcahy Department of Conservation & Environment
Members	Mr. H.M. Churchward CSIRO Mr. J.C. Grasby Department of Agriculture Mr. J.J. Havel Forests Department Mr. C.P. Hutchison Department of Lands & Surveys Mr. W.M. McArthur CSIRO Mr. B.J. O'Leary Department of Resources Development Dr. E.M. Mattiske (for Mr. Havel)
Deputy Member	

Conservation Reserves and National Parks Committee

Chairman	Dr. P.R. Wycherley, Director Kings Park & Botanic Garden
Members	Professor R.T. Appleyard University of W.A. Dr. B.E. Balme University of W.A. Mr. E. Bettenay CSIRO Mr. E.R. Biggs Mines Department Dr. A.A. Burbidge Department of Fisheries & Wildlife Mr. A.S. George Department of Agriculture Mr. J.J. Havel Forests Department Mr. R.J. Powell Department of Fisheries & Wildlife Dr. E.M. Mattiske Forests Department Dr. F.G. Smith National Parks Authority Mr. J.R. Ellis University of W.A. Mr. R.H. Archer (for Mr. Biggs) Mr. H.M. Churchward (for Mr. Bettenay)
Deputy Members	

Commercial and Productive Use Committee

Chairman	Mr. H.E. Hunt, Chief Engineer Metropolitan Water Board
Members	Mr. G.H.C. White ALCOA of Australia Ltd Mr. D.P. Eckersley, President Australian Farmers Federation Mr. A.W. Hogstrom Department of Agriculture Mr. P.J. McNamara Forests Department Mr. J.H. Lord, Director Geological Survey Mines Department Mr. G.W. Nichols R & I Bank of W.A. Mr. W.T. Peart Vickers Hoskins Mr. B.J. O'Leary Department of Resources Development Mr. W.S. Shelton Public Works Department Mr. K.J. Wulff State Energy Commission Mr. P.K. Guimelli (for Mr. O'Leary) Mr. F.J. Malone (for Mr. Peart) Mr. M. Newman (for Mr. Wulff)
Deputy Members	

Secretariat

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Editorial assistance: Mrs. J. Hutchison

Appendix 2

TERMS OF REFERENCE

The terms of reference for the constituent committees, shown in Figure 1.3 and in Appendix 1, are given below.

1. System 6 Committee

To receive technical reports from the lower committees and, having regard to present and likely future developments, to make recommendations to the Environmental Protection Authority on:

- (i) areas within System 6 desirable for national parks, nature reserves, and major associated recreational resources;
- (ii) related matters in and near the area delineated as System 6.

2.1 Conservation and Land Use Committee

To develop for consideration by the System 6 Committee proposals for areas that should be set aside as national parks and nature reserves in System 6 taking account of:

- (i) the natural ecosystems themselves, their characteristics and management requirements;
- (ii) the demands on the land for commercial and other production, development and public services where these interact or may interact with proposals for reservation.

2.1.1 Ecosystem and Land Use Inventory Committee

To systematically assemble and report on information relevant to the identification of areas suitable for present or future reservation as national parks, nature reserves and associated recreational resource areas, taking cognisance of:

- (i) existing information on the nature and extent of the principal natural ecosystems, sub-systems and physiographic domains within the area known as System 6;
- (ii) other relevant information such as shire and council administrative boundaries, existing patterns of land use, water supply catchment areas, State and private forests, mining leases and tenements, lines of communication, etc.

2.1.2 Conservation Reserves and National Parks Committee

To report to the Conservation and Land Use Committee on existing and required conservation reserves and national parks generally, taking account of:

- (i) the EPA policies and philosophies expressed particularly in the Preamble to the two 'red books';
- (ii) public and other submissions received during the course of the System 6 Study;
- (iii) information and comments derived from the Ecosystem and Land Use Inventory Committee and the Commercial and Productive Use Committee.

2.1.3 Commercial and Productive Use Committee

To report to the Conservation and Land Use Committee and to provide information for the Conservation Reserves and National Parks Committee which will:

- (i) ensure that land use and potential land use alternatives to reservation are considered at appropriate times;
- (ii) attempt to evaluate the degree of compatibility between apparently conflicting land uses;
- (iii) ensure in their deliberations that the interests of State and Local Government instrumentalities, institutions and the private sector concerned with land use are taken into account;
- (iv) devise procedures which will ensure early planning for rehabilitation to be undertaken at the cessation of commercial exploitation, or following exploitation of short duration, where such rehabilitation is in the interests of conservation, national parks and associated recreational resources;
- (v) arrange economic analyses of proposals referred to it for that purpose by the Conservation and Land Use Committee.

2.2 Tourism and Recreation Committee

To develop for consideration by the System 6 Committee:

- (i) an assessment of the present tourism and recreation facilities in System 6 and their utilisation, and likely additional needs, taking into account the requirements of residents and tourists;
- (ii) forecasts to the year 2000 of the consequential demands for such resources associated with tourism and recreation in all their forms taking into account envisaged changes of life-style such as the duration of the working week, the increased mobility of the population, the age of retirement and other facets of the quality of life.

2.3 Local Government and Urban Planning Committee

To develop for consideration by the System 6 Committee:

- (i) an assessment of the present reserves set aside as regional or public open space, the extent and manner in which these are being presently used and make recommendations about modifications in use and developments thereof for the near future;
- (ii) forecasts to the year 2000 of the consequential demands for resources of this type, taking into account envisaged changes of life-style such as the duration of the working week, the increased mobility of the population, the age of retirement and other facets of the quality of life;
- (iii) an assessment of the extent to which Local Government might play an active part in selection, management and maintenance of reserve areas including financial contributions in cash or in kind.

To draw up for the System 6 Committee a plan for implementing the EPA recommendation to the Minister for Local Government, that "he considers ways and means by which Local Government authorities can appoint for liaison with the appropriate Government Departments professional reserve advisory officers in the same way as the Local Government authorities appoint, for example, recreation officers".

Appendix 3

LOCAL AUTHORITIES IN SYSTEM 6

Country		Metropolitan Region	
Beverley	Shire ★	Armadale	Town
Brookton	Shire ★	Bassendean	Town
Boyup Brook	Shire ★	Bayswater	Shire
Bridgetown-Greenbushes	Shire ★	Belmont	City
Bunbury	City	Canning	City
Boddington	Shire ★	Claremont	Town
Chittering	Shire ★	Cockburn	City
Collie	Shire	Cottesloe	Town
Dardanup	Shire	East Fremantle	Town
Donnybrook-Balingup	Shire ★	Fremantle	City
Gingin	Shire ★	Gosnells	City
Harvey	Shire	Kalamunda	Shire
Mandurah	Shire	Kwinana	Town
Murray	Shire	Melville	City
Nannup	Shire ★	Mosman Park	Town
Northam	Shire ★	Mundaring	Shire
Toodyay	Shire ★	Nedlands	City
Victoria Plains	Shire ★	Peppermint Grove	Shire
Wandering	Shire ★	Perth	City
Waroona	Shire	Rockingham	Shire
West Arthur	Shire ★	Serpentine-Jarrahdale	Shire
Williams	Shire ★	South Perth	City
York	Shire ★	Stirling	City
		Subiaco	City
		Swan	Shire
		Wanneroo	Shire

★only partly in System 6

Appendix 4

SUMMARY OF SUBMISSIONS TO THE SYSTEM 6 STUDY

Topics covered by submissions from private sector and local government

Population growth in System 6
Land use conflicts
Management of open space
Special recreation requirements
Pathway systems
Specific localities
General localities

Submissions from government departments and authorities

Metropolitan Water Supply, Sewerage and Drainage Board
Public Works Department
Water Purity Advisory Committee
Department for Youth, Sport and Recreation (formerly Community Recreation Council)
Department of Tourism
Forests Department
Bush Fires Board
Metropolitan Region Planning Authority
Town Planning Department
Mines Department
Department of Resources Development (formerly Department of Industrial Development)
Main Roads Department
Public Health Department
Zoological Gardens Board
National Parks Authority
Kings Park Board
Leschenault Estuary Management Authority
Peel Inlet Conservation Advisory Committee
Harbour and Light Department
Western Australian Herbarium, Department of Agriculture
Cockburn Sound Study Group
Department of Fisheries and Wildlife
State Housing Commission

General

A total of four hundred and twenty-seven submissions was received in the period December 1976 to May 1977, from a wide spectrum of the community. A breakdown of the submissions according to source is given below, and a complete list appears at the end of this Appendix.

Category	Number	Percentage
Private sector		
Private individuals	250	59
Voluntary conservation groups	29	7
Community groups	26	6
Recreation groups	25	6
Professional bodies and tertiary institutions	14	3
Industry (mining, agriculture, land development)	12	3
Local government authorities	32	7
Government departments and statutory authorities	39	9
Total	427	100

In some cases, submissions were supported by the names, addresses and signatures of up to a thousand people. The respondents represented a wide range of interests and provided a very useful input. There was general support for the Study and very few criticisms of its structure or proposed procedure.

The majority of submissions were considered by the relevant committees in the early stages of the Study. They proved useful in the development of recommendations and the preparation of committee reports. Eighty per cent of the recommendations made in the submissions have been incorporated to some degree in the System 6 Committee's Report. The remaining twenty per cent have not been included either because they were not directly relevant to the Study or because they were not compatible with the recommendations being developed.

The submissions from the private sector and local government and those from government departments and authorities are summarised separately below.

Topics covered by submissions from private sector and local government

Population growth in System 6

Population growth was referred to in fifteen per cent of all submissions. In most of those cases the belief was expressed that the population of System 6 is at or approaching an optimum level. The main adverse effects of population growth above an optimum level were identified as accelerating crime rates, increasing psychological stress, pollution, traffic congestion, and declining water quality and availability, all resulting in a decline in the 'quality of life'. The limited availability of potable water was seen to be the greatest natural constraint to population growth. Damming of more river valleys and increased groundwater extraction were alternatives not generally accepted because of perceived threats to wetland and river valley ecosystems. Further restrictions on immigration and decentralisation were seen to aid the control of population growth and to lessen the water supply problem.

Land use conflicts

Much concern was expressed about the deterioration of natural ecosystems and the depletion of public open space by urban development, road construction, power transmission and the mining and extractive industries.

Several submissions proposed that interim controls should be placed on urban development within System 6, particularly in outer metropolitan areas.

Freeways were objected to where they encroached on river foreshores and wetlands. Road widening was seen to be detrimental to areas of significant scenic value because of its tendency to increase traffic flow, and therefore litter, and to detract from natural settings through destruction of natural vegetation along verges.

Powerlines also received attention because of their tendency to scar natural landscapes, particularly river valleys, and to diminish the individual's perception of wilderness in secluded areas.

Bauxite mining and quarrying attracted considerable comment, with clay and sand extraction being mentioned to a lesser degree. The loss of attractiveness of the Darling Scarp was the main objection to quarrying, while comments related to bauxite mining covered topics such as salinity, dieback disease, destruction of flora and disruption of fauna. Local government authorities in country areas expressed the need for continued access to sand and gravel in local reserves.

Management of open space

There was a general call for open space management responsibilities to be shared on a more equitable basis. Local government authorities believe that the responsibility for planning and management of all types of open space imposes a serious burden, particularly when such reserves service areas beyond a local authority's boundary. Regional management bodies, possibly co-ordinated and financed by a government department, were proposed by several associations and professional bodies. Special interest groups and community groups expressed willingness to assist in the management of the areas of interest to them.

Several groups and individuals requested an increase in the number of rangers for maintenance and policing in National Parks. Additional rubbish bins, toilets and litter fine warnings were also called for. Fire, weed and vermin controls were seen as generally deficient, particularly where reserves and agricultural land lie adjacent to each other.

The question of management of scenically attractive land in private ownership, particularly in rural areas south and east of the Perth Metropolitan Region, was subject to considerable comment. Planning and zoning constraints were seen as measures which could be employed to help protect these rural landscapes. Road verge conservation was also strongly advocated. Roads identified for

special consideration included the Great Northern, Brand and Albany Highways and roads in the Mandurah and Bunbury regions.

Special recreation requirements

Several sporting organisations and leisure groups pointed out that recreational pursuits which are generally incompatible with other land uses require land to be allocated for a single purpose. These include, for example, nudist, off-road vehicle and sports clubs. Inland fishermen, canoeists, climbers and orienteers requested special consideration but these groups may be catered for without excluding other land uses.

Pathway systems

These were proposed for the purpose of adding a further dimension to linear parks, linking open space and providing access for pedestrians, cyclists, and horse-riders. Local and regional pathway systems could be initiated through co-ordination of the efforts of local and regional planning authorities.

Specific localities

More than two hundred specific localities were proposed for reservation and were investigated by the Conservation Reserves and National Parks Committee. Many of these localities were within the Perth Metropolitan Region where there was a strong desire to retain remnants of natural ecosystems in areas such as Star Swamp (M35), Swanbourne (M46), Herdsman Lake (M43) and portions of the Canning River (M68) and its foreshores.

Other submissions identified wetlands and rivers in country areas and marine and coastal reserves along many parts of the coastline.

General localities

These included the jarrah forests, the Darling Scarp, wetlands, the coastal region, marine environment and rivers.

The scenic beauty of the Darling Scarp was seen to be in jeopardy due to quarrying and subdivision developments.

Concern was expressed over the effects of groundwater extraction, urban encroachment, power boats and resort development on wetlands. Some recreational groups pointed out that wetlands have considerable potential for various water-based activities.

The marine environment, coast and islands were highly regarded both for conservation and recreation purposes. Land developers maintained that development along the coast could be achieved while protecting the environment.

The retention of rivers in their present state, mainly for recreational enjoyment, was of particular concern. Several references were made to the Wild and Scenic Rivers Act operating in the United States and the fact that this could be used as the basis for similar legislation in Western Australia.

Submissions from government departments and authorities

Metropolitan Water Supply, Sewerage and Drainage Board

About half of the divertible fresh to brackish water in the zone between the Moore and Murray Rivers has already been diverted to water supply. The only other substantial quantities available relatively close to Perth are to be found in the South-West. Transfer of this water to the metropolitan area could only be done at considerable cost.

The supply of water may be kept at an acceptable level by increasing the proportion of groundwater in the total public supply system, the use of brackish waters with subsequent dilution or desalination, increased expenditure on treatment and possibly by artificially recharging aquifers using surface water or treated wastewater effluents.

Education of water users to use and re-use water more efficiently, and the development of a more realistic pricing policy is intended to help lessen the demand for water in the future.

Water catchments must be managed so that long term storage with minimum treatment is possible. This could be achieved by protecting vegetative cover to avoid salinity problems, prohibiting public access within 2 km of reservoirs, restricting public access outside this zone, and postponing bauxite mining in drier parts of catchment areas until jarrah dieback is controlled.

Public Works Department

Alternative water resource management strategies have been devised by the Public Works Department. Water supplies could be further supplemented by the development of minor sources, such as wastewater, and by increasing the efficiency of water diversion with the use of expensive technology. A large reduction in the public's demand for water would only follow a major change in life-style.

The continued availability of water resources must be a top priority. The maximum conservation and recreation value must be gained from those water resources which cannot currently be developed, irrigation dams and certain wetlands. Multi-purpose reserves, and consecutive use of water resources for various purposes, may relieve conflicts between conservation, recreation and water supply. A land use inventory is needed, as a basis for considering all demands on each water resource and for such problems as salinity, environmental impact and divertibility of waters.

Water Purity Advisory Committee

This inter-departmental Committee presented a submission prepared by its working group on catchments and recreation. Strict guidelines and further restrictions on catchments were proposed, including severe restrictions on public access and recreation within a 2 km radius of reservoirs for domestic water supply, and intermediate and outer zones to act as buffers where certain types of passive recreation could be allowed. It was also proposed that a strip of land 2 km wide around the top water level of Harvey Weir should be resumed, or that a moratorium on animal husbandry be imposed and that the use of catchment areas by clubs and recreation groups should be co-ordinated by the Department for Youth, Sport and Recreation.

Department for Youth, Sport and Recreation (formerly Community Recreation Council)

Increases in population and community affluence will greatly add to the demand for outdoor recreation. Careful planning and integrated management will be essential, to maximise the benefit from those areas of reserved land which may support recreation activity as a secondary use (e.g. State Forest). A mechanism for catering for recreation demand would be a state-wide recreation areas plan which would provide for recreation at local, neighbourhood, district, regional and state levels. This parks system would be managed by a state body. Disadvantaged people should be given full consideration in planning.

Department of Tourism

Many areas in need of special consideration were listed. These included Yanchep, the Upper Swan and Avon Valleys, Peel Inlet, offshore islands, scenic drives, scenic rail routes and the Darling Scarp. Dams and suitable wetlands should be developed for boating and other water sports in preference to further development of facilities on the Swan River. Consideration should be given to the provision of further coastal marinas.

Forests Department

The main concern is to ensure the preservation of a full range of ecosystems for conservation and to provide recreational facilities in State Forest. Management Priority Areas (MPAs) have been developed to manage defined areas for specific purposes other than for commercial use. The selection of MPAs for conservation of flora and fauna was constrained by factors such as availability of land, incidence of dieback disease, and requirements for timber production, mining and dam sites. MPAs for recreation were selected in such a way that they conform with the requirements of the water supply authorities.

Bush Fires Board

There is a need for more research on the effects of fire on flora and fauna so that more effective management of all types of reserves can be achieved. Conservation and recreation objectives could then be met without jeopardising adjacent private properties or the reserves themselves.

Fire protection programmes require co-ordination between proposed district and regional bodies. The Forests Department and the Bush Fires Board should administer and fund programmes, as they are the only organisations with the staff and expertise to do so.

Metropolitan Region Planning Authority

The situation regarding Region Open Space and its acquisition was reviewed. Thirty-one additional localities and five large tracts of land worthy of landscape protection were recommended for consideration in the System 6 Study.

Town Planning Department

There is no suitably equipped Region Open Space management agency available at present.

Water supply regulations have resulted in considerable restrictions in catchment areas. Therefore, the strip of land between catchment boundaries and the Darling Scarp will become increasingly important for recreation. Reserves and protective zoning will be needed in this area, and more recreational facilities will be required on irrigation dams and their catchments.

Rural wedges in the Metropolitan Region, which include wetlands and National Parks, will need protective zoning and development controls. Gravel and sandpits in these wedges should be reserved for motor sports.

Areas identified as needing to be reserved or protected included the coastal region, the Gingin chalk scarp, Chittering Valley, land east of the Harvey Estuary and Peel Inlet, land adjacent to

Yalgorup National Park, land south of Donnybrook, the Blackwood River, and land alongside major rivers, particularly in white water areas.

Mines Department

There is a need to conserve groundwater resources and to prevent the sterilisation of mineral resources when reserve requirements are being reviewed. It is believed this can be achieved by referring all future proposals for reservation to the Department of Mines and by establishing multi-purpose reserves, where mining followed by rehabilitation might be allowed.

Department of Resources Development (formerly Department of Industrial Development)

There has to be a rational approach to balance conservation and development in System 6. Changing Reserves to Class A status should not be done where Class B or C status would be adequate.

Conflicts between conservation and development may be resolved through 'framework planning', where current and future demands on land and resources are evaluated so that land use priorities may be determined.

Urban development should be allowed to occur where there is sufficient demand for it, and this particularly applies to coastal areas in the Metropolitan Region.

Main Roads Department

Existing potential sources of road-making materials must remain available for use. Class A Reserves need not involve restriction on access for extraction of material, but if this does eventuate, future proposals for Class A Reserves would be opposed.

Public Health Department

Public open space should be located adjacent to industry so that residential areas are protected by a buffer zone. Consideration should be given to the noise levels of certain recreation activities (trail-bikes, speedway etc.) near residential areas.

Zoological Gardens Board

A country zoo of about 300 ha should be provided within 100 km of Perth to help ease the demand on the South Perth Zoo, which has limited capability for expansion.

National Parks Authority

A National Park must have natural scenic beauty. Amenities and usage must be maintained without destroying the natural environment. The ratio of the perimeter to the area of a National Park needs to be kept to a minimum so that the least possible interference from outside can occur and any incursion by vermin, weeds or fire can be kept at bay with minimum management costs. National Parks with management problems and/or in need of extra staff include Yanchep (M3), Neerabup (M6) and Yalgorup (C54). In some cases National Parks have become too small or have come under considerable pressure from outside and should consequently be managed as Metropolitan Parks. Examples include Greenmount, Gooseberry Hill, Kalamunda and Lesmurdie National Parks. Metropolitan Parks should be managed by horticultural experts accustomed to maintaining areas of high intensity use.

Kings Park Board

The proposed controlled access highway which would affect Bold Park (M47) should be re-routed elsewhere since it will affect Perry Lakes and separate them from Reabold Hill. Bold Park now provides a much needed bird sanctuary and passive recreation area. There are more than one hundred native plant species in the area.

There is a need for an arboretum and a botanic garden on a heavier type of soil in the vicinity of Perth, as Kings Park (M49) is an inadequate site for a comprehensive botanic garden. The maintenance of the varied bushland of Kings Park should be continued.

Leschenault Estuary Management Authority

The natural state of the Leschenault Inlet should be maintained as far as possible. Planning for this area is essential, and needs to be continuous and flexible. Research studies and existing monitoring programmes should assist in this process. There are still many unknowns in regard to the capacity of the environment to cope with development, recreation and other activities in the region.

Peel Inlet Conservation Advisory Committee

The Committee, a forerunner of the Peel Inlet Management Authority, considered that there were sufficient National Parks in the Peel Inlet and Harvey Estuary area. Any further reserves should only be created after consultation with the relevant local authorities and government bodies. Nature reserves should be vested in an authority or body directly responsible for their management and maintenance.

Harbour and Light Department

Boating is experiencing a boom. There is a considerable shortage of areas for aquatic recreation in navigable waters. Recreation in an aquatic environment should be considered as important as conservation, and the Harbour and Light Department should have representation on management authorities responsible for navigable waters.

Western Australian Herbarium, Department of Agriculture

The Western Australian Herbarium submitted the following list of needs in regard to the protection of flora:

- the creation of new reserves;
- the upgrading of Reserves to Class A and vesting in appropriate authorities;
- protection of plant communities on road verges;
- liaison with relevant departments and bodies to minimise damage to the natural environment;
- protection of coastal vegetation (particularly in the Perth Metropolitan Region), rivers, reserves, springs, wetlands and the Darling Scarp.

Cockburn Sound Study Group

Carnac Island (C46) and Garden Island (M96) are the only places in the Sound where conservation of flora and fauna could be achieved. There should be careful planning to improve public access to parts of Garden Island while protecting the indigenous flora and fauna.

Industries should be sited back from the shore to allow for recreational usage. The proposed reclamation of 65 ha of the waters of Mangles Bay for three shipping berths at Rockingham and the proposed siting of a further seventeen berths to the east of the Garden Island Causeway, should be deferred pending consideration of the impact on the area's ecology and recreation potential. Water quality standards should be implemented after consideration of the findings of the Cockburn Sound Study.

There is a need to increase the degree of public involvement in planning the use of the Sound. Recreational access to beaches is a major concern, the boating fraternity requires more facilities, and there should be early implementation of the proposal for a recreation area from Woodman Point to Coogee Beach.

Department of Fisheries and Wildlife

Twenty-nine localities were identified and proposed for consideration by the System 6 Study. Each proposal contained detailed information on flora and fauna, and recommended management procedures. The forests of the Darling Range and the caves of System 6 were also proposed for consideration in the System 6 Study, together with wetlands, river valleys, springs and offshore islands. There are many reserves which require change of status, vesting and purpose.

State Housing Commission

The Commission pointed out the special needs of its clients, who are often disadvantaged members of the community. Parks and recreation areas should be situated close to their homes, for easy access. Provision of open space requires detailed planning, based on a land use inventory. Specific proposals included the recreational use of dams, the provision of green belts and additional National Parks, especially between the South-West and South-East corridors, and the linking of parks and reserves by linear reserves which could accommodate cycleways. The Commission believes that economic constraints make it impossible for any more than 10% of land gazetted for housing development to be set aside for public open space even where residential densities are high.

Special consideration for the Aboriginal people of System 6 is requested by the State Housing Commission. Sacred tribal lands should be protected from the pressures of development, and reservation of areas containing Aboriginal sites should be accompanied by special provisions for access and protection from vandalism. Problems such as the housing of Aborigines living on parks and reserves, and the possibility of employing and training members of Aboriginal communities as warders and rangers in parks and reserves must also be considered.

List of submissions

Advisory Committee on Purity of Water
Affleck, D.A.
Agriculture Department, Soils Division
Alcoa of Australia (WA) Ltd.
Amateur Canoe Association of W.A.
Anonymous (2 submissions)
Arkeveld, C.

Armadale-Kelmscott Shire Council
(now Armadale Town Council)
Armstrong, F.L.
Arnold, J.C.L.
Australian Institute of Horticulture Inc.
Australian Institute of Landscape Architects

Australian Institute of Urban Studies
 (W.A. Division) Inc.
 Australian Labor Party (Roleystone Branch)
 Australian Underwater Federation
 (W.A. Branch)
 Australian Wildlife Conservation Committee
 Backshall, D.
 Baker, G.F.U.
 Bamford, M.J. (3 submissions)
 Barnett, M.
 Bath, P.J.
 Batini, F. (2 submissions)
 Bayley-Jones, C.R.
 Beaton, R.
 Belcastro, D.
 Benson, P.A.
 Benson, W.B.
 Bibby, P.
 Bickley and Districts Progress Association
 Biggs, J.
 Bignell, M.
 Bischoff, B.
 Bishop, C.
 Bloeman, A.
 Boardman, W. and Boud, M.E.
 Boyd, K.
 Brand, A.
 Bremers, T.A.
 Broad, D.S.
 Brockis, M.
 Brown, M.
 Brown, T.
 Browne, E.D. (2 submissions)
 Browne, R.
 Brownlow, K.
 Bullsbrook (Residents and Landowners)
 Bunbury Town Council (now Bunbury City
 Council) (2 submissions)
 Bush Fires Board of W.A. (2 submissions)
 Butler, B.
 Butler, W.H.
 Canning River Conservation Association
 Carlin, M. and B.
 Carrington, J.E.
 Carroll, M.J.
 Carter, E.M.
 Carter, R.P.V.
 Cartwright, R.
 Casserley, P.
 Casson, J.
 Chapman, R.
 Chequer, E.M. and S.D.
 Chitty, W.G. (5 submissions)
 Christ Church Grammar School
 Churches of Christ in W.A. Inc.
 (Department of Christian Education)
 Churchward, H.M.
 Clements, R.
 Climbers Association of W.A. (2 submissions)
 Cockburn Sound Study Group
 Cockburn Town Council (now Cockburn City
 Council) (2 submissions)
 Coleman, P.J.
 Collet, L.
 Confederation of Australian Motor Sports
 Confederation of W.A. Industries
 Conservation Council of W.A. Inc.
 (6 submissions)
 Community Recreation Council of W.A.
 Cook, S.C.
 Cook, W. and G.M.
 Cook, W.
 Cooling, E.K.
 Cornish, J. and Flynn, C.
 Cottesloe Town Council
 Cousins, M. and O.D.
 Coutler, J.
 Danridge, S.
 Darling Range Conservation Farming Club
 Davis, B.
 Deering, R.
 Demarte, J., Hamill, R., Mathanda, R.
 and Vine, A.
 Denning, E.
 Dickens, A.G.
 Dolva, S.
 Dun, I.
 Duzwick, G.
 Eastern Hills Tree Society
 Eaton Progress Association
 Edmondson, F.
 Egerton-Lefroy, F.
 Ellery, J.H.
 Ellinson, R.E.
 Emberson, J. (2 submissions)
 Epton, V.F. and J.E.
 Esplanade Developments Ltd.
 Evans, L.
 Fahrner, G. and H.
 Farmer, W.L.
 Farmers' Union of W.A. (Beekeepers Section)
 Farmers' Union (Chittering Branch)
 Farmers' Union (Toodyay Branch)
 Farmers' Union of W.A.
 Felton, B.
 Ferro-Cement Boat Association (W.A.)
 Fewster, J.M.
 Fewster, M.J.
 Field, S. and Maisey, K.
 Fisheries & Wildlife, Department
 (2 submissions)
 Fond, J.
 Forests Department
 Forest Products Association
 Forma, R.
 Frayne, R.
 Freeman, E.
 Fremantle Society Inc. (2 submissions)
 Gingin Shire Council
 Girl Guides Association
 Goedegebuure, A.
 Gom, K.M.
 Gosnells Town Council (now Gosnells
 City Council)
 Graham, D.J. and A.
 Guild of Undergraduates (University of W.A.)
 Guise, L.S.
 Gwyne, K and K.

Gwynne, E.
 Gwynne, H.K. (2 submissions)
 Hainge, P.
 Hallam, S.
 Hancock, D.A.
 Hansen, P.
 Harbour and Light Department
 Hardy, E.W.
 Harley Davidson Motor Cycle Club Inc.
 Harold, G.
 Harper Nelson, J.
 Hart, R.J. (3 submissions)
 Harvey, M.
 Harvey Shire Council
 Hay, M.
 Hazlemere Progress Association
 Helena Valley-Boya Association
 Hemsley, P. (2 submissions)
 Henry, J.
 Henry, T.A.
 Hodgkin, E.P.
 Hoff, B.C. (2 submissions)
 Horgan, L.
 Horton, E.T. and C.R.
 Institute of Foresters
 Irvine, D.
 Jackson, B.
 James, C.
 James, M.W.
 Johnston, H.D.
 Kalamunda Ratepayers and Residents
 Association
 Kalamunda Shire Council
 Kane, J.A.
 Karajas, J.
 Kendall, I.R.
 Kendrick, G.W.
 Kings Park and Botanic Garden
 (3 submissions)
 Kings Park and Swan River Preservation
 Society
 Kwinana Shire Council (now Kwinana Town
 Council)
 Lampe, J.
 Land Rover Owner's Club
 Lantzke, Dr. I.R. (2 submissions)
 Lantzke, Dr. I.R. and students of Graylands
 Teachers College
 Lee, L.G.
 Leschenault Naturalist's Society
 Leschenault Estuary Management Authority
 Lesmurdie Progress Association
 (2 submissions)
 Lesmurdie 2000
 Lewington, J.H.
 Lishaman, J.
 Loney, S.R.
 MacDonald, I.J.
 MacDonald, K.
 Mackay, P.
 Madden, D.
 Main Roads Department
 Mandurah, Licensed and Professional
 Fisherman's Association
 Mandurah Primary School
 Mandurah Shire Council
 Mareemba Beach Estate No. 2 Syndicate
 (2 submissions)
 Marshall, H.
 Martin, T.S. and Associates
 Mathanda, R.
 Maunsell and Partners Pty. Ltd.
 McDavitt, R.C.
 Melville-Jones, J.R.
 Melville, Mrs.
 Melville Senior High School
 Menzel, C.H.
 Meredith, S.D.
 Metropolitan Region Planning Authority
 (2 submissions)
 Metropolitan Water Supply, Sewerage and
 Drainage Board
 Miller, M.J.
 Mines Department
 Mitchell, C.
 Moody, P.
 Moore, J.
 Moore Regional Council of W.A.
 Morris, C.A. (2 submissions)
 Moses, P.J.
 Mullaloo Progress Association
 Mundaring Shire Council (4 submissions)
 Munro, A.D.
 Munro, P.
 Murphy, C.A.
 Mynott, D.
 Nannup Shire
 National Country Party of Australia (W.A.)
 Inc. (2 submissions)
 National Parks Authority (2 submissions)
 National Parks Board of W.A.
 (2 submissions)
 National Trust of Australia (W.A.)
 N'Cole, D.
 Nedlands City Council
 Newman, P. and Dunlop, N.
 Nickel, U.
 Nokes, R.J.
 Northam Shire Council
 Oats, A.L.
 O'Neil, J.
 Orienteering Association of W.A.
 (2 submissions)
 Parmiter, J.J.D.
 Pastoralists and Graziers Association of W.A.
 Inc.
 Patterson, V.M.
 Pearson, G.W.
 Peel Inlet Conservation — Advisory
 Committee
 Peel-Preston Preservation Group
 (3 submissions)
 Perkins, S.
 Perth City Council
 Phillips, S.
 Pinjarra Steam and Hills Railway Preservation
 Society (2 submissions)
 Potsey, K.

Powell, R. and Emberson, J.
 Premier, Sir Charles Court
 Property and Valuation Office
 Public Health Department
 Public Works Department (3 submissions)
 Resort Developers Pty. Ltd.
 Richards, K.T.
 Richardson, M.F.
 Riley, E.A.
 Ritsen, M.
 Roberts, J.L.
 Robertson, et al
 Robertson, R.A.
 Robinson, F.L.
 Robinson, G.
 Roleystone Progress Association
 Royal Australasian Ornithologists Union
 Royal Australian Institute of Architects
 Rutherford, P.J.
 Ruthrof, H.G.
 Sampson, F.
 Sampson, G.
 Sansoni, M.
 Saunders, T.T.
 Sawyers Valley Association
 Scott, N.M.
 Scott, R.H.
 Sedgwick, E.H. (2 submissions)
 Semeniuk
 Serls, K.M.
 Serventy, D.L.
 Shaw, S.R.
 Shellam, G.R. (2 submissions)
 Shepherd, R. (2 submissions)
 Sims, J.
 Singleton, H.
 Slater, L.
 Smart, R.N.
 Smith, A.N.
 Smith, C.F.J.
 Smith, F.W.
 Smith, P.G.
 South Perth City Council (3 submissions)
 South West Regional Development
 Committee
 Spafford, J.T.
 Spence, M.H.
 Spence, W.
 Spencer, J.A.
 Stanley, F.
 State Housing Commission
 Stegena, G.
 Steilberger, R.
 Stewart, L.
 Stirling City Council
 Storer, R.
 Stringall, I.
 Stubbs, L.
 Subiaco City Council (2 submissions)
 Sunseekers Inc. (2 submissions)
 Sutherland, G.R.
 Swan River Conservation Board
 Swanbourne Residents Group
 Taylor, M.

Taylor, J.
 Teede, C.
 Thompson, I.
 Thompson, J. and King, H.
 Thompson, K.F.
 Thorn, S.B.
 Thwaites, P.
 Tingay, A. and S.
 Tonkin, A., M.L.A. (2 submissions)
 Toodyay Naturalists Club (2 submissions)
 Toodyay Shire Council
 Tourism Department
 Town Planning Department
 Trail and Enduro Motor Cycle Club
 Tree Society (2 submissions)
 Trigg North Beach Waterman Community
 Association
 Underdown, D.
 United Nations Association of Australia
 Utting, J.
 Vallentine, R.G. and M.A.
 Vann, D.
 Vaughan, M.
 Vaughan, M.A.
 Vipac and Partners
 Viticulturist Union of W.A.
 W.A. Association of Recreation Personnel
 W.A. Chicken Meat Association
 W.A. Gould League
 W.A. Herbarium
 W.A.I.T. Environmental Studies Group
 W.A.I.T. Department of Medical Technology
 W.A. Lawn Tennis Association (Inc.)
 Walker, R.A.
 W.A. Marine Research Laboratories
 W.A. Motor Cycling Association
 W.A. Naturalists' Club
 Wanneroo Shire Council
 W.A. Petroleum Pty. Ltd. (2 submissions)
 Waroona Shire Council
 W.A. Speleological Group
 W.A. Sports Federation
 W.A. Trout and Freshwater Angling
 Association Inc. (2 submissions)
 W.A. Water Ski Association Inc.
 W.A. Wildflower Society (Eastern Hills
 Branch) (2 submissions)
 W.A. Wildflower Society Inc.
 Wedd, D.H.
 Western Titanium
 Western Walking Club (2 submissions)
 Whitley, F.
 Worth, K.
 Wough, D.
 Yunderup Delta Society (2 submissions)
 Zoological Gardens (2 submissions)

Appendix 5

State Forest Management Priority Areas for conservation and recreation in or near System 6

Name	Locality Number	Figure	Location	Working Plan No. 86	Area (ha)	Geomorphological Region	Rainfall	Adequacy of Conservation		Special Features
								Duplication	Similar	
Bell	C77	55	Murray River	10.3	2590	Darling Plateau	High	Murray Valley	Plavins, Teesdale	Paperbarks. Range of vegetation.
Bennelaking (System 4)	C94	66	Bennelaking	4.7	5635	Darling Plateau	Low	—	—	Remnant forests representative of Collie River Catchment.
Boyagarring	C40	31	Shire of Brookton	8.5	1480	Darling Plateau	Low	Lupton	—	Wandoo, powderbark. Dissected lateritic slopes.
Caraban	C12	11	Yanchep	15.4	2966	Coastal Plain	Low	—	Ridges, Wabbling	Tuart, limestone heath.
Clifton	C55	40A	Lake Clifton	10.1	533	Coastal Plain	Medium	Myalup	McLarty	Tuart with peppermint understorey. Spearwood Dune System.
Cooke	C38	30	Mount Cooke	8.2	4695	Darling Plateau	Medium	Eagle Hill	Dale, Gyngoorda, Windsor	Virgin jarrah, butter gum, range of vegetation types. Mt. Cooke. Scenic.
Dale	C32	25	Shire of Beverley	2.6	6272	Darling Plateau	Medium	—	Cooke	Large range of landforms, vegetation types and fauna.
Dalgarup (System 2)	C100	71	Bridgetown	12.1	3552	Darling Plateau	High	—	—	Northern extension of karri in State Forest.
Dardanup	C86	59	Dardanup	4.4	1480	Blackwood Plateau	Medium	—	—	Includes northern extension of Blackwood Plateau. Mountain gum.
Duncan	C42	32	North Bannister	3.5	9935	Darling Plateau	Low	—	Gyngoorda, Russell, Windsor	Virgin wandoo. Drummond's gum.
Eagle Hill	C36	28	Kinsella	8.1	4638	Darling Plateau	Medium	Cooke	Gooralong, Gyngoorda, Windsor	Virgin jarrah, black gin.
Federal	C76	54	Waroona	10.4	1412	Darling Plateau	High	—	—	High quality yarri.
Goonac	C92	65	Noggerup	4.5	5211	Darling Plateau	Medium	Muja	—	Virgin jarrah. Tammar.
Gooralong	M84	154	Jarrahdale	8.4	705	Darling Plateau	High	Karnet	Serpentine	Virgin jarrah. Extension to Serpentine National Park.
Greenbushes	C99	70A & B	Bridgetown	5.5	1351	Darling Plateau	Medium	—	—	Virgin jarrah.
Gunapin	C34	27	Shire of York	2.3	13497	Darling Plateau	Low	—	Nalyerin, Sullivan, Surface	Swamp vegetation and associated fauna. Deep sandy soils.
Gyngoorda	C43	32	Bannister	3.4	3453	Darling Plateau	Low	Russell, Windsor	Duncan, Stene, Wandering	Rock sheoak and Drummond's gum.

Julimar	C21	18	South Bindoon	2.1	27798	Darling Plateau	Low	—	—	Northern extension of jarrah marri, wandoo forests; <i>Dryandra polycephala</i> , <i>Hibbertia miniata</i> .
Karnet	M86	154	Serpentine	3.8	3688	Darling Plateau	High	Gooralong, Serpentine	—	Valley vegetation, butter gum.
Lennard	C87	60	Wellington Dam	4.2	7562	Darling Plateau	High	Westralia	—	High quality yarri, granitic outcrops.
Lupton (System 4)	C41	31	Shire of Brookton	8.8	2770	Darling Plateau	Low	Boyagarring	—	Wandoo, powerbark.
McLarty	C56	40B	Lake Clifton	10.11	727	Coastal Plain	Medium	—	Clifton, Myalup	Tuart. Spearwood Dune System.
Melaleuca	M9	85	Gnangara	15.1	3208	Coastal Plain	Low	—	—	Bassendean Dune System.
Mullalyup	C95	67	Balingup	5.4	4134	Darling Plateau	Medium	—	—	Yarri, heaths, on granitic outcrops.
Murray Valley	C73	52	Dwellingup	3.3	11159	Darling Plateau	High	Bell	Plavins, Teesdale	Recreation MPA
Myalup	C57	40B	Lake Preston	10.2	868	Coastal Plain	Medium	Clifton	McLarty	Swamp vegetation, tuart; transition between Spearwood and Bassendean Dune Systems. Swamp fauna.
Muja (System 4)	C93	66	Shire of West Arthur	4.6	3411	Darling Plateau	Medium	Goonac	—	Lake Ngartiminy; swamp vegetation.
Nalyerin	C83	58	Shire of Collie	10.7	10375	Darling Plateau	Medium	Trees	Gunapin, Sullivan Surface	Lake Nalyerin. Large range of flora and fauna.
Noggerup	C91	64	Noggerup	5.2	3487	Darling Plateau	High	Preston	—	Swamp banksia; high quality.
Nollajup	C101	72	Boyup Brook	5.6	661	Darling Plateau	Low	—	—	Southern virgin jarrah and wandoo.
Plavins	C74	53	Dwellingup	3.6	3495	Darling Plateau	High	Teesdale	Bell, Murray Valley	High quality jarrah, marri, river banksia.
Preston	C90	63	Noggerup	5.1	2707	Darling Plateau	High	Noggerup	—	Virgin jarrah. Moonah paperbark.
Ridges	M4	80	Yanchep	15.2	1260	Coastal Plain	Low	—	Caraban, Wabling	Extension of Yanchep National Park.
Russell	C33	26	Shire of Beverley	2.5	5702	Darling Plateau	Low	Gyngoorda	Duncan, Stene, Wandering	Virgin wandoo.
St. John Brook	C97	69	Nannup	12.2	3194	Blackwood Plateau	High	—	—	Incised valley of St. John Brook in east Sunkland. Outstanding development of blackbutt with shrub understorey. Possible rare fauna habitat. Recreation. Historical (Barrabup Mill and Pool).
Samson	C75	54	Waroona	10.5	1035	Darling Plateau	High	—	—	High quality bullich.
Serpentine	M87	154	Jarrahdale	8.7	1496	Darling Plateau	High	Karnet	Gooralong	Valley vegetation, marri and yarri.

Stene	C85	58	Shire of Williams	10.8	4487	Darling Plateau	Low	Wandering	Gyngoorda, Russell	Virgin jarrah and wandoo.
Sullivan	C35	27	Shire of Beverley	2.4	4555	Darling Plateau	Low	—	Gunapin, Nalyerin, Surface	Swamp vegetation (and associated fauna).
Surface	C82	58	Shire of Collie	10.6	15125	Darling Plateau	Medium	—	Gunapin, Nalyerin, Sullivan, Trees	A large area of virgin jarrah forest.
Teesdale	C72	51	Dwellingup	3.7	1728	Darling Plateau	High	Plavins	Bell, Murray Valley	Virgin jarrah. Scenic.
Trees	C84	58	Shire of Collie	4.1	7837	Darling Plateau	Medium	Nalyerin	Surface	Virgin jarrah.
Wabbling	C13	12	Yanchep	15.3	5030	Coastal Plain	Low	—	Caraban, Ridges	Transition from Spearwood and Bassendean Dune System. Wabbling Hill.
Wandering (System 4)	C44	33	Wandering	3.10	4334	Darling Plateau	Low	Stene	Gyngoorda, Russell	Woodlands of jarrah, marri, wandoo, rock sheoak, jam and eastern extension of yarri in State Forest.
Westralia	C88	61	Collie	4.3	2131	Darling Plateau, Collie Basin	High	Lennard	—	Range of vegetation types, including only representatives of vegetation from Collie Basin. Numbat.
Windsor	C39	30	Mount Cooke	8.6	4225	Darling Plateau	Medium	Gyngoorda	Cooke, Duncan Eagle Hill	Granitic monadnocks. Swamp vegetation and fauna. Scenic.

Appendix 6

Existing National Parks in System 6

Name	Location	Locality Number	Figure	Area (ha)
Avon Valley	Avon River	M16	90	4477
Gooseberry Hill	Gooseberry Hill	M34	107	33
Greenmount	Greenmount	M29	102	56
John Forrest	Swan View	M21	95	1577
Kalamunda	Piesse Brook	M34	107	375
Lesmurdie Falls	Forrestfield	M80	150A	56
Moore River	Lancelin	C2	5	17543
Neerabup	Wanneroo Road	M6	82	1195
Serpentine	Serpentine River	M85	154	635
Walyunga	Avon River	M18	92	1790
Yalgorup	Lakes Clifton and Preston	C54	40A & B	11545
Yanchep	Wanneroo Road	M3	80	2799
				42081

Appendix 7

Existing Nature Reserves in System 6

Reserve Class Number	Description	Local Authority	Locality Number	Figure	Area (ha)	Purpose (Conservation of Flora and Fauna unless otherwise indicated)
A	2738 Mealup Point	Murray	□	38	30.4	
A	3345 Moore River	Victoria Plains	C5	7	258.9	
A	9838 Wannamal Lake	Gingin	C10	10	85.9	
A	9868 Yanchep National Park	Wanneroo	M3	80	2789	Protection and Preservation of Caves and Flora, and Health and Pleasure Resort
A	15556 Thompson Lake	Cockburn	M93	158	508.7	Fauna Conservation, Research and Drainage
A	21708 Malap Island (Lake Joondalup)	Wanneroo	M7	83	4	Protection of Flora and Fauna
A	22576 Kalamunda	Kalamunda	□	—	2	Public Park and Flora
A	23756 Harvey Estuary	Waroona, Murray	C51	38	1019	
A	23958 Ridley Green	Kwinana	□	—	1.3	Flora and Children's Playground
A	23961 Ridley Green	Kwinana	□	—	2.2	Flora and Nursery School
A	24436 North-east of Wabbling Hill	Gingin	C13	12	112.9	Protection of Flora
A	24581 Nowergup Lake	Wanneroo	M6	82	116.5	Fauna Sanctuary
A	24739 Harvey Estuary Swamps and Lake McLarty	Murray	C52	38	48.1	
A	24781 Forrestdale Lake	Armadale-Kelmscott	M95	160	244.6	Conservation of Flora and Fauna and Recreation
A	25446 Powalup	Donnybrook-Balingup	C98	70A	67.2	
A	25562 Blue Gum Swamp	Melville	□	—	8.3	Recreation and Conservation of Fauna
A	25886 West of Byford	Serpentine-Jarrahdale	M99	162	153.6	
A	26270 East of Australind	Harvey	□	—	10.4	
A	26646 Carnac Island	Cockburn	C46	35	18.8	Recreation and Conservation of Fauna
A	27595 West of Calingiri	Victoria Plains	C21	18	124.4	
A	27620 Ellen Brook Wildlife Sanctuary	Swan	M17	91	67.2	Preservation of Fauna (Short-Necked Tortoise)
A	27621 Twin Swamps Wildlife Sanctuary	Swan	M17	91	155.3	Preservation of Fauna (Short-Necked Tortoise)
A	30191 Avon Valley	Toodyay	M16	90	1991.2	
A	31048 Lake Joondalup	Wanneroo	M7	83	465.4	Recreation and Conservation of Flora and Fauna
B	4990 Peel Inlet	Murray	C50	37	139.2	
B	24036 Austin Bay	Murray	C50	37	343.5	Conservation of Fauna (Straw-necked Ibis)
C	529 Beelaring Spring	Toodyay	C27	21	39.9	
C	659 Goonaring Spring	Toodyay	C27	21	52.6	
C	2707 Robert Bay	Murray	C50	37	98.3	Public Utility and Conservation of Flora and Fauna
C	4070 North of Bullsbrook	Chittering	C26	20	17.4	
C	6268 East of Coolup	Murray	□	—	15.7	Flora and Timber
C	7349 Jandabup Lake	Wanneroo	M8	84B	307.6	Conservation of Fauna
C	7756 Bartram Road, Success	Cockburn	□	—	33.4	Drainage and Conservation of Fauna
C	9676 Yurine Swamp	Gingin	C6	8	29.7	
C	10233 South-west of Parkerville	Kalamunda	□	—	4	Conservation of Flora
C	10745 East of Harvey	Harvey	C80	57	2.4	Preservation of Beauty Spot
C	11140 North-west of Parkerville	Mundaring	□	—	4.1	Conservation of Flora
C	12049 West of Cookernup	Harvey	C60	42	79.4	Water, Conservation of Flora and Aquatic Life
C	12632 West of Cookernup	Harvey	C60	42	40.5	Water, Conservation of Flora and Aquatic Life
C	15783 Wildlife Park	Collie	□	—	17.4	
C	19900 West of Coondle	Toodyay	□	—	87.2	
C	20765 Helena Valley	Mundaring	M34	107	4	Recreation and Bird Sanctuary
C	22096 Culham	Toodyay	C23	18	386	
C	22199 Wagerup	Waroona	C59	41	300.8	
C	22690 West of Collie	Collie	C88	61	2	Native Flora

C	22797	East of Harvey	Harvey	C80	57	300.7	
C	23012	Mundijong Swamps	Serpentine-Jarrahdale	□	—	28.5	Conservation of Fauna
C	24204	Shoalwater Bay Islands	Rockingham	M101	163	3.2	Conservation of Fauna (Shoalwater Bay Wildlife Sanctuary)
C	24257	Bambun, Nambun and Mungala Lakes	Gingin	C15	14	81.7	Conservation of Fauna
C	24430	South of Pinjarra	Murray	□	—	3.2	Conservation of Flora
C	24472	East of Lake Preston	Harvey	C61	43	36.9	
C	24504	Cohunu Wildlife Sanctuary	Gosnells	M80	150D	16.3	Wildlife Park
C	25919	Copley Dale	Swan	□	—	5.4	
C	26756	Wallerling Swamp	Gingin	C15	14	19.3	
C	27304	Collie	Collie	□	—	1.6	Flora and Fauna Sanctuary
C	27810	North of Mandurah	Mandurah	□	—	3.3	Conservation of Flora
C	28087	Peel Inlet and Nerimba Cay	Murray	C50	37	891.4	Conservation of Fauna
C	28167	South-west of Byford	Serpentine-Jarrahdale	M100	162	32.9	
C	28926	South of Collie	Collie	□	—	6.9	Conservation of Flora
C	29121	Wilga	Boyup Brook	C96	68	31.5	Conservation of Flora
C	29241	Lake Banganup	Cockburn	M93	158	253.7	Conservation of Fauna, Uni. Marsupial Research
C	29538	Chittering and Needonga Lakes	Chittering	C19	17	230.5	
C	30142	Kalamunda	Kalamunda	M80	150A	3.7	Preservation of Natural Flora
C	30306	Anvil Gully	Toodyay	□	—	39.2	
C	30667	North of Lake Manaring	Mundaring	M27	100	58.9	
C	30681	North of Lake Manaring	Mundaring	M27	100	24.3	
C	30809	Wanneroo Research Station Site	Wanneroo	M7	83	39	Research and Conservation of Flora and Fauna
C	31241	South-west of Gingin	Gingin	M5	81	337	
C	31893	Tub Rocks Warnbro Sound	Rockingham	M101	163	—	Conservation of Fauna
C	31894	The Sisters, Warnbro Sound	Rockingham	M101	163	—	Conservation of Fauna
C	31993	Mary Carroll Park	Gosnells	M76	147	8.6	Bird Sanctuary and Park
C	32064	Mills Road	Gosnells	M80	150D	5	Wildflower Sanctuary
C	32202	Karnet Brook	Serpentine-Jarrahdale	M85	154	302	
C	32352	Serpentine	Serpentine-Jarrahdale	□	—	1.8	Conservation of Flora
C	32400	North-west of Clackline	Northam	C29	23	458.9	
C	32807	Mt. Byroomanning	Chittering	C20	17	181.3	Conservation of Flora
*C	33188	Mt. Westdale	Beverley	C35	27	802.4	
C	33254	Nunamullen Lake	Toodyay	□	—	19.7	
C	33749	Boodalan Island	Murray	□	—	1.6	Recreation and Conservation of Flora and Fauna
C	33803	Swan River Foreshore	South Perth	□	—	4.4	Conservation of Fauna
C	34442	Dobaderry Swamp	Beverley	C35	27	1895.6	
C	34761	Gingin Stock Route	Gingin	□	—	65.4	
C	34811	Benger Swamp	Harvey	C65	45	10.1	
C	35066	Alfred Cove	Melville	□	—	7.3	
C	36126	Harvey River	Waroona	C51	38	31.1	Drainage and Conservation of Flora and Fauna
C	36433	West of Serpentine	Serpentine-Jarrahdale	□	—	1	Conservation of Flora

□Reserves not considered in the System 6 Study

* Reserve outside System 6, but considered in the System 6 Study

Appendix 8

Scientific names for System 6 flora

*introduced species

A

Acacia spp. — wattles
acuminata — jam
celastrifolia
cochlearis — rigid wattle
lasiocarpa
linearifolia
microbotrya — manna wattle
oncinophylla
pulchella — prickly moses
rostellifera
saligna
stenoptera
truncata
xanthina
Acanthocarpus preissii
Acianthus reniformis — mosquito orchid
acorn banksia — *Banksia prionotes*
Actinostrobilus pyramidalis — swamp cypress
Actinotus leucocephalus — flannel flower
Adenanthos barbigerus — hairy jug flower
cygnorum — woollybush
drummondii
meissneri
obovatus — basket flower
teges
Adriana quadripartita
Agonis flexuosa — peppermint
linearifolia
Albany synaphea — *Synaphea polymorpha*
Albizia lophantha
Alyxia buxifolia
Amyena miguelii — mistletoe
Anarthria prolifera
Anigozanthos humilis — cats' paw
manglesii — red and green kangaroo paw
pulcherrimus — golden kangaroo paw
Anthocercis littorea — yellow-tail flower
Apium prostratum
Arthrocnemum sp.
bidens
halocnemoides
*ash — *Fraxinus* sp.
Astartea fascicularis
Aster subulatus
Astroloma stomarrhena
Atriplex spp.
hartala
*Avena fatua — wild oats
Avicennia marina var. *resinifera* — mangrove, white

B

babe-in-a-cradle — *Epiblema grandiflorum*
bacon-and-eggs — *Oxylobium capitatum*
Baeckea camphorosmae
tenuifolia
banjines — *Pimelea* spp.
Banksia attenuata — slender banksia
grandis — bull banksia
ilicifolia — holly-leaf banksia
laricina — rose banksia
littoralis — swamp banksia
littoralis var. *seminuda* — river banksia
meissneri
menziesii — Menzies' banksia
prionotes — acorn banksia
bare twig rush — *Baumea juncea*
basket flower — *Adenanthos obovatus*
Baumea articulata — jointed twig rush
juncea — bare twig rush
Beaufortia elegans
squarrosa

blackboy — *Xanthorrhoea preissii*
black gin — *Kingia australis*
black kangaroo paw — *Macropidia fuliginosa*
bladderwort, twining — *Utricularia volubilis*
Blancoa canescens — winter bell
blueboy — *Stirlingia latifolia*
blue fairy orchid — *Caladenia deformis*
blue leschenaultia — *Lechenaultia biloba*
bog clubmoss — *Lycopodium carolinianum*
boobialla — *Myoporum adscendens*
boronia — *Boronia* spp.
tall — *Boronia molloyae*
Borya nitida — pincushion
Bossiaea aquilifolium — waterbush
ornata
bottlebrush, lesser — *Callistemon phoeniceus*
one-sided — *Calothamnus quadrifidus*
Brachyloma preissii
bracken — *Pteridium esculentum*
bright podolepsis — *Podolepis canescens*
bristly cottonheads — *Conostylis setigera*
broombush honeymyrtle — *Melaleuca uncinata*
brown mallet — *Eucalyptus astringens*
*buffalo grass — *Stenotaphrum secundatum*
bull banksia — *Banksia grandis*
bullich — *Eucalyptus megacarpa*
bulrush — *Typha orientalis*
buttercups — *Hibbertia* spp.
butter gum — *Eucalyptus laeliae*
buttons, water — *Cotula coronopifolia*
Byblis gigantea — rainbow plant

C

Cakile maritima
Caladenia deformis — blue fairy orchid
triangularis
Calectasia cyanea — Star-of-Bethlehem
Callistemon phoeniceus — lesser bottlebrush
Callitriche stagnalis — water starwort
Callitris morrisoni — Morrison's cypress
preissii — Rottneest cypress
Calothamnus quadrifidus — one-sided bottlebrush
rupestris
sanguineus — silky bloodflower
Calytrix flavescens — summer star flower
fraseri — pink calytrix
Cassytha racemosa — dodder-laurel
Casuarina acutaria
fraserana — sheoak
huegeliana — rock sheoak
humilis — scrub sheoak
lehmanniana
obesa — swamp sheoak
thuyoides
cats' paw — *Anigozanthos humilis*
Caustis dioica
Centella cordifolia
Chamaelaucium uncinatum — Geraldton wax
Chara australis
chenille honeymyrtle — *Melaleuca huegelii*
Christmas tree — *Nuytsia floribunda*
clubbrushes — *Scirpus* spp.
coast saw-sedge — *Gahnia trifida*
cookies' tongues — *Templetonia retusa*
common hovea — *Hovea trisperma*
smokebush — *Conospermum stoechadis*
verreauxia — *Verreauxia reinwardtii*
Conospermum spp. — smokebushes
Conospermum glumaceum — hooded smokebush
polycephalum
stoechadis — common smokebush
triplinervum — tree smokebush

Conostephium minus
Conostylis candicans
 setigera — bristly cottonheads
 coral vine — *Kennedia coccinea*
Corybas dilatatus — helmet orchid
 cottonheads — *Conostylis* spp.
 bristly — *Conostylis setigera*
Cotula coronopifolia — water buttons
 *couch grass — *Cynodon dactylon*
 couch honeypot — *Dryandra nivea*
Cyathochaete avenacea
 **Cyclosorus* sp. — tropical fern
 **Cynodon dactylon* — couch grass
Cyperus vaginatus
 cypress, Morrison's — *Callitris morrisoni*
 Rottneest — *Callitris preissii*
 swamp — *Actinostrobus pyramidalis*

D
 daisy-bush, rough — *Olearia rudis*
Dampiera alata
Darwinia sp.
 thymeloides
Dasyogon sp.
 bromeliaefolia
 hookeri — pineapple bush
Daviesia juncea
 pectinata — prickly bitter-pea
Diplopeltis huegelii
 dodder-laurel — *Cassytha racemosa*
Dodonaea attenuata
 hackettiana — Hackett's hop bush
Drosera spp. — sundews
Drosera gigantea
 pulchella
 Drummond's gum — *Eucalyptus drummondii*
 drumstick isopogon — *Isopogon sphaerocephalus*
Dryandra carduacea
 drummondii
 nivea — couch honeypot
 polycephala
 praemorsa
 sessilis — parrot bush

E
 **Ehrharta calycina* — veldt grass
 **Eichhornia crassipes* — water hyacinth
Eleocharis sphacelata
Epiblema grandiflorum
Eremaea spp.
Eremophila glabra — tar bush
Eriochilus scaber
Eriostemon spicatus — pepper-and-salt
Eucalyptus accedens — powderbark
 stringens — brown mallet
 calophylla — marri
 * *citriodora* — lemon scented gum
 * *cladocalyx* — sugar gum
 decipiens — limestone marlock
 diversicolor — karri
 drummondii — Drummond's gum
 foecunda — Fremantle mallee
 gomphocephala — tuart
 haematoxylon — mountain gum
 laeliae — butter gum
 lane-poolei — salmon white gum
 loxophleba — york gum
 marginata — jarrah
 megacarpa — bullich
 patens — yarri
 rudis — flooded gum
 todtiana — pricklybark
 wandoo — wandoo
Euchilopsis linearis — pea plant
 *European olive — *Olea europaea*

F
 *fern, tropical — *Cyclosorus* sp.
 **Ficus* sp. — fig

*fig — *Ficus* sp.
 flannel flower — *Actinotus leucocephalus*
 flooded gum — *Eucalyptus rudis*
Frankenia pauciflora
 **Fraxinus* sp. — ash
 Fremantle mallee — *Eucalyptus foecunda*
 fringed lily — *Thysanotus anceps*
 fuschia grevillea — *Grevillea bipinnatifida*

G
Gahnia trifida — coast saw-sedge
Galeobryum sp. — species of liverwort
Gastrolobium spinosum — prickly poison
 Geraldton wax — *Chamaelaucium uncinatum*
 giant rush — *Juncus pallidus*
 *gladiolus — *Gladiolus* spp.
 **Gladiolus* spp. — gladiolus
 golden kangaroo paw — *Anigozanthos pulcherrimus*
Gompholobium knightianum
 tomentosum — yellow pea
 granite petrophile — *Petrophile biloba*
 greenhood orchid — *Pterostylis rogersii*
Grevillea bipinnatifida — fuschia grevillea
 crithmifolia
 endlicherana
 glabrata
 pilulifera
 thelmanniana — spider-net grevillea
 wilsonii — Wilson's grevillea
 grey honeymyrtle — *Melaleuca incana*
Gyrostemon ramulosus

H
 Hackett's hop bush — *Dodonaea hackettiana*
 hairy flag — *Patersonia rudis*
 hairy jugflower — *Adenanthos barbigerus*
Hakea amplexicaulis
 ceratophylla
 costata
 lissocarpa — honeybush
 prostrata — harsh hakea
 sulcata
 varia
Hardenbergia comptoniana — wild sarsaparilla or wisteria
 helmet orchid — *Corybas dilatatus*
Hemiandra pungens — snakebush
Hemigenia pritzelii
Hibbertia hypericoides
 montana
 racemosa
 holly-leaf banksia — *Banksia ilicifolia*
 honeybush — *Hakea lissocarpa*
 honeymyrtle, broombush — *Melaleuca uncinata*
 chenille — *Melaleuca huegelii*
 grey — *Melaleuca incana*
 rough — *Melaleuca scabra*
 hooded smokebush — *Conospermum glumaceum*
 hovea, common — *Hovea trisperma*
Hydrocotyle lemnoides
Hypocalymma angustifolium — white myrtle
 robustum — Swan River myrtle

I
Isopogon drummondii
 dubius — pincushion coneflower
 sphaerocephalus — drumstick isopogon
Isotoma hypocrateriformis — woodbridge poison

J
Jacksonia floribunda
 furcellata
 hakeoides
 sericea
 sternbergiana — stinkwood
 jam — *Acacia acuminata*
 jarrah — *Eucalyptus marginata*
 jointed twig rush — *Baumea articulata*
 jugflower hairy — *Adenanthos barbigerus*

Juncus kraussii
maritimus
pallidus — giant rush

K

kangaroo paw, red and green — *Anigozanthos manglesii*
 black — *Macropidia fuliginosa*
 golden — *Anigozanthos pulcherrimus*
 karri — *Eucalyptus diversicolor*
 karri-hazel — *Trymalium spathulatum*
Kennedia coccinea — coral vine
prostrata — red runner
Kingia australis — black gin
 koolah — *Podocarpus drouyniana*
Kunzea recurva — mountain kunzea
vestita — spearwood

L

Labichea punctata
Lagurus ovatus
Lambertia multiflora
 lambstail — *Lachnostachys* spp.
Lechenaultia biloba — blue leschenaultia
floribunda
linarioides — yellow leschenaultia
Lemna minor
 *lemon scented gum — *Eucalyptus citriodora*
Lepidosperma gladiatum — sword grass
Leptocarpus canus
scarosus
Leptospermum firmum — tea tree
ellipticum — swamp tea tree
 lesser bottlebrush — *Callistemon phoeniceus*
Leucopogon kingianus
verticillatus — tassel flower
 limestone marlock — *Eucalyptus decipiens*
 liverwort — *Galeobryum* sp.
Lobelia alata
Logania vaginalis
Lycopodium carolinianum — bog clubmoss
Lysinema elegans

M

Macropidia fuliginosa — black kangaroo paw
Macrozamia reidleyi — zamia
 mangrove, white — *Avicennia marina* var. *resinifera*
 manna wattle — *Acacia microbotrya*
 marri — *Eucalyptus calophylla*
Melaleuca acerosa
cuticularis — saltwater paperbark
huegelii — chenille honeymyrtle
incana — grey honeymyrtle
lanceolata — Rottneest tea tree
lateritia — robin redbreast bush
leptoclada
microphylla
preissiana — Moonah paperbark
rhopiophylla — swamp paperbark
scabra — rough honeymyrtle
teretifolia
uncinata — broombush honeymyrtle
viminea
 Menzies' banksia — *Banksia menziesii*
Mesomelaena stygia — telegraph sedge
tetragona — semaphore sedge
 mistletoe — *Amyena miguelii*
 Moonah paperbark — *Melaleuca preissiana*
 morrison — *Verticordia nitens*
 Morrison's cypress — *Callitris morrisoni*
 mosquito orchid — *Acianthus reniformis*
 mountain gum — *Eucalyptus haematoxylon*
 mountain kunzea — *Kunzea recurva*
Myoporum adscendens — boobialla
Myriophyllum spp.
 myrtle, Swan River — *Hypocalymma robustum*
 white — *Hypocalymma angustifolium*

N

Neurachne alopecuroides
Nuytsia floribunda — Christmas tree

O

**Olea europaea* — European olive
Olearia axillaris
rudis — rough daisy bush
 *olive, European — *Olea europaea*
 one-sided bottlebrush — *Calothamnus quadrifidus*
 orchid, blue fairy — *Caladenia deformis*
 greenhood — *Pterostylis rogersii*
 helmet — *Corybas dilatatus*
 mosquito — *Acianthus reniformis*
Oxylobium capitatum — bacon-and-eggs

P

paperbark, Moonah — *Melaleuca preissiana*
 saltwater — *Melaleuca cuticularis*
 swamp — *Melaleuca raphiophylla*
 Papilionaceae — pea flower family
 parrot bush — *Dryandra sessilis*
 **Paspalum distichum* — water couch
Patersonia occidentalis — purple flag
rudis — hairy flag
 pea plant — *Euchilopsis linearis*
Pelargonium capitatum
 pepper-and-salt — *Eriostemon spicatus*
 peppermint — *Agonis flexuosa*
 pepper tree — *Schinus molle*
Persoonia elliptica
longifolia
Petrophile biloba — granite petrophile
linearis — pixie mops
longifolia
serruriae
Phlebocarya ciliata
 pincushion — *Borya nitida*
 pincushion coneflower — *Isopogon dubius*
 pineapple bush — *Dasypogon hookeri*
Pittosporum sp.
 pixie mops — *Petrophile linearis*
Podocarpus drouyniana — koolah
Podolepis canescens — bright podolepis
Polygonum attenuatum
 powderbark — *Eucalyptus accedens*
 pricklybark — *Eucalyptus todtiana*
 prickly bitter-pea — *Daviesia pectinata*
 prickly moses — *Acacia pulchella*
 prickly poison — *Gastrolobium spinosum*
Pronaya elegans
Pteridium esculentum — bracken
Pterostylis rogersii — greenhood orchid
Ptilotus manglesii
Pultenaea reticulata
 purple flags — *Patersonia occidentalis*

Q

quandong — *Santalum acuminatum*

R

rainbow plant — *Byblis gigantea*
 rats' tails — *Scaevola thesioides*
 red runner — *Kennedia prostrata*
Regelia ciliata
 **Rhagodia radiata*
 ribbons, water — *Triglochin procera*
 river banksia — *Banksia littoralis* var. *seminuda*
 robin redbreast bush — *Melaleuca lateritia*
 rock sheoak — *Casuarina huegeliana*
 romulea — *Romulea* spp.
 rose banksia — *Banksia loricata*
 Rottneest cypress — *Callitris preissii*
 tea-tree — *Melaleuca lanceolata*
 rough daisy bush — *Olearia rudis*
 rough honeymyrtle — *Melaleuca scabra*
Ruppia maritima
 rush giant — *Juncus pallidus*

S

Salicornia australis — samphire
 **Salix* spp. — willow
 salmon white gum — *Eucalyptus lane-poolei*

*saltwater couch — *Sporobolus virginicus*
 paperbark — *Melaleuca cuticularis*
Salvinia spp. — salvinia
 salvinia — *Salvinia* spp.
Samolus repens
Santalum acuminatum — quandong
 samphire — *Salicornia australis*
Scaevola crassifolia
 holosericea
 nitida
 thesiodes — rats' tails
Schinus molle — pepper tree
Schoenus spp.
Scholtzia involucrata
Scirpus maritimus
 nodosus
 prolifer
 vallidus
 scrub sheoak — *Casuarina humilis*
 sedge, coast saw — *Gahnia trifida*
 semaphore — *Mesomelaena tetragona*
 telegraph — *Mesomelaena stygia*
Selenothamnus squamatus
 semaphore sedge — *Mesomelaena tetragona*
Senecio lautus
 sheoak — *Casuarina fraserana*
 rock — *Casuarina huegeliana*
 scrub — *Casuarina humilis*
 swamp — *Casuarina obesa*
 silky bloodflower — *Calothamnus sanguineus*
 slender banksia — *Banksia attenuata*
 smokebush, common — *Conospermum stoechadis*
 hooded — *Conospermum glumaceum*
 tree — *Conospermum triplinervum*
 snakebush — *Hemiantra pungens*
 snottygobble — *Persoonia* spp.
 spearwood — *Kunzea vestita*
 spider-net grevillea — *Grevillea thelemanniana*
Spinifex spp.
Spirogyra spp.
 **Sporobolus virginicus* — saltwater couch
Spyridium globulosum
 star flower, summer — *Calytrix flavescens*
 Star-of-Bethlehem — *Calectasia cyanea*
 starwort, water — *Callitriche stagnalis*
 **Stenotaphrum secundatum* — buffalo grass
 stinkwood — *Jacksonia sternbergiana*
Stipa variabilis
Stirlingia latifolia — blueboy
Stylidium spp. — trigger plants
Stylidium imbricatum — tiled trigger plant
Suaeda australis
 *sugar gum — *Eucalyptus cladocalyx*
 summer star flower — *Calytrix flavescens*
 sundew — *Drosera* spp.
 swamp banksia — *Banksia littoralis*
 cypress — *Actinostrobus pyramidalis*
 paperbark — *Melaleuca raphiophylla*
 sheoak — *Casuarina obesa*
 teatree — *Leptospermum ellipticum*
 Swan River myrtle — *Hypocalymma robustum*
 swishbush — *Viminaria juncea*
 swordgrass — *Lepidosperma gladiatum*
Synaphea petiolaris
 polymorpha — Albany synaphea

T

tall boronia — *Boronia molloyae*
 tar bush — *Eremophila glabra*
 tassel flower — *Leucopogon verticillatus*

teatree — *Leptospermum firmum*
 Rottneest — *Melaleuca lanceolata*
 swamp — *Leptospermum ellipticum*
 telegraph sedge — *Mesomelaena stygia*
Templetonia retusa — cockies' tongues
Tetragonia decumbens
Threlkeldia diffusa
Thysanotus sp.
 anceps — fringed lily
 tiled triggerplant — *Stylidium imbricatum*
Tricoryne elatior — yellow lily
 trigger plants — *Stylidium* spp.
Triglochin acuta
 procera — water ribbons
 *tropical fern — *Cyclosorus* sp.
Trymalium ledifolium
 spathulatum — karri-hazel
 tuart — *Eucalyptus gomphocephala*
 twig rush, bare — *Baumea juncea*
 jointed — *Baumea articulata*
 twining bladderwort — *Utricularia volubilis*
Typha orientalis — bulrush

U

Utricularia volubilis — twining bladderwort

V

*veldt grass — *Ehrharta calycina*
Verreauxia reinwardtii — common verreauxia
Verticordia densiflora
 lindleyi
 nitens — morrison
 plumosa
Viminaria juncea — swishbush

W

wandoo — *Eucalyptus wandoo*
 water bush — *Bossiaea aquilifolium*
 buttons — *Cotula coronopifolia*
 *hyacinth — *Eichhornia crassipes*
 ribbons — *Triglochin procera*
 starwort — *Callitriche stagnalis*
 *couch — *Paspalum distichum*
 wattle, manna — *Acacia microbotrya*
 rigid — *Acacia cochlearis*
Westringia rigida
 white mangrove — *Avicennia marina* var. *resinifera*
 white myrtle — *Hypocalymma angustifolium*
 *wild oats — *Avena fatua*
 wild sarsaparilla or wisteria — *Hardenbergia comptoniana*
 *willow — *Salix* spp.
 Wilson's grevillea — *Grevillea wilsonii*
 winter bell — *Blancoa canescens*
 woollybush — *Adenanthos cygnatum*
 woodbridge poison — *Isotoma hypocrateriformis*
 woody pear — *Xylomelum occidentale*

X

Xanthorrhoea preissii — blackboy
Xylomelum occidentale — woody pear

Y

yarri — *Eucalyptus patens*
 yellow leschenaultia — *Lechenaultia linarioides*
 lily — *Tricoryne elatior*
 pea — *Gompholobium tomentosum*
 tail flower — *Anthocercis littorea*
 york gum — *Eucalyptus loxophleba*

Z

zamia — *Macrozamia reidiei*