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THE IMPACT OF PROPOSED ROADS ON WETLANDS IN THE PERTH METROPOLITAN REGION

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Perth, Western Australia

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THE IMPACT OF PROPOSED ROADS ON WETLANDS IN THE PERTH METROPOLITAN REGION

On 20th January, 1986 State Cabinet approved the release of this consultant's Report.

Cabinet resolved that decision-making authorities should have regard to the study and should consult the Department of Conservation and Environment during the planning stages, and before any decisions are made, concerning any planned works identified in this Report.

The primary purpose of this Report is as an information source.

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Table of Contents

List of Tables

List of Figures

Appendices

Appendix

THE IMPACT OF PROPOSED ROADS ON WETLANDS IN THE PERTH METROPOLITAN REGION

1 INTRODUCTION

1.1 BACKGROUND

The Department of Conservation & Environment (DCE) commissioned LeProvost, Semeniuk & Chalmer, Environmental Consultants (LSC) to investigate the potential impact of the construction of proposed roads on wetlands in the Perth Metropolitan Region. In essence the study as defined by DCE was intended to locate all proposed roadworks in the Perth Metropolitan Region, determine their proximity to wetlands and provide guidelines for the assessment of the conservation potential of those wetlands that may be adversly affected.

This report presents the results of the investigation.

1.2 OBJECTIVES AND SCOPE

The objectives of the study were:

(i) to determine the number and locations of wetlands potentially at risk from proposed roadworks in the Perth Metropolitan Region; and

(ii) to develop criteria for the assessment of the environmental significance and conservation value of these wetlands.

The approach adopted to achieve these objectives was:

(a) for Objective (i)

- wetlands in the Perth Metropolitan Region were mapped at a scale of 1:50,000;
- proposed roadworks were mapped at a scale of 1:50,000; and
- the wetlands at risk from proposed roadworks were identified by overlaying these maps and noting where planned roads passed through or near wetlands.

(b) for Objective (ii)

- literature on the classification and management of wetlands in Western Australia and elsewhere was reviewed;
- a broad and systematic approach to classification of wetlands in the Perth Metropolitan Region was developed;
- criteria for assessing the conservation value of wetlands were formulated;
- community groups, Government Departments and persons having expertise in the field of wetland conservation and study were invited to comment on the overall approach and individual criteria for wetland assessment;
- a procedure for the implementation of the wetland assessment was formulated.

1.3 REPORT STRUCTURE

The ensuing sections follow the sequential tasks outlined above.

Task 1 : Preparation of wetland maps - Section 2.

Task 2 : Preparation of road maps - Section 3.

Task 3 : The anticipated zones of impact - Section 4.

Task 4 : Development of criteria to assess wetland conservation values - Section 5.

2 MAPPING OF WETLANDS

2.1 INTRODUCTION

It is evident that the most practicable method to determine the relationship between wetlands and proposed roads is comparison of road and wetland maps as overlays to a common base reference map system. This will not only allow identification of points of conflict between wetlands and proposed roads, but of other potential sources of conflict arising from other forms of development shown on the base maps.

The basic requirements for this analysis are maps, at a common scale, of "significant" wetlands and proposed roads covering the designated study area, which for the current investigation is defined as the Perth Metropolitan Region.

The mapping of significant wetlands requires definition firstly of what is a wetland and, secondly, what is a "significant" wetland.

2.1.1 The Definition of a Wetland

In Western Australia wetlands have been defined for conservation purposes as: "Areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries" (Wetlands Advisory Committee, 1977).

This broad definition of a wetland is not specific enough to allow for the precise mapping of wetlands and their boundaries, as the limiting frequency and periodicity of inundation does not form an integral part of the definition. Thus areas inundated very infrequently, e.g. only once in a number of years, or for very short periods, e.g. one day or less, fall within the limits of the present definition of a wetland, as they are subject to intermittent inundation, although for all practical purposes they may not be regarded as wetlands.

In addition, this definition does not lend itself directly to traditional aerial photographic analysis, the technique generally used in drawing wetland boundaries on topographic maps. For this reason the presence of particular plant species such as reeds, samphires or paperbarks, or vegetation forms dependent on a high water table such as a lush growth of grasses in an otherwise sparsely vegetated area, are frequently used in drawing wetland boundaries, although such features are not criteria of the definition.

2.1.2 Definition of a "Significant" Wetland

To date there has been no clearly defined process for assessing the value or "significance" of individual wetlands on a regional basis. A relatively small number of well-known wetlands such as Herdsman Lake and Bibra Lake are subjectively recognised as having a "significant" regional value although in only a few cases have wetlands been assessed in scientific (or "objective") studies which have confirmed their (specific) valuable features. Smaller and generally less well-known lakes and swamps are frequently assessed on a subjective basis and often then only within a local framework. Consequently, at present, there is little available information on the significance of wetlands within the study area and on a regional basis. The development of a framework for a comprehensive wetland evaluation process necessary for regional wetland assessment is discussed in Section 5 of this report.

2.2 ASSESSMENT OF AVAILABLE WETLAND MAPPING DATA

It can be seen from the previous section that, at this stage of the study, it is not possible to map the impact of proposed roads on "significant" wetlands as defined in the study brief. A number of compromises must therefore be adopted in order to achieve the goals of the study. These include variations to the definition of wetlands, the scope of wetlands to be covered in the mapping, and the effects of scale on the coverage of wetlands achieved.

2.2.1 "Significant" Wetlands

In the absence of any rationale for determining at the outset of the study the "significance" of any given wetland, and indeed the resources to individually assess each of the estimated 10,000 wetlands within the Perth Metropolitan Region even if such a rationale had been available, it was decided that in the initial mapping process all identifiable wetlands would be included for the assessment of future road conflicts.

2.2.2 Wetland Mapping

To date there has been no attempt to map wetlands as defined by the Wetlands Advisory Committee (1977), either on a local or regional scale. The scope of this study does not allow for the commissioning of a new system of mapping of the wetlands of the study area, even assuming that a satisfactory solution had been found to the assignment of boundaries of ephemeral wetland areas.

Consequently existing mapping which delineates wetlands, according to other definitions, has been adopted for the purposes of the study. The main requirements of such mapping are that the maximum detail on wetlands is shown and that the coverage takes

in the whole of the Perth Metropolitan Region. A secondary requirement is that the scale of the mapping should be amenable to manipulation to complement road and base map scales.

Map Sheet Coverage: The approximate number of map sheets required to cover the Study Area at each of the following scales is:

Scale	1:5,000	approximately	1,000 sheets
	1:25,000	"	40 "
	1:50,000	"	10 "
	1:100,000	"	3 "
			2 (large)
	1:250,000	"	1 sheet

There will be some variation on the above depending on the sizes of the individual sheets in a map series.

The most appropriate scale for the project is considered to be that of the Metropolitan Region Scheme (MRS) maps, i.e. 1:50,000. This scale provides a workable number of maps, is at the same scale as most maps of proposed regional future roads and, if assembled on the same grid, can be directly overlaid on the current MRS maps to assist in assessing future potential impacts from other development processes as well as placing roads and wetlands within the framework of existing and proposed development.

Scale Detail: The amount of information which can be incorporated in any map depends largely on the scale of the map and to a lesser degree, on the number of different features to be mapped within a given area. Thus a map showing details of roads, railways, cyclepaths and footways, for example, is able to show less detail on any single feature than if that feature alone were being mapped. Similarly the smaller the scale, i.e. the smaller the mapped representation of the object compared to its real size, the less the detail that can be shown for any given feature and the larger the size a feature must be before it will be recorded at true scale on the map. For example, Shenton Park Lake which is approximately 250m in diameter would be shown, at various map scales, as:

50mm	in diameter	on a	1:5,000 scale map
10mm	"		1:25,000 " "
5mm	"		1:50,000 " "
2.5mm	"		1:100,000 " "
1mm	"		1:250,000 " "

The effect of scale reduction consequently imposes a downward limit to the size of wetland which can be recorded on a map and consequently an arbitrary, although necessary for practical purposes, size limit is imposed. In practice it is not possible to convey any detail other than location at a mapped size of 1mm and less or to convey additional information on structures other than very approximate shape at a mapped size of less than 2mm unless

scale exaggeration techniques are used. Further, unless larger scale mapping, e.g. 1:10,000 or 1:5,000 is used in the production of the original mapping, it is unlikely that topographic features of less than 1mm mapped size will be recorded and subsequently appear at the reduced map scale.

If, as recommended in the previous section, a map scale of 1:50,000 is adopted, the smallest wetland which can be shown would be approximately 50m in diameter. Fortunately, this size restriction will apply largely to isolated wetlands. Streams and linked wetlands, etc. are usually recorded by virtue of their linear nature despite frequently being only a few metres in width.

Information Bases: A number of accessible map systems containing wetland information were examined for their suitability for use as wetland overlay maps, including:

- 1:5,000 series orthophoto maps
- 1:25,000 series topographic survey maps
- 1:100,000 series topographic survey maps
- 1:250,000 series topographic survey maps
- 1:250,000 series vegetation mapping - Perth Sheet (Beard, J.S. 1979)
- 1:50,000 Metropolitan Region Scheme maps
- 1:50,000 Geological Survey Environmental Geology Maps
- 1:250,000 Atlas of Natural Resources - Darling System (System Six) Land-use, Vegetation, Landforms and Soils, and Geology and Mineral Resources maps.

i) 1:5,000 Orthophoto Maps: The orthophoto maps provide potentially the greatest amount of readily available information on wetlands (other than aerial photography at the same or larger scale) although their use requires interpretation of boundaries and a high degree of ground verification which is beyond the scope of the present study. There would also be a very significant amount of cartographic work in reducing the information to a workable scale, which again is outside the scope of the study.

ii) 1:25,000 Topographic Survey Map Series: The 1:25,000 Topographic Survey Map Series produced by the Department of Lands & Surveys, Western Australia and printed by the Royal Australian Survey Corps provide wetland information with mapped boundaries of:

Land subject to inundation (- regularly by seasonal flood water)
Swamps - perennial and seasonal
Lakes - perennial to mainly dry
Streams - perennial to mainly dry
Rivers - perennial to mainly dry

This therefore incorporates all of the categories included in the wetland definition with the exception of areas of waterlogged soils. Areas of waterlogged soils are frequently located on the periphery of mapped wetland types and may possibly exceed the combined area of all other wetland types.

Waterlogged soils also support the majority of the peripheral vegetation commonly referred to as wetland vegetation which is an integral part of a natural wetland and critical to the consideration of wetlands for conservation purposes.

In practical terms the photography on which the mapping is based varies in terms of the time of year in which it is taken, and on the variability of seasons and hence water levels which occur from year to year. Such variability means that mapping of ephemeral wetland areas must be based substantially on the presence of recognisable wetland vegetation rather than the presence of surface water. Consequently the interpretation of wetland boundaries relies heavily on the skill and experience of the photo interpreter although cross checking to achieve maximum uniformity is undertaken. (In the final wetland map series evidence can be seen of the variability which does occur. A good example is where adjacent sheets have been joined in the Muchea area revealing a disjunction in areas mapped as subject to inundation). It should be noted that the classification of "land subject to inundation" is the most subject to mapping variability because of seasonal factors and because it is most generally mapped by vegetation characteristics, there being no obvious structural formations associated with this wetland type. Even when flooded the surface water in these areas is frequently masked by dense vegetation.

It is also noted that the definitions used do not specify either periods of flooding or stream flow, or periods between flooding or stream flow, other than in general terms.

iii) 1:50,000 Topographic Series: The 1:50,000 Topographic Series is mapped according to the same criteria as the 1:25,000 series and in fact forms an extension of the large-scale mapping, currently replacing the 1:25,000 series maps on the eastern side of the Perth Metropolitan Region. Consequently the style and presentation of information is identical, although there is obviously a loss of information on smaller features because of the reduction in scale.

iv) 1:100,000 Topographic Series: The 1:100,000 Topographic Map Series is prepared by the Division of National Mapping from information supplied by the Department of Lands & Surveys, Western Australia. In addition to the further loss of information caused by the reduction of scale, mapping at 1:100,000 is also carried out according to a different set of criteria to the 1:25,000 and 1:50,000 map series. In practice the same categories of wetland are mapped and in a very similar manner, however the 1:100,000 series

definitions are generally more specific as to duration and frequency of inundation or stream flow than those of the 1:25,000 and 1:50,000 series.

v) 1:250,000 Topographic Survey: The 1:250,000 Topographic Survey map series is mapped by the Department of Lands & Surveys, Western Australia and printed by the Royal Australian Survey Corps. In this series there is a significant further reduction in the detail of information presented, although this is a function of the scale effect rather than of any change in mapping definitions.

In general terms the loss of recorded wetlands at reducing scales is not expressed by a simple relationship. Although a halving of scale reduces the mapped size of a wetland by 50% it does not take into consideration the size gradients of existing wetlands. For example, if 50% of all wetlands were approximately 100m in diameter, with 10% significantly larger and the remaining 15% significantly smaller, 60% of wetlands would be recorded on mapping at a scale of 1:100,000 while only 25% of all wetlands would be recorded at a scale of 1:250,000.

vi) 1:250,000 Vegetation Mapping (Beard): The 1:250,000 vegetation maps are drawn on a 1:250,000 topographic map base supplied by the Division of National Mapping, Canberra, with vegetation boundaries, interpreted by aerial photography with ground verification, superimposed over the topographic base. As such there is no additional physical detail presented on wetland boundaries and the vegetation boundaries are not adequate at this scale of mapping to more accurately define wetland features.

vii) 1:250,000 Atlas of Natural Resources - Darling System (System Six) Mapping: The 1:250,000 Darling System maps of vegetation, land use, landforms and soils, and geology are also based on a 1:250,000 topographic map base. There is no additional superimposed information presented which would make the use of this mapping preferable to that of the 1:250,000 topographic maps. In this series the wetlands detail also has been reduced in order to clarify other aspects of the mapping. In practical terms the use of this map system would also render the extraction of wetland information more difficult because of the colour system used.

viii) 1:50,000 Metropolitan Region Scheme Maps: These maps are drawn on a topocadastral map base. The location of larger wetlands is shown but no data are provided on peripheral and ephemeral wetland areas. As such, the level of information presented is considered to be inadequate for the purposes of this study.

The presentation of zoning boundaries, and information on reserved areas and future land use planning does however, mean that this map series forms an ideal base for overlaying more detailed mapping of roads and wetlands.

ix) Perth Metropolitan Region 1:50,000 Environmental Geology Series: The Environmental Geology Series is prepared by the Geological Survey of Western Australia on a 1:25,000 topographic map base [see (ii) above] with geological information superimposed. The geological information is based on interpretation of aerial photography with extensive ground truthing. This map series (which is currently incomplete) does not provide additional information on wetland boundaries as such. Rather, it presents information on various soil types which allows some inferences to be drawn on wetland distributions, as the formation of certain soil types is dependent on conditions found only in wetlands. The information however is at least partly historical in that it maps soils which have already been formed. These soils may no longer be in the process of formation, due to changes in water table or stream channels, etc., and consequently the area may no longer be classed as a wetland within the accepted definition.

Preferred Map Information Base: From the above review it can be seen that within the constraints of the study and the desire to include the maximum level of information on the wetlands overlays, the 1:25,000 or 1:50,000 Topographic Map Series are the best currently available source of data. An examination of current availability showed that neither series provided a complete coverage of the study area but that the two series do provide complementary coverage which encompasses the whole of the Perth Metropolitan Region.

In order to utilise the information provided by the two topographic map series it was first necessary to bring the maps to a common scale, in this case the selected scale of 1:50,000. This has been achieved by reducing the 1:25,000 maps by 50%. The wetland information was then extracted from the maps for transformation onto clear overlays and the sheets restructured to utilise the same boundaries as the MRS maps. As far as practicable the information has been extracted in its original format and this is reflected in the wetland classification used in the wetlands overlay maps. This retains basic information on wetlands which allows some broad scale assessment of the distribution of various wetland formations to be carried out.

Omissions in Mapping: It must be recognised that while all possible information has been included, certain information could not be shown on the wetland overlay maps. The omissions generally fall within the following categories:

(i) wetlands or portions of wetlands omitted from the original mapping;

(ii) wetlands not shown because of scale. This would include the majority of wetlands of less than 50m diameter, other than linear features such as streams and creeks;

(iii) areas of temporary inundation which could not be interpreted from the available aerial photography in the original mapping process;

(iv) categories of wetlands not recognised in the mapping definitions, e.g. areas of waterlogged soils not subject to inundation.

Fortunately categories (iii) and (iv) are most generally found in association with recognised wetlands and by allowing for a peripheral "zone of wetland influence" marginal to mapped wetlands, a substantial proportion of such areas can be included in the assessment.

For this reason it is recommended that a zone, equal in width to the diameter of the mapped wetland, be allowed in preliminary assessments of whether or not a proposed road will have any impact on a wetland area. Further detailed mapping and assessment are required to determine whether there is any real impact involved.

The planning and construction of roads is the responsibility of a number of different authorities and at present there is no uniform and comprehensive mapping available of all classes of roads proposed to be constructed within the Perth Metropolitan Region. The mapping of roads for this project is discussed in the following section of the report.

3 MAPPING OF PROPOSED ROADS

3.1 INTRODUCTION

Initial discussions were held between LSC and officers of the DCE, MRD, and TPD to establish definitions, the practical scope of the study and the availability of information on current road planning. As a result of these discussions numerous factors were revealed which have influenced the approach to the collection of data and the timescale for this study. These are discussed below.

The responsibility for planning and construction of roads in the Perth Metropolitan Region is shared by the MRPA, MRD, 26 Local Authorities (LGAs) (see Table 2) and private developers, but there is no central source of information on road planning at all levels. In the absence of a single responsible agency, there are wide variations in the approach to road planning.

The MRPA is largely responsible for **regional** road planning, in conjunction with the MRD. However, the MRS maps do not distinguish between constructed and reserved roads, and the TPD does not keep up-to-date records of their state of construction. Information on reserved but unconstructed regional roads came largely from construction agencies - the MRD and 26 LGAs who are responsible, either directly or through contract management, for road construction (see Section 3.6.1 and 3.6.2). It should be noted that the MRD does not use the same road classification system as the MRPA.

Local road planning is largely the responsibility of LGAs, either directly or through their approval of subdivision and development plans. Other authorities, for example the MRD or the MRPA, become involved in some instances. Between the various LGAs, local roads are subject to variation in approach to planning, environmental assessment procedures, terminology and construction standards. Many local road maps are out of date, and few distinguish between constructed and planned roads. Identification of unconstructed road reserves and planned roads depended largely on the local knowledge of LGA officers. This is an extremely large task for larger, fast-growing areas such as Wanneroo.

Some LGAs have overall road plans, or area structure plans to guide road development. Many respond to individual subdivision and development applications within the confines of their Town Planning Scheme (TPS) zonings and MRPA Corridor Structure Plans (see Section 3.6.2).

There are, at this stage, no definite road plans for many areas still to be developed, especially in the outer Metropolitan Area. Conversely, many roads shown in TPS and other maps are historical

and may never be built, or not on the alignments currently shown. Finally, road plans which are at the concept stage or under current study cannot be mapped at an appropriate scale.

Environmental assessment procedures are well defined for the planning of regional roads, and for construction of roads under control of the MRD, but vary widely for LGA roads (see Section 4.3).

This situation makes assessment of the impact of future road construction on wetlands difficult. The information presented in this report highlights both the general problems in assessing and managing the impact of road construction, and the specific cases where currently planned roads will pass through or near wetlands.

Subject to these considerations, the following information on roads has been obtained:

i) Constructed declared highways and declared main roads (mapped at 1:50,000; information from MRD).

ii) Roads currently **reserved on the MRS but not constructed** which are likely to be MRD responsibility (mapped at 1:50,000; information from MRD).

iii) **Unconstructed, reserved important regional roads** (mapped at 1:50,000; information from TPD and LGAs).

Categories (ii) and (iii) represent roads which are currently shown on the MRS but are not yet constructed.

iv) **Amendments** to the MRS currently in hand (mapped at 1:50,000; information from MRD).

v) Proposals currently **under investigation** for inclusion in the MRS (mapped on varying scales; information from MRD and TPD).

vi) **Corridor structure plans** (mapped at 1:100,000; information from TPD).

vii) Major **local road plans** (reserves and proposals) for each LGA area (mapped at varying scales; information from LGAs).

viii) Other land-use proposals, such as urban, special rural or industrial development, with implications for wetlands (mapped at varying scales, information from LGAs).

3.2 DEFINITIONS

Definitions used in interpreting the guidelines for this study are as follows:

(i) Perth Metropolitan Region - as defined on the MRS.

(ii) Planned road networks - roads for which planning processes are currently underway for alignment, construction, or major realignment (sand tracks were considered to be unconstructed even though some environmental disturbance may have already occurred). Assessment of the potential impacts of widening or upgrading roads is beyond the scope of this study and these projects are included only where specifically mentioned by LGAs.

(iii) Controlled access highways, other major highways and important regional roads - as defined by the MRPA.

(iv) Major local roads - district distributor and collector roads[1].

3.3 SOURCES OF INFORMATION

Background information on road planning and construction, and its environmental impact and assessment, was provided by officers of the DCE (see Appendix 1).

Maps and other information on the planning and environmental assessment of Main Roads (Declared Highways and Declared Main Roads) were provided by the MRD.

Maps of unconstructed Important Regional Roads and Structure Plans for the four development corridors in the Perth Metropolitan Region were provided by the TPD. The TPD also provided information on the role of the MRPA in road planning, assessment of proposed regional roads, and management of wetlands in Regional Open Space.

Maps and other information on local road planning were provided by the 26 LGAs in the Perth Metropolitan Region (see Table 2) through individual meetings with planning and/or engineering staff. Information on other planned developments which may affect wetlands (for example Special Rural zones or industrial development) and details of the status of wetlands in the LGA area were obtained where available[2].

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1 Where available, information was collected on planning of all local roads as it was considered that any road works through or near wetlands could have the potential for environmental impact.

2 Information was provided over the period November 1984 to March 1985, and was current at this time. It should be noted that both planning and road construction are constantly in progress.

3.4 AVAILABILITY OF INFORMATION

Planning information for regional roads is readily available from the MRD and TPD. Where alignments are determined (at least broadly) on the MRS, assessment of likely future impact on wetlands is possible. Where alignments are conceptual or there are several possible alignments, such assessment is more difficult.

The availability of planning information for local roads varies between LGAs. In the inner Perth suburbs such as Subiaco or Bayswater where development is largely complete, there are few new roads planned and information is highly accessible. However, in the outer-lying, larger, fast-growing areas such as Wanneroo, Cockburn and Mundaring, areas may be zoned for future development but there may be no road plans yet in existence. The situation is further complicated by the following factors:

- Many maps are out of date and do not show current road plans.

- Town Planning Scheme and other maps which show roads and road reserves usually do not distinguish between constructed and unconstructed roads. Identifying unconstructed roads usually involves utilising the local knowledge of Council staff, with help from aerial photography (itself often out of date) and the Perth Metropolitan Street Directory. This is a very time-consuming process when there may be several hundred roads involved. For example, the Shire of Mundaring estimated that there were 600 to 700 existing road reserves (named) and a further 100 not named within its boundaries. Many roads within these reserves are already constructed but maps do not show where roads are presently unconstructed. There are probably several hundred proposed roads, some shown on structure plans but others not yet mapped.

- The Metropolitan Street Directory does distinguish between constructed and unconstructed roads, and is fairly up to date, but it does not in general show **planned** roads. Unconstructed roads are marked only when they are expected to be built within the life of the directory (about a year) and many major road plans whose timescales are unknown are not shown. The Metropolitan Street Directory coverage is also incomplete, providing no coverage of some of the outer, sparsely populated parts of the Perth Metropolitan Region.

- Many roads shown on Town Planning Scheme and other maps are "historic" and will not be built at all, or not on the alignment shown.

Local Government Authorities were extremely co-operative and, in most areas, fairly complete local road planning information was obtained. In some areas, however (especially Mundaring, Rockingham, Wanneroo and Cockburn), the task to provide the same degree of information was so large that it would have necessitated

perhaps weeks of work. In these areas regional and major local road plans, and indications of roads planned in wetland areas, were provided.

3.5 CONFIRMATION OF INFORMATION

Road planning information (Regional and Local) was summarised in table form and returned to all LGAs for verification. Verification was obtained from all Local Authorities with the exception of Serpentine-Jarrahdale and Perth. (Information on where planned roads pass through or near wetlands was added later when road and wetland maps were overlaid).

Notes taken during discussions with officers of Government Departments were summarised and returned for confirmation, before being used as a basis for the discussion sections of this report.

3.6 ROAD PLANNING IN THE PERTH METROPOLITAN REGION - BACKGROUND

3.6.1 Regional Roads

The MRPA is the major planning authority for regional roads in the Perth Metropolitan Region. The MRPA (in conjunction with the MRD) identifies alignments, and reserves alignments under the MRS.

Regional roads are shown on the MRPA map "Planning the Perth Metropolitan Region" (MRPA, 1982) (1:100,000; copies available from the TPD), and also on base-maps at 1:50,000.

These maps distinguish three categories of regional roads:

Controlled Access Highways
Other Major Highways
Important Regional Roads.

They show all roads reserved under the scheme including those already constructed and those reserved but not constructed. The maps do not distinguish between constructed and unconstructed roads, and the TPD does not keep up-to-date records of their state of construction. (Thus most maps of **unconstructed** regional roads were obtained from the various construction authorities).

Before a road appears on the MRS it must pass through a series of planning stages.

Identification of alignments usually begins with a **concept plan**, often involving a number of alternative alignments. At this stage, maps (at varying scales) are held by the TPD and are not easily

accessible as they are considered confidential working documents. As planning proceeds, the concept plans may be published for discussion (for example, the booklet on the Midland Western Link Road), or they may appear on the "Corridor Plans" for Perth's future development. Structure plans, in which road alignments are conceptual only, are available for the South West, South East, North West and Eastern Corridors at 1:100,000.

In order to be incorporated as a major amendment (under Section 33 of the Town Planning Act) to the MRS, the road plan must pass through several stages.

Preparation of plans and reports on engineering, planning and environmental aspects, includes liaison with other authorities such as DCE and LGAs. This takes approximately fourteen months and results in a scheme report to the MRPA.

This is followed by consultation with LGAs and Government Departments over a period of about four months. A proposed amendment is then formulated and submitted to the MRPA through Group District Planning Committees, then to the Minister for Planning. The amendment is then gazetted and advertised.

There follows a public submission period of 90 days, which can include local displays and meetings. Further environmental submissions may be received at this stage, as well as at the consultation stage. Public hearings are held, open to those who have made submissions. Following the public hearings, the TPD produces a report for the MRPA. The MRPA may then recommend adoption of the amendment or modifications to it, or its dismissal. To proceed, the amendment goes to the Minister for Town Planning, is signed by the Governor, and tabled in Parliament for 12 sitting days.

Some road reserves shown on the MRS have been purchased or acquired in other ways, but others are still in private ownership. In some cases, roads may be planned and their alignments obtained (for example as a condition of subdivision) before they appear on the Scheme (for example north of Burns Beach in the Shire of Wanneroo).

Further planning and environmental assessment depends on the construction authority. The MRD is the major construction authority for regional roads. It is responsible for declaring roads under the Main Roads Act, road construction and advising LGAs and the MRPA on planning, construction methods and standards. The MRD carries out routine environmental assessment prior to construction (see Section 4.3). The MRD, however, uses a different road classification (as defined under the Main Roads Act):

Declared Highways
Declared Main Roads

These roads largely (but not completely) correspond to the categories of Controlled Access Highways and Other Major Highways, as defined by the MRPA.

Regional roads which are not covered by the Main Roads Act, i.e. most of the Important Regional Roads (the "blue roads" on the MRS maps) are largely the responsibility of the LGAs in whose area they fall (although the MRD may provide advice, in particular where Bicentennial or Commonwealth road funds are used).

While alignments have already been subject to environmental assessment before reservation under the MRS, approaches to further assessment of these roads at the construction stage vary between LGAs. In the past there has been no consistent approach to planning road construction in or adjacent to wetlands, or referral requirements. In March 1985 the DCE in conjunction with the MRD issued LGAs with guidelines for environmental assessment of road works (see Section 4.3).

3.6.2 Local Roads

There is no definition of a "major local road". Designated arterial roads, district and local collector and distributor roads, access and subdivision roads are commonly-used terms but terminology varies.

Local Government Authorities are the major planning and construction agencies for local roads, either directly or through the control they exert over private development under provisions of Town Planning Schemes and approval of development applications.

Local roads, constructed and unconstructed (but not all road plans - see Section 3.4), are marked on Town Planning Scheme maps at varying scales, and are available for inspection in LGA offices. (Copies are not usually available, although some LGAs have zoning maps on a reduced scale available to the public). They are also shown on various other road and land use maps (again at varying scales) held by LGAs, and in the Perth Metropolitan Street Directory (published in book form at 1:20,000, or available in sheet form at 1:40,000 from the Department of Lands and Surveys). The difficulties in accessing local road planning information have already been discussed in Section 3.4.

Approaches to road planning vary between LGAs. For example, the Shire of Swan is currently rationalising road planning (and future use of wetland areas) as part of the development of land use policies for the Shire. Therefore, while little road planning information is now available, co-ordinated planning is underway. The Shire of Mundaring has also adopted an overall approach to road planning by developing structure plans to guide development, although final road design may vary in response to development applications and more detailed planning.

Some LGAs, such as Armadale, while having no overall policy on road planning, have developed structure plans to guide road development in future urban areas in their Town Planning Scheme. Others, however, respond largely to individual subdivision and development applications. Planning control is exerted by zoning in the TPS, but much of the detailed road planning is done by private developers (subject to approval of the plans by the TPD and LGA). For example, in Wanneroo the rural corridor to the east of Wanneroo Road (through which runs a wetland chain including Mariginiup and Jandabup Lakes) is subject to individual proposals for subdivision for Special Rural Zones, with associated access roads. (The Shire of Wanneroo has formed a committee to consider future management of wetlands in their area).

Environmental assessment procedures vary widely - see Section 4.3.

3.7 ROAD PLANNING IN THE PERTH METROPOLITAN REGION - RESULTS OF THE SURVEY

Road planning, both regional and local, is briefly summarised for each LGA in Table 3.

Table 4 lists road plans in more detail, including **regional** and **local** road plans, **concept** plans (which may include proposed roads not yet reserved or even subject to detailed alignment) and other **developments** (such as urban, industrial or special rural zones) in areas for which no detailed road plans are yet available. Table 4 also indicates which roads pass through or near wetland areas (see Section 4).

The listings of regional road plans are complete; local road plans are relatively complete for most LGA areas, with the exception of Cockburn, Mundaring, Rockingham, Swan and Wanneroo (for the reasons discussed in Section 3.4). For these areas, major local roads and those known to pass near wetlands are listed. Conceptual road plans and other developments are not complete listings due to the variability in accessibility of this information. These listings reflect projects in advanced planning stages. Further concept plans for roads, and urban and industrial development are published in the planning strategies for the four urban corridors of Perth's future development. Planned roads shown in the corridor plans are conceptual alignments only, and will be subject to the rigorous assessment procedures outlined in Section 3.6.1 prior to their inclusion in the MRS. A detailed analysis of the corridor plans in relation to wetlands was beyond the scope of the present study, and would also be premature in relation to the stage of planning of the conceptual road alignments. However, road plans listed as priorities for implementation have been included.

Planned roadworks are presented in map form in the map overlay "Future Road Construction in the Perth Metropolitan Region" held by the DCE, and in Figure 2 of this report.

Figure 2 shows all **regional road** plans (declared highways, declared main roads and important regional roads) in the Perth Metropolitan Region, including those roads reserved on the MRS but not yet constructed, and those roads indicated by the MRD as current amendments to the MRS or which are currently under investigation for inclusion into the MRS.

Regional road listings in Table 4 have each been allocated a symbol which appears next to the road on the map (see key on map).

For example A/R4 refers to the fourth regional road listed under the Shire of Armadale. Table 4 states the MRS map for the LGA area to facilitate location of the symbol when referring from the table to the map overlays. To refer from the map overlay to the table, the LGA abbreviation (the first part of the symbol) locates the LGA in Table 4, and the number locates the road in the listing under that area. A further symbol (see map key) highlights where planned regional roads pass through or near wetlands.

Local road plans are not mapped in Figure 2 because of the number involved and the difficulties of scale. Those local road plans which pass through or near a wetland are indicated by a symbol, the position of which indicates the approximate location of the roadwork/wetland overlap. As for regional roads, the symbols facilitate locating details of the proposed roadworks in Table 4.

Concept plans for roads which have not yet been subject to detailed planning of alignment or reservation are also indicated by a symbol where they may pass through or near a wetland. (These listings must be interpreted as conceptual only, and final alignments may differ).

Wetland areas which are included in areas zoned for future industrial, urban or special rural development, but for which no specific road plans are yet available, are also shown by symbols which can be located in Table 4.

Thus the roadworks overlay, in conjunction with the wetland overlay and the zonings shown on the MRS base map (combined in Fig. 2), indicates where proposed roadworks have the potential to have an environmental impact on wetland areas. This is discussed further in Section 4. Some roads shown to be planned in wetland areas may never be constructed. Those for which there are no current construction plans are listed in Table 5.

Table 3 also indicates the major named wetlands in each LGA area. Some LGAs expressed concern about the future conservation or management of specific wetland areas. Their recommendations on wetlands requiring further research towards their future management are listed in Table 6.

4 THE ANTICIPATED ZONES OF IMPACT

4.1 NUMBER OF WETLANDS AFFECTED

The planned roadworks listed in Table 4 and located in Figure 2 indicate where currently planned roads may pass through or near wetlands. This provides a guide to the location of possible future conflicts between roadworks and wetland conservation. Nearly 200 such locations are shown, and this does not include some future road construction where detailed road planning is unavailable or incomplete. (This applies particularly to the wetland-rich areas of Cockburn, Rockingham, Swan and Wanneroo). It should therefore be stressed that this number represents an order of magnitude only, underestimating future road construction but possibly overestimating areas where serious wetland damage is likely to occur. For example, some points of conflict which have been mapped refer only to minor creek-crossings. The extent of the conflict in each case will depend not only on the current status and conservation value of the wetland (see Section 5), but also on final road alignment within the reserve, any changes in alignment (especially in roads which are currently concept plans only), construction methods, and pre- and post-construction management. Some of the roads listed may, in fact, never be built, either because of changes in plans, or opposition to the project, because the road reserve is historic, or because the plan has been superceded by overlying freeway reserves. Table 5 lists road reserves passing through or near wetlands for which there are no current construction plans.

Much of the impact appears to occur on the Swan Coastal Plain and virtually every major geomorphic element has some wetlands which may be affected. The least affected unit appears to be the Quindalup Dune System because this unit contains only scattered wetlands.

The large number of potential impacts must now be carefully assessed bearing in mind that a wetland in a given area cannot be used as a representative from the region; it can however be a representative of wetlands for the geomorphic element within which it occurs.

The problem of addressing the potential problem of impact/intersection of roads on wetlands now resolves into providing a means of assessing the significance of a given wetland. This assessment is provided in Section 5. A discussion of the types of potential impacts of roads on wetlands is provided below.

4.2 THE IMPACT OF ROADWORKS ON WETLANDS

Roadworks may affect wetlands in a number of ways and to varying degrees:

- the road may directly intersect the wetland, necessitating engineers to build causeways, or bridges, or to drain and fill the wetland;

- the road may directly intersect the wetland margin or interfere with adjoining hydrologic/physical factors that maintain the wetland;

- the road may not directly intersect the wetland but by-products of roadworks and later traffic, and the road itself after construction may have an indirect effect on the wetland, e.g. disruption to fauna movement, increased runoff and seepage of polluted water into the wetland.

This section lists the range of impacts that roads may produce on wetlands. These impacts may be direct (extreme) through to indirect, and can include the following factors:

- Destruction of wetland vegetation
- Filling-compaction and development of road embankments
- Draining to ensure no flooding of roadway
- Disruption to hydrology - interruption of water movement by the imposition of an embankment and/or drainage line (N.B.: in context of wetland systems)
- Noise - initially due to construction activity and subsequently to traffic noise
- Disruption to fauna habitats
- Disruption to fauna and flora by altered water regime
- Interruption to fauna movements (e.g. birds, tortoise)
- Runoff water from road (pollution/eutrophication)
- Spillage of liquid or chemicals in transport
- Increased fire risk
- Invasion by weeds
- Aesthetic disruption
- Increased access to wetland - including disturbance, littering, woodcutting, trail bikes usage
- Social considerations
  - how people **perceive** the roadworks/impact
  - disruption of access
- Vehicle emissions, e.g.
  - lead
  - dust
  - carbon monoxide
  - nitrogen (oxides)
  - hydrocarbons
- Increased management costs.

Clearly, any one road development in or adjacent to a wetland area is unlikely to produce all the effects listed above. The nature and degree of impact will depend on both the road (e.g. alignment, construction methods, vehicle use, and management), and the characteristics of the wetland (see Section 5).

4.3 ENVIRONMENTAL ASSESSMENT PROCEDURES

Assessment by officers of the DCE, MRD or LGAs of the environmental impact of a proposed road usually takes place in two phases (see DCE, 1984):

(i) Assessment of road alignment;
(ii) Detailed assessment at construction stage.

This allows modifications to be made in:

- alignment of the road reserve;
- alignment of the road within the reserve;
- construction methods;
- management (pre- and post-construction).

For a **regional** road to be added to the MRS, a major amendment to the MRS is required.

The procedure for assessing impact of a proposed road or a wetland, including establishing the alignment of a proposed regional road, has been outlined in Section 3.6.1. There is provision for environmental assessment in the planning, consultation and public review phases.

The MRD undertakes routine environmental assessment prior to construction. An "environmental checklist" (see Appendix 2) is completed, and on this basis the project is classified into one of four categories:

(a) No further action required;
(b) Statement required by Division of MRD;
(c) Report required;
(d) Notice of Intent/Environmental Review and Management Programme required.

Details of the MRD environmental assessment procedure are laid down in the Environmental Assessment Manual (MRD, 1982).

In the past there has been no standard approach by LGAs to environmental assessment of planned **local** roads. Assessment is an individual matter for the LGA concerned, except in cases where the MRD is involved (for example when using Bicentennial or Commonwealth funds) when the MRD may require environmental

assessment. In cases where major environmental effects could occur, the EPA may require the preparation of a Notice of Intent (NOI) or Environmental Review and Management Programme (ERMP).

Local Government Authorities vary widely in their approach to environmental matters. Many of the LGA officers contacted during this survey were very aware of the need to take into account environmentally sensitive areas in planning roadworks. Where possible, there is also a tendency to avoid planning alignments through wetlands because of the engineering problems involved. However, in the absence of environmental guidelines or standard referral procedures, environmental assessment procedures have varied widely.

In March 1985 the DCE, in conjunction with the MRD, released Guidelines for Environmental Assessment of Roadworks. These guidelines were distributed to LGAs with the aim of creating an awareness of the effects that road projects may have on the environment, and to enable LGA officers to assess the effects of individual projects (see Appendix 3).

The guidelines list "Projects of concern" including roads which are "adjacent to or could interfere with either wetlands, lakes, rivers, estuaries, areas of sheet flow, or areas prone to flooding".

Measures to minimise negative effects are suggested, and checklists for environmental assessment are provided. These are similar to those used by the MRD, and result in classification of a project into categories based on degree of environmental effects.

The assessment is essentially a self-appraisal process, but in the case of projects funded through the MRD, the MRD can require the submission of an internal assessment.

The guidelines suggest that projects with the potential for significant environmental impact should be referred to the DCE but this is not a legislative requirement (except when major environmental effects require a NOI or ERMP to be submitted to the EPA).

5 GUIDELINES FOR WETLAND ASSESSMENT

The objective of developing guidelines to assess the conservation potential of wetlands resolves into three tasks.

(i) An identification of resources at risk, which in essence involves an understanding of wetland types, their distribution and their ecological/environmental status.

(ii) The development of criteria to assess the conservation significance of wetlands.

(iii) The development of a procedure to implement the criteria.

5.1 RESOURCES AT RISK

A primary task in assessing the conservation potential of a natural system is to determine the resources that the system contains and consequently what resources may be at risk. In this investigation the task requires an understanding of the types of wetlands, their distribution, abundance and ecologic/environmental status. Individual wetlands can then be viewed in perspective.

A first requirement is to develop a classification of wetland types. There have been several classifications of the wetlands of the Swan Coastal Plain and the Darling System (System Six), notably by Riggert (1966), Tingay & Tingay (1976), the Wetlands Advisory Committee (1977), and C.A. Semeniuk (in prep.). These systems of classification are briefly discussed below.

Classification Adopted by Riggert: As part of a study into wetlands by the Department of Fisheries & Fauna, Riggert (1966) classified and evaluated wetlands of the Swan Coastal Plain. The study was oriented to evaluating the utilisation of wetlands by waterfowl. Riggert postulated that the presence or absence of waterfowl provided a good indication of the physical state of a wetland. The wetlands were classified on physical criteria developed by the Wetlands Classification Committee of the United States Fish and Wildlife Service (Martin et al., 1953) into 22 types:

INLAND FRESH AREAS
1. Seasonally flooded basins or flats
2. Flooded Agricultural Land
3. Inland fresh meadows
4. Inland shallow fresh marshes
5. Inland deep fresh marshes
6. Inland open fresh water
7. Permanent Open Water (Reservoirs)
8. Shrub swamps
9. Wooded swamps
10. Bogs

INLAND SALINE AREAS
11. Inland saline flats
12. Inland saline marshes
13. Inland open saline water

COASTAL FRESH AREAS
14. Coastal shallow fresh marshes
15. Coastal deep fresh marshes
16. Coastal open fresh water

COASTAL SALINE AREAS
17. Coastal salt flats
18. Coastal salt meadows
19. Irregularly flooded salt marshes
20. Regularly flooded salt marshes
21. Sounds and bays
22. Mangrove swamps

Western Australian examples of these categories of wetlands then were described by Riggert in terms of size, depth, total surface area and vegetation. The wetlands were evaluated on the basis of utilisation by waterfowl into the following categories:

(i) Breeding
(ii) Feeding
(iii) Migration
(iv) Loafing

The wetlands were also categorised on the basis of utilisation by waterfowl into the following categories:

- Excellent : over 25,000 waterfowl-days use annually
- Good : from 10,000 to 25,000 waterfowl-days use annually
- Average : from 1,000 to 10,000 waterfowl-days use annually
- Fair : 1,000 and below waterfowl-days use annually.

This approach by Riggert (1966) constitutes an evaluation of wetlands for a specific requirement, in this case waterfowl usage. It indicates some of the variability in wetland types but does not distinguish between the many types of wetlands that exist in the Darling System that can be separated on the basis of geometry, soils, vegetation, origin, and other faunal groups apart from waterfowl.

Classification Adopted by Tingay & Tingay: As part of a study into wetlands of the Darling System (System Six) prepared for the EPA, Tingay & Tingay (1976) classified wetlands and compiled an inventory of them in the southwest of Western Australia. The classification they adopted was a limnological one developed by Hutchinson (1957) and cited in Bayly & Williams (1973), wherein wetlands are in the first instance classified into:

Lentic (areas of standing water)
Lotic (areas of running water).

Thereafter Lentic categories are further subdivided into: 1) lakes: tectonic, volcanic, landslide, glacial, solution, fluviatile, wind action or coastal types, and 2) shallow water bodies: underground water, springs, water associated with terrestrial vegetation, puddles, rock pools and ponds, either permanent or temporary. Lotic categories are further subdivided as permanent, temporary or episodic, unidirectional flow, fluctuation in flow rates, linear morphology, etc.

Tingay & Tingay apply the classification system to the Swan Coastal Plain and note that the **Lentic** wetlands dominate the Bassendean, Quindalup, Spearwood and Pinjarra geomorphic systems, and that each wetland type within a geomorphic system may have similarity in terms of origin, nature and biota. Relating the various wetland types back to the original categorisation/classification, Tingay & Tingay classify the Yanchep Lakes for instance, as Lentic solution lakes, and the wetlands of the Bassendean system as Lentic wind action-dune-water table lakes. They further subdivide the lentic wetlands of the coastal plain on the basis of soil elements and series (i.e. they adopt soil associations as environmental indicators). The **Lotic** wetlands are subdivided by Tingay & Tingay on geographic bases into Moore, Swan, Peel, Leschenault, Capel and Hardy types with no further subdivision.

The approach adopted by Tingay & Tingay (1976) constitutes a useful categorisation of wetlands for inventory purposes in that the categories or heirarchial subdivisions provide a checklist of features to be determined for each wetland. Furthermore it highlights the variability of wetland types. However, the system adopted is too complicated for classification purposes. It involves a worker having to determine a wide range of factors before a classification is possible - the classification then relies on a knowledge of the wetland soils which may occur as complex mosaics. Yet a simpler classification is possible based on readily-available features gathered from maps and short field survey.

It should be noted, however, that many of the factors used by Tingay & Tingay are important features of wetlands that are utilised in the classifications presented below.

Classification Adopted by Wetlands Advisory Committee (1977): The Wetlands Advisory Committee (1977) in a report to the EPA devised a classification of wetlands. The main sub-division adopted by the committee was:

- Lentic (non-flowing)
- Lotic (flowing)
- Estuarine
- Artificial

Thereafter the wetlands were further sub-divided on primary criteria of size, salinity and permanence, and secondly on the degree of vegetation cover. These factors were considered important to determining the value or potential of a wetland for particular uses (e.g. waterfowl drought refuge; or use for aquatic recreation). This approach by the Wetlands Advisory Committee (1977) produced a total of 15 potential types of Lentic wetlands which, together with the Lotic, estuarine and artificial, produced a total of 18 wetland types throughout the region of System 6.

Wetlands classified by the procedure devised by the Wetlands Advisory Committee were then allocated symbols (similar to that proposed by Tingay & Tingay, 1976) to distinguish them. Thus Lake Jandabup at Wanneroo was designated LE.f.l.p.sc (Lentic, fresh, large, permanent, semi-closed vegetation cover), the Swan River upper reaches were designated LO (Lotic); the Swan River at Fremantle was designated E (estuarine) and ornamental lakes in Kings Park were designated A (artificial).

The classification adopted by the Wetlands Advisory Committee (1977) provides a very useful approach to categorising the various types of wetlands. In effect the procedure devised by the committee addresses all major attributes of wetlands except for shape, water maintenance and origin. However the classification only distinguishes between two sizes of wetland (small and large) and does not separate types of Lotic and Estuarine systems. Furthermore, the classification of vegetation (which relies on shape, permanence of water and soils) could not readily be categorised as a tertiary classification factor since the criteria of shape and soil were not incorporated into the classification.

The classification of the Wetlands Advisory Committee (1977) however does provide useful information on wetland types which clearly shows the variability and complexity of wetlands that exist in the Darling System.

Classification adopted by C.A. Semeniuk (in prep.): As part of a long-term investigation of wetlands of the Darling System, C.A. Semeniuk of V & C Semeniuk Research Group in 1978 began development of a classification of wetlands from a geomorphic viewpoint. The rationale of the geomorphic approach is that ultimately wetlands are related to landform development and water

maintenance, and that a geomorphic classification best provides a framework to understanding the various types of wetlands, their distribution and their relationship to biota.

The ensuing section is drawn largely from C.A. Semeniuk (in prep.). In essence, the work indicates that the wetlands across the Darling System (Swan Coastal Plain and Darling Plateau) are variable in type, origin and maintenance, and that consequently a suite of wetlands in one area or given locality cannot be used indiscriminately as representative of the region. Each geomorphic setting can be seen to contain its own suite of inter-related wetlands.

The classification by C.A. Semeniuk (in prep.) recognises that wetlands range from:

permanent lakes, small to large
seasonal lakes, small to large
seasonally water-logged soils
fluviatile systems
estuarine systems.

These categories are intergradational. C.A. Semeniuk (in prep.) notes that a limnological classification as presented by previous workers considers only part of the range above since many wetlands in fact may have no free-standing water at any time of year, while other wetlands are part of an intermittently exposed/inundated coastal estuarine system, and still others are not limnological entities in any sense. Thus a classification that separates the wetland types into inland fresh versus inland saline, coastal fresh versus coastal saline as proposed by Riggert (1966) serves as a useful function in identifying wetland types for use of avifauna but does not provide distinction between the many varied wetlands existing in the Darling System.

The components that C.A. Semeniuk (in prep.) employed to establish the wetland categories include those basic features such as:

- geometry and bathymetry
- geomorphic setting
- water characteristics

At a later stage the components of (1) stratigraphy (history) and geomorphic maintenance, (2) processes of water maintenance, and (3) soilwater/soil relationships are further used to categorise types of wetlands.

The various wetland types thus distinguished form the framework to the various vegetation associations and vegetation structure forms in the Darling System, since geomorphic processes and products, together with processes of water maintenance, develop the various types of habitats and regulate the vegetation.

A primary concern of the classification is the geomorphic setting of any wetland in the Darling System. This factor of geomorphic setting predetermines in a major way the type of landform available to develop a wetland. For instance, processes of geomorphic evolution within the Quindalup Dune System (McArthur & Bettenay, 1960) result in a variety of depression landforms that will function as wetlands, and these processes and products are distinct from those that develop wetlands in the Spearwood Dunes or Pinjarra Plain systems. This principle applies to the other geomorphic elements and thus, across the Darling System from the Darling Plateau to the Quindalup Dunes and incorporating the Swan River Estuary, there are a variety of geomorphic processes and a variety of processes of water maintenance (recharge, throughflow, discharge) which interact and combine to develop the various wetland types.

Vegetation per se is not used as a primary criterion but C.A. Semeniuk (in prep.) recognises that vegetation responds to variable habitat. Consequently the same geomorphic type of wetland may contain quite different vegetation, in terms of structure and composition, because of locality, variable wetland geomorphic history, vegetation history/dynamics and subtle variation in stratigraphy, soil and water relationships. An attempt at describing or classifying the relationship of vegetation type to wetland type should be undertaken once the primary geomorphic classification is published.

Although the classification of C.A. Semeniuk (in prep.) has been devised for the entire Darling System from Bunbury to Moore River, only those components occuring in the Perth Metropolitan Region were used here. The elements of the classification are presented in Table 7 and Figure 3, and serve to illustrate 1) the complexity of wetland types; in the Perth Metropolitan Region there are at least 23 types, 2) the generalisation that suites of wetlands can recur within the same geomorphic setting, and 3) that wetlands even within the same geomorphic setting can be diverse in origin (cf wetlands in the Quindalup Dunes).

5.2 DRAFT GUIDELINES FOR ASSESSING CONSERVATION VALUES OF WETLANDS

A rational approach to land management and conservation including that of wetlands is to formulate a strategy whereby a given terrain is compartmentalised into its natural history and sociological components, and each component is assessed from a point of view of the value of resources available against resources at risk. These components of a given natural system may be at any nominated scale. The assessment of the conservation, social, or scientific value of any component is based on the following criteria:

- regional significance of the system - is it regionally widespread and common, is it significant to the region, is it restricted to local areas?

- does it contain unique landforms, biota or other natural features that provide it with state-wide, national or international status?

- does it offer social, recreational, educational, scientific/research, wildlife sanctuary/habitat, resources?

To help achieve the objective of rational conservation, the following section provides a further list of criteria to assess the conservation significance of any wetland[3].

(1) Is the wetland type regionally widespread or is it restricted in distribution? If the latter, then it may warrant conservation. (If the former, it may still be significant for conservation purposes - see below).

Having identified why a given wetland is regionally significant and thus requires conservation and management, it would then be necessary to identify the range of conservation values which apply to specific resources within the wetland. To do this, one needs to resolve the various other conservation criteria listed below. These criteria would require input from a range of natural history scientists but would mainly draw on the experience of geomorphologists and biologists.

(2) Is the wetland important as a productive area upon which depend such commercial endeavours as fisheries (e.g. in coastal areas mangroves function as nursery areas for fisheries)?

For terrestrial wetlands of the Swan Coastal Plain this may not be relevant but may be relevant for the estuarine flats adjoining the Swan River system.

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[3] These guidelines have been circulated to various individuals and/or organisations (see Appendix 4) with expertise, knowledge, involvement or interest in wetlands, with a request to comment on or refine the approach adopted here. This presentation represents the original document as circulated with main comments from the various reviewers incorporated, and the ambiguities highlighted by the various commentaries rectified.

(3) Is the wetland important to maintain the quality of human or animal and plant life (e.g. vegetation to arrest soil erosion)?

For wetlands on the Swan Coastal Plain and Darling Plateau this aspect would involve water quality relevant for the resident animal/plant population, maintenance of habitats for the migratory, nomadic or resident wildlife, and natural recharge/discharge processes.

(4) Does the wetland have important ecological or geological features of national or international significance (comparable to the significance of the Shark Bay stromatolites, Pinnacles at Cervantes)?

For wetlands this includes landforms, vegetation assemblages and other examples of regionally unique ecological and geological features. Some wetlands in Western Australia have international significance under the Ramsar Treaty.

(5) Is the wetland important in providing pristine environments or habitats (or system of these units) which are a research resource (comparable to the corals of the Ningaloo Reef; terrestrial vegetation of the Mitchell Plateau; strandplain of the Gascoyne delta)?

For wetlands this includes the range of interactions between landforms and habitats, the evolution of landforms, stratigraphic history of wetlands, ecological relationship between the above and population dynamics of various species of flora, aquatic fauna and other vertebrate fauna such as tortoises, avifauna.

(6) Could the wetland function as an important pristine to semi-pristine or even altered environment for use by primary, secondary or tertiary educationalists because of scientific features and accessibility (e.g. geological localities for illustrating earth science principles, wetland localities for illustrating ecological principles)?

For wetlands this would include any of the suite of landforms, their associated biota, interdependence and evolution.

[Note: In Western Australia, there is inadequate reservation for scientific/educational purposes of the various types of wetland types which occur within or close to the Metropolitan Area. These areas are under intense pressure for recreational and other development. This trend has been identified by numerous authors and must be expected to continue to grow as population pressures increase.]

(7) Does the wetland function as the habitat of rare and endangered species?

For example, Bullsbrook swamps for the Short-necked Tortoise.

(8) Does the wetland function as an important regional wildlife sanctuary, even if the flora/fauna are not rare or endangered?

For wetlands this would include those areas that provide water, refuge or breeding grounds for a variety of reptiles, avifauna, mammals, etc.

(9) Is the wetland important as either a seasonal or temporary habitat or breeding ground of large numbers of migratory or nomadic animals, particularly waterbirds?

For wetlands in general this factor is likely to be important.

(10) Can the wetland function as a semi-pristine to pristine area or wilderness for use by naturalists, bush-walkers, etc. (e.g. Kakadu National Park in the Northern Territory or Herdsman Lake in the Perth Metropolitan Area)?

Wetlands close to the population centre of Perth have special value to naturalists, professional ornithologists, amateur bird observers, outdoor enthusiasts, etc.

(11) Does the wetland have importance from the point of view of aesthetics?

Well-vegetated and/or water-filled wetlands provide a contrast to the adjacent, heavily-developed residential areas.

(12) Does the wetland have importance as an historic or actively-utilised Aboriginal heritage site?

There are some recorded Aboriginal sites at wetlands and therefore this factor has to be assessed for each site.

(13) Does the wetland have value for active water-based recreation?

There is increasing pressure for use of wetlands for boating and other water sports, including duck hunting.

(14) Does the wetland regardless of whether it is pristine or degraded, constitute part of a linked natural system, either physical or biological (biological: in terms of usage by waterbirds particularly migrating or nomadic species) such that its destruction or alternate use would result in disturbance/alteration to adjoining wetlands?

(15) Does the wetland have social values evidenced by community concern for its conservation, regardless of scientific values?

Conclusion: The significance of a wetland in relation to the above criteria may be summarised in a Table giving a score to each criterion. This is discussed in the next section.

If all members of the community are to derive benefit from wetland systems, it will be necessary to ensure that any proposed development or management of wetlands is compatible with the range of alternative potential uses of the resources. To this end, the criteria above have identified in a preliminary fashion the range of potential conservation values which apply to the resources of any given wetland.

5.3 THE DEVELOPMENT OF A PROCEDURE TO IMPLEMENT THE ASSESSMENT

Any attempt to develop a procedure to implement the above criteria to assess wetlands must address or incorporate several issues:

(i) For many wetlands there are insufficient data available for such assessment.

(ii) Many wetlands are already destroyed or severely altered such that those remaining (some estimate only 20% remain) must in general be viewed as significant. Any further development, degradation or destruction of those remaining can only decrease the total wetland resource of the region.

(iii) There are conflicting demands for use of wetlands by social, government, developmental, educational and research groups.

(iv) The perceived value judgement of a minority group has to be viewed in perspective, for instance a scientific community, although a minority, may have information and an understanding about a natural system such as to warrant its conservation even though the public at large is not aware of these values and do not share the same perspective; alternatively, a minority group in a residential area may place importance on a wetland in their suburban area that informed professional scientists do not necessarily share. Both value judgements are valid.

(v) Many of the decisions of today will have impact on generations of the future and decisions taken today should not unduly pre-empt or predetermine the attitudes of and possibilities for the future.

(vi) Finally, the various criteria listed in the previous section may need to be given different priorities.

With these issues in mind, it is suggested that the following procedure be adopted for wetland assessment (see also flow chart, Fig. 4):

(1) Identify wetland.

(2) Apply assessment criteria to the wetland
- if insufficient information available then obtain additional information or data,
- if sufficient information available proceed to 3.

(3) Apply a rating to each criterion for the wetland in question; i.e. rating of 1 = not significant; 2-4 = graded scale of moderate significance; 5 = high significance.

(4) Construct a histograph of ratings values versus criterion.

(5) Assess wetland on a preliminary basis using the histograph. This is amplified below.

The preliminary assessment of a wetland on the basis of the histograph is based on the premise that if one or more criteria develops a significance loading of greater than 2 then that wetland is moderately to highly significant to some component of the Western Australian community. If all criteria are less than 2, then the wetland does not appear to be significant on the basis of the established criteria (see Fig. 5). However such a wetland might still be considered for rehabilitation if there is perceived need for wetlands in any given area. This procedure ensures that a single criterion can be instrumental in assessing a wetland as significant. The wetland in question would then undergo a thorough assessment to determine land management priorities.

6 CONCLUSIONS AND RECOMMENDATIONS

The main conclusions deriving from this study are listed below;

- A large number of roads are proposed to be constructed in future years within the Perth Metropolitan Region.

- A large number of wetlands have been identified in the Perth Metropolitan Region and have been mapped in this report but the type, environmental status or ownership have been distinguished only broadly on the MRS map.

- The potential areas of impact of currently planned roads on wetlands have been identified and mapped.

- The assessment of the wetlands that could potentially be affected by roads/roadworks should be based on criteria that recognise the regional setting of the wetland, its type (classification), its utilisation by natural fauna/flora, its utilisation by the urban community, its environmental/ ecologic/conservation status, and finally its ownership.

- In this report a procedure is described for assessing a wetland in terms of 15 criteria; these criteria need to be individually assessed and given a (subjective) rating on a 1 to 5 scale. Individual workers in their area of specialisation are best equipped to assess or to provide input to a wetland ecologist so that a rational rating of each wetland criterion is achieved.

- It is beyond the scope of this report to individually assess each wetland that has been identified as potentially being affected by roads/roadworks, but it is recommended that such assessment be urgently undertaken.

This study has highlighted a number of points and potential problems that might arise as a result of proposed roadworks in the Perth Metropolitan Region. These are discussed below as:

- proposed roadworks in the Perth Metropolitan Region,
- number of wetlands that can potentially be affected by roadworks,
- scale of potential impact,
- ecological/environmental status of wetlands,
- assessment of wetlands.

The proposed roadworks over the next 10 to 20 years in the Perth Metropolitan Region are numerous and all will have some impact on the surrounding environment, both natural and man-made. It is not surprising that proposed roads/roadworks may affect a large number of wetlands because wetlands and surrounding lands provide natural low and comparatively flat ground for road alignment and also because these "unusable" landforms have not been intensively utilised for other purposes so that they have survived as the only

remaining undeveloped land in many areas. This study has highlighted that there are at least 180 localities where wetlands may be affected in some way by proposed roads/roadworks.

While the total number is high, it is recognised that some of these zones of impact may represent minor impacts such as a road crossing a small creek, and also that some of the wetlands may already be totally degraded or subject to alternative land uses, including grazing, market gardens, or filling and drainage. Thus assessment of these areas of possible impact is vital to ensure that priority for conservation is given to those remaining wetlands which have a current or **potential** conservation value.

Such individual assessment was not within the scope of this study. It has been estimated that a very basic assessment would require at least one day per wetland, or a minimum of 180 man days.

Although the potential number of impacts of roads on wetlands is high, at first assessment one might erroneously conclude that perhaps 25%-50% of the wetlands might be utilised for roads, without a **major** loss in total wetland numbers across the Perth Metropolitan Region. However, the pattern is rather more complicated because many of the wetlands identified during the wetland mapping task may in fact be totally degraded, so that priority for conservation should/must be given to the remaining wetlands of reasonable conservation/environmental status. The assessment of wetlands is even more complicated if any form of regional classification, or categorisation, of wetlands is taken into consideration. In effect this means for example that although there might be 100 wetlands worthy of conservation, and this number looks favourable to environmental scientists and conservationists who would view that a large number of wetlands could be conserved, unfortunately these wetlands may represent only five examples each of 20 different types of wetlands. The assessment of wetlands therefore must address the problems of the different types or categories of wetlands, as well as the multivaried usage by natural biota and the local human community.

During the task of assessment it is suggested that the individual wetlands which potentially may be affected by roads and roadworks be critically reviewed in terms of:

(i) regional setting and wetland classification,

(ii) environmental/ecologic/conservation status of the wetland and its current usage,

(iii) the criteria for conservation either using those adopted here or those formulated by DCE (1984).

Totally degraded wetlands (e.g. cleared, ploughed and drained wetlands) for instance might not proceed further then (ii) above.

Whereas this study has identified areas where currently-planned roads may impact wetlands, individual assessment of these areas of possible impact should identify where road realignment, or pre- or post-construction management is required to protect the integrity of the wetland areas. Road construction, however, must be viewed within the context of the overall urban, industrial or rural development of which it is a part. Possible impacts on wetlands are then seen within a wider framework. The approach to classification and assessment of wetlands presented in this report provides a basis for assessing the limited remaining wetland resources to ensure appropriate future conservation and management as development proceeds.

7 REFERENCES

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TABLE 1

SEQUENTIAL TASKS CONDUCTED IN STUDY

TASK	METHOD	RESULT
1. Preparation of wetland maps	Examination of various maps and aerial photographs available; selection of most suitable map based on accuracy, availability, and cost/ benefit	Metropolitan Region Scheme maps at 1:50,000 used as basis to illustrate wetland distribution
2. Preparation of road maps	Discussion with various local and state government authorities to determine location of proposed roads; transfer of information from maps	Maps showing intended roadworks; table of intended roads; road classification
3. Identification of wetlands at risk	Overlay of maps (1) and (2) above	Map of wetlands at risk
4. Development of criteria to assess wetland	Development of criteria for conservation; feedback from various government and conservation personnel on these criteria; development of preliminary classification of wetlands based on distribution, geomorphology, etc.	Preliminary criteria for assessment of wetlands

TABLE 2

LOCAL GOVERNMENT AUTHORITIES IN THE PERTH METROPOLITAN REGION

- Armadale (Town Council)
- Bassendean (Town Council)
- Bayswater (City Council)
- Belmont (City Council)
- Canning (City Council)
- Claremont (Town Council)
- Cockburn (City Council)
- Cottesloe (Town Council)
- East Fremantle (Town Council)
- Fremantle (City Council)
- Gosnells (City Council)
- Kalamunda (Shire Council)
- Kwinana (Town Council)
- Melville (City Council)
- Mosman Park (Town Council)
- Mundaring (Shire Council)
- Nedlands (City Council)
- Peppermint Grove (Shire Council)
- Perth (City Council)
- Rockingham (Shire Council)
- Serpentine-Jarradale (Shire Council)
- South Perth (City Council)
- Stirling (City Council)
- Subiaco (City Council)
- Swan (Shire Council)
- Wanneroo (Shire Council)

TABLE 3

SUMMARY OF PROPOSED ROAD DEVELOPMENTS
AND MAJOR WETLANDS IN LOCAL GOVERNMENT AUTHORITY AREAS
IN THE PERTH METROPOLITAN REGION

LOCAL GOVERNMENT AUTHORITY

Armadale

ADDRESS	**TELEPHONE**
Jull Street, Armadale, W.A. 6112	399 6666
CONTACT PERSON	**DATE**
Mr John Adderley (Planning) Mr Greg Elsegood (Engineering)	9.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS No. 2 (1983)	No	Structure plan of proposed development obtained (Armadale 1830-2000)

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Beechboro-Gosnells Highway (now Tonkin Highway), Corfield-Spencer Road link, Garden Street link, Scenic Drive, Ranford Road

Local roads
See table 3.

Concept plans
Shown on Armadale 1830-2000 plan (see table 4).
See also South East Corridor Strategy Plan.

Subdivisions
Further subdivision of urban areas on Armadale 1830-2000 Structure Plan.
Northern Area (A14) already received TPB approval for structure plan for subdivision.
Southern Area not yet zoned urban. Structure plan to MRPA.
Future industrial area in wetland area.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Lake Forrestdale and associated wetlands (in ROS)
Wungong River (part of foreshore in ROS)
Wright Lake(owned by Council; in ROS. Could be developed for recreation - needs work done to develop management plan. Note - adjacent to proposed Beechboro-Gosnells Highway [now Tonkin Highway])
Lake Balannup (privately owned. Ranford Road goes through it - will be upgraded and extended to South Street).
Swamps in rural area to west of Shire. Future industrial area will require drainage.
Canning River (some foreshore in LOS. Most private ownership).
Neerigen Brook, tributaries of Wungong Brook, Wright Brook, Churchmans Brook, Carradine Brook, Stinten Creek, Stony Brook.

NOTES

LOCAL GOVERNMENT AUTHORITY

Bassendean

ADDRESS	**TELEPHONE**
48 Old Perth Road, Bassendean, W.A. 6054	279 5022
CONTACT PERSON	**DATE**
Mr Clarrie McCreed (Town Clerk) Mr Bob Milne (Engineer)	6.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
District Scheme No. 3	Yes	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

The Town of Bassendean is already highly developed. There are few road proposals.

Local roads
Area of vacant land, zoned industrial, to be subdivided (no plans at this stage).
Roads north of industrial area to be constructed (time scale not known).

Note: Roads running into Regional and Local Open Space on Swan River foreshore are reserves. The Local Authority has no intention of proceeding with them.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore and associated wetlands
Wetlands in Pickering Park and nearby Local Open Space, and in Regional and Local Open Space at Ashfield Flats (McDonald Park) may have value. Local Authority feels that there is an urgent need for study of these areas with a view to developing development and management plans (there is currently no management).

NOTES

LOCAL GOVERNMENT AUTHORITY

Bayswater

ADDRESS	**TELEPHONE**
61 Broun Avenue, Morley, W.A. 6062	272 0622
CONTACT PERSON	**DATE**
Mr Greg Rowe (Deputy City Planner) Mr Edwin Long (Deputy City Engineer) Mr Peter Smith (CEP - reserve management)	4.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No.13	Examined (copies not available)	Town Planning Scheme 13 (District Zoning Scheme) Land use maps (1:5,000, north and south sheets) show existing and reserved roads (copy obtained)

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

The City of Bayswater is already highly developed. Almost all roads shown on the TPS are already constructed. Exceptions are those on the Swan River foreshore; although reserved, the Local Authority has no intention of constructing these.

Regional roads
The proposed Swan River Drive is shown on the TPS along the foreshore. The Local Authority has queried the need for this reservation.

Concept plans
Only three road projects are being considered which are not shown on TPS (See table 4).
(1) Subdivision (single residential)
(2) Extension north of Beechboro-Gosnells Highway (now Tonkin Highway)
(3) Joining Garrett Road to Grand Promenade; upgrading Garrett Road

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River (foreshore covered by Regional Open Space reserve)
Wetlands on Swan River foreshore (see notes)

NOTES

Local Authority, with C.E.P., have employed Peter Smith to investigate development and management of a parcel of land on the Swan River foreshore which is currently owned by the Local Authority and zoned residential. Considered plans are bird sanctuary and golf course. A wetland area is involved.

LOCAL GOVERNMENT AUTHORITY

Belmont

ADDRESS	**TELEPHONE**
215 Wright Street, Cloverdale, W.A. 6105	478 0222
CONTACT PERSON	**DATE**
Mr Adrian Oats (Planning) Mr Britt Payne (Engineering	6.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 6 No. 11 (in progress)	No	Street map obtained (extract from UBD)

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Beechboro-Gosnells Highway (now Tonkin Highway)
City Northern Bypass
Redcliffe-Bushmead Highway
Abernethy Road (upgrading)
Esther Street
Great Eastern Highway (upgrading)
Orrong Road (upgrading)

Local roads
Listed in table 4.
Note: regional and local road proposals on Swan River foreshore, Redcliffe

Subdivision
Redevelopment of area bounded by Beechboro-Gosnells Highway (now Tonkin Highway), Klem & Epsom Streets

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore
Tomato Lake
Ornamental lake in Centenary Park
Ornamental lake in Faulkner Park

NOTES

Airport land - road reserves shown on this area are not under Local Authority control.
Tip site on Swan River foreshore (Golf St.) subject to management proposals for recreation.

LOCAL GOVERNMENT AUTHORITY

Canning

ADDRESS	**TELEPHONE**
1317 Albany Highway, Cannington, W.A. 6107	451 0606
CONTACT PERSON	**DATE**
Mr C. O'Neal	

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS 16 (1973) (zoning scheme)	Yes	TPS Nos 17, 21, 23, 24, 25, 29, 30, 31, 33, 34 cover areas of City of Canning

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional
Roe Highway
Orrong Road
South Street
McDowell Street

Local
Streets on Swan River foreshore (see table 3) gazetted but no proposals for construction.
Streets in line of Spencer-Manning Road link proposal gazetted but not constructed.

Subdivisions
As per zonings in TPS (see table 4 and TPS 16)

Concept plans
Spencer-Manning Road link (subject of ERMP)
Adenia Road extension
(See also South East Corridor Strategy Plan)

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Canning River - ROS joint management plan being prepared by MRPA-Council, see concept plan (attached)
Swamp in industrial-zoned land between Sheffield Road and the railway line - Council officers concerned about its future conservation.
Bannister Creek - LOS and drainage - some natural areas
Compensating basins in LOS on Agincourt Drive (worth preserving)
Seasonal swamp on Roe Highway alignment

NOTES

Possible construction of cycleways at south end of Bull Creek and through wetland south of Canning River.

LOCAL GOVERNMENT AUTHORITY

Claremont

ADDRESS	**TELEPHONE**
308 Stirling Highway, Claremont, W.A. 6010	384 1377
CONTACT PERSON	**DATE**
Mr Ron Brooks (Town Planning)	9.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No.	No	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Local Authority area almost fully developed.

Leura Avenue to be realigned at Stirling Highway end.
(Stirling Highway to be upgraded.)
Subdivision of John XXIII College property near Lake Claremont and on the Swan River foreshore for residential purposes.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore
Lake Claremont

NOTES

Road shown on some maps through Lake Claremont has been closed.

LOCAL GOVERNMENT AUTHORITY

Cockburn

ADDRESS	**TELEPHONE**
9 Coleville Crescent, Spearwood, W.A. 6163	418 3311
CONTACT PERSON	**DATE**
Mr Russell Candy Mr Keith Rimmer Mr Bob Jeans (Planner)	22.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
	No	City of Cockburn map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Roe Highway
Cockburn Road-Rockingham Mandurah Highway
Spearwood Avenue
Yangebup Road
Kwinana Freeway
North Lake Road - Forrest Road

Local roads
Information not available (See table 4). Will be planned according to development applications.

Subdivision and development
See South West Corridor Strategy Plan

Concept plans
Southern extension of Kwinana Freeway) see South West Corridor Strategy Plan
Southern extension of Coolbelup Avenue)

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Eastern and western chain - see Cockburn Wetlands Study
Manning Lake)
Lake Coogee)
North Lake Lake)
Bibra Lake Lake) ROS
Yangebup Lake)
Kogolup Lake)
Thompsons Lake)
Banganup Lake)

Banjup Lake) private ownership
Unnamed swamps)

NOTES
See attached.

NOTES

Wetlands in Spearwood, west of Rockingham road merit study in view of private ownership and future residential development.
See Cockburn Wetlands Study, System 6 report.
Submission from Coolbellup Community Association Inc. expressed concern about Roe Highway alignment and suggested alternative.
Submission from Yangebup Progress Association expressed concern about effects of realignment of Forrest Road on Little Rush Lake and industrial development near South Lake.
Submission from Wetlands Conservation Society expressed concern about Forrest and Yangebup Roads realignments and Roe Highway extension.

LOCAL GOVERNMENT AUTHORITY

Cottesloe

ADDRESS	**TELEPHONE**
Broome Street, Cottesloe, W.A. 6011	384 1566
CONTACT PERSON	**DATE**
Mr Malcolm Doig (Deputy Town Clerk)	14.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS No. 1	No	Street map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Area fully developed.

Regional roads
West Coast Highway

Local
Almost all constructed as shown except as indicated in table 4.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

None (coast)

NOTES

Currently upgrading Curtin Avenue to 10 metre width. South from Servetus Street to Local Authority boundary, partly on reserve for West Coast Highway.

LOCAL GOVERNMENT AUTHORITY

East Fremantle

ADDRESS	**TELEPHONE**
Canning Highway, East Fremantle, W.A. 6158	339 1577
CONTACT PERSON	**DATE**
Mr Cowan	15.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 2	No	Street map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Area fully developed - no local road development or subdivision proposed

Regional
Southern approaches to Stirling Bridge from Leach Highway (MRD)
(Fremantle Eastern Bypass) - also see Fremantle

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore - mostly in 'A' class reserve vested in Council and leased to sporting groups. Part of foreshore covered by road reserve (existing road).
(No other wetlands).

NOTES

LOCAL GOVERNMENT AUTHORITY

Fremantle

ADDRESS	**TELEPHONE**
William Street, Fremantle, W.A. 6160	335 6422
CONTACT PERSON	**DATE**
Mr Les Croxford	15.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 2 (3 in progress)	No	Street map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Area almost fully developed - few road plans

Regional roads
Fremantle Eastern Bypass
Roe Highway

Local
See table 4.

Subdivisions
Large holdings of land still to be subdivided to ca 2,000m^2 industrial; some larger holdings in South Fremantle and Beaconsfield to be subdivided for residential purposes (small roads and cul de sacs)

Concept plans
(see table 4)
Canning Highway deviation
Parry Street

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore (managed by Council)

NOTES

Future development of facilities on the foreshore at Success Harbour may necessitate improved access to fishing boat harbour from Marine Terrace - possibly a road along the foreshore west of the railway line (no plans as yet)

LOCAL GOVERNMENT AUTHORITY

Gosnells

ADDRESS	**TELEPHONE**
Albany Highway, Gosnells, W.A. 6110	398 2233
CONTACT PERSON	**DATE**
Mr Keith Thomas (City Engineer)	16.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS 1	Copy of Concept for TPS 6 "City of Gosnells 2002" obtained	City of Gosnells road map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Roe Highway
Garden Street
Scenic Drive
Beechboro-Gosnells Highway (now Tonkin Highway)
(Ranford-Corfield-Spencer Road link - largely upgrading)
(Warton Road - largely upgrading)

Local roads
Roads in Canning Loc. 16 south of Garden Street extension.
Others as listed in table 4.

Subdivisions
Forrest Lakes (wetland area)
Huntingdale
Future subdivision of residential areas as shown on TPS 6

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Balannup Lake (boundary with Armadale) private (seasonal)
Mary Carroll Park - managed by Local Authority (fairly permanent)
Artificial lakes at Council Chambers, Hester Park and on banks of Canning River at Thornlie
Bickley Brook Reservoir
Canning River - note: pressure for further development of ROS needs study - could leave some areas natural
Woodlupine Brook
Yule Brook
Southern River (becomes Wungong)
Quarries at Bell's Dam, Barrington's quarry, Readymix quarry and claypits on Bickley Road

NOTES

Roads in Canning Loc. 16 are private not gazetted roads.

LOCAL GOVERNMENT AUTHORITY

Kalamunda

ADDRESS	**TELEPHONE**
2 Railway Road, Kalamunda, W.A. 6076	293 2111
CONTACT PERSON	**DATE**
Mr Geoff Dutton (Engineer)	7.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No.	No	Copy of street map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Ring Road
Scenic Drive

Local roads
See table 4.

Concept plans
See table 4.

Development plans
Proposed subdivisions covered by TPS amendments or guidelines are indicated.
Note: TPS 12 (industrial) covers wetland area.
Much of the rural undeveloped land in Forrestfield and Wattle Grove could eventually be made Special Rural Zones.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Creeks on plateau and escarpment
Swamps in Forrestfield area

NOTES

Wetland area in ROS (A class reserve) vested in Kalamunda Shire Council. Suggested that it could be a valuable area if appropriately developed and managed. Shire would like to see studies on the wetland.

LOCAL GOVERNMENT AUTHORITY

Kwinana

ADDRESS	**TELEPHONE**
Gilmore Avenue, Kwinana, W.A. 6167	419 2222
CONTACT PERSON	**DATE**
Mr David Porter Mr Doug Smith	15.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS No. 2 (in prep.)	Yes (current TPS)	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional
Wellard Road
Fremantle-Rockingham Controlled Access Highway
Gilmore Avenue
Charles Street
Peel Highway

Local
See table 4.

Subdivisions
Balance of Parmelia/Orelia
Leda
Special Rural Zones

Concept plans
Kwinana Freeway extension south and see South West Corridor Strategy Plan and table 4.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Wattleup Lake) private ownership
Long Swamp)

Sandy Lake) private ownership (Alcoa)
The Spectacles)

Swamps in Golf Course, Westrail Marshalling Yards and CSBP

NOTES

The Spectacles are worthy of preservation

LOCAL AUTHORITY

Melville

ADDRESS	**TELEPHONE**
Almondbury Road, Booragoon, W.A. 6154	364 5677
CONTACT PERSON	**DATE**
Mr Laurie Wills (Engineer) Mr Bruce Guthrie (Parks)	19.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 2	Yes	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Roe Highway
Kwinana Freeway
(South Street - upgrading to dual carriageway)
(North Lake Road - upgrading)

Subdivisions
Kardinya subdivision stage 2
Subdivision bounded by Farrington Road, Roe Highway and Kwinana Freeway
Subdivision between South Street and Roe Highway
Future subdivision of residential and urban deferred land as shown in TPS 2

Concept plans
Karel Avenue, Murdoch Drive

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Bull Creek foreshore and Bull Creek
Blue Gum Lake) management by Council
Booragoon Lake)
Piney Lake - management plan in preparation by MRPA (ROS) (subject of submission by Wetlands Conservation Society)
Swamp in Reserve 32863 - Council wants vesting for public recreation and parkland
Swan River foreshore - see System 6 (ROS)
Artificial lakes in Frederick Baldwin Reserve (drainage)
Swamp in Leeming subdivision
Swamps on Kwinana Freeway-South Street interchange
Hospital Swamp - site of proposed hospital corner South Street and Murdoch Drive (subject of submission by Wetlands Conservation Society)

NOTES

LOCAL GOVERNMENT AUTHORITY

Mosman Park

ADDRESS	**TELEPHONE**
Bay View Terrace, Mosman Park, W.A. 6012	384 1633
CONTACT PERSON	**DATE**
Mr Doug Walker (Town Clerk)	14.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS No. 1	No	No map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Area almost fully developed.

Regional roads
West Coast Highway (concept only)

Local roads
No road development proposed

Subdivisions
Army land marked "North Fremantle Townsite" on TPS
Residential zoned land between McCabe Street and Swan River (adjoins ROS)

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore (ROS)

NOTES

LOCAL GOVERNMENT AUTHORITY

Mundaring

ADDRESS	TELEPHONE
Great Eastern Highway, Mundaring, W.A. 6023	295 1400
CONTACT PERSON	**DATE**
Mr Keith Weymes	20.11.84

TOWN PLANNING SCHEME	COPIES OBTAINED	NOTES
District Scheme No. 1 (currently under review)	No	Structure plans (see notes below) - copies held by DCE

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Roe Highway
Scenic Drive

Local roads
Only district distributor roads noted on table. Other local roads too numerous to list individually, and proposals not firm (see notes below). Estimate 600-700 existing road reserves (named) and further 100 not named - predominantly built but no record of unconstructed road reserves. Several hundred road proposals - some not on structure plans, some shown on structure plans but alignment may vary (depends on landscape assessment at construction stage and on development applications).

Concept plans
See Eastern Corridor Strategy Plan (structure plans largely in accordance with Corridor Plan).

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Lake Manarin
Lake Leschenaultia
Numerous creeks

NOTES

Structure plans have been prepared to cover whole Shire area. These plans show concept plans for road development including district distributor roads, local distributor roads and access roads (do not distinguish between constructed and proposed). Alignments of proposed roads are approximate - plans will be reviewed and development proposals may not coincide with the structure plans.

LOCAL GOVERNMENT AUTHORITY

Nedlands

ADDRESS	**TELEPHONE**
Stirling Highway, Nedlands, W.A. 6009	386 2414
CONTACT PERSON	**DATE**
Mr Kerry Martin (Supt. of Works)	14.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 2	No	Street map of Nedlands, Claremont, Cottesloe, Peppermint Grove obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Local Authority area almost fully developed

Local
No further road development planned

Subdivisions
Swanbourne-Graylands hospital site to be subdivided for residential development by Urban Lands Council

Concept plans
Servetus Street extension to West Coast Highway

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore in ROS managed by Local Authority.
Area near Sunset Hospital steep cliff; natural foreshore
Remainder managed for recreation

NOTES

Small section of Beatrice Road shown on map as extending into ROS on Swan River foreshore has been closed. (All other roads on river foreshore already constructed as shown).

LOCAL GOVERNMENT AUTHORITY

Peppermint Grove

ADDRESS	**TELEPHONE**
1 Leake Street, Peppermint Grove, W.A. 6011	384 0182
CONTACT PERSON	**DATE**
Mr Graham Partridge (Shire Clerk)	14.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 2 (No. 3 in progress)	No	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Shire almost fully developed.
No major road proposals or future subdivisions.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore in ROS, managed by the Shire. Section of foreshore adjacent to Town of Claremont boundary is cliff - noted in System 6 report. This area is to remain as a natural foreshore area; the remainder is developed for recreation.

NOTES

**

LOCAL GOVERNMENT AUTHORITY

Perth

ADDRESS	**TELEPHONE**
27 St George's Terrace, Perth, W.A. 6000	425 3333
CONTACT PERSON	**DATE**
Mr V. Klyne (Engineer)	19.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
City of Perth City Planning Scheme	Yes	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

City area almost fully developed except City Beach.

Regional roads
Stephenson Highway
City Northern Bypass
Burswood Highway

Local
Lake Monger Drive - section between St Columbia's Avenue and Dodd Street - will not be built.
(See table 4)

Subdivisions/developments
Technology Park, Bentley.
Future subdivision of residential zoned areas in City Beach.

Concept plans
Extension of Underwood Avenue to West Coast Highway

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River foreshore (ROS)
Herdsman Lake
Lake Monger
Perry Lakes

NOTES

LOCAL GOVERNMENT AUTHORITY

Rockingham

ADDRESS	**TELEPHONE**
Council Avenue, Rockingham, W.A. 6168	(095) 27 1111
CONTACT PERSON	**DATE**
Mr Paul Garnett (Shire Engineer)	6.12.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS No.1	No	Map showing zonings obtained (1:25,000)

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Fisher Street
Hawker Street
Garden Island Highway
Peel Highway (Kwinana-Rockingham-Mundijong connection)
Warnbro Sound Avenue - Forty Road
Leghorn Street - Dixon Street

Local roads
See table 4 for major local road proposals. The list is not complete. Further urban, industrial and Special Rural Zone development in areas shown in the South West Corridor Strategy Plan (Strategy 3) will involve future road development. Road planning will respond to future needs.

Concept plans
Kwinana Freeway; Sixty-eight Road Deviation and see South West Corridor Strategy Plan.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Bell Street Swamp (Rotary Park) managed by Council
Lake Cooloongup-Lake Walyungup - ROS (MRPA has concept plan for management but it has not been implemented)
Lake Richmond - ROS (compensating basin)
Wetland system running north-south, east of Mandurah Road - private ownership - could be incorporated in ROS in structure plan, or incorporated in residential development
Lake Beenyup - privately owned
Serpentine River and pools
ALCOA rehabilitated mined area and rehabilitated clay pits in northeast of Shire
(Southeast part of Shire very swampy)

NOTES

Anstey Swamp (south of Lake Walyungup to east of Mandurah Road) could be worth studying re future conservation (privately owned)
See System 6 recommendations.

LOCAL GOVERNMENT AUTHORITY

Serpentine

ADDRESS	**TELEPHONE**
Patterson Road, Mundijong, W.A. 6202	(095) 25 5255
CONTACT PERSON	**DATE**
Mr Richard Watson	21.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No.	No	Copy of MRD State of Construction map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional
Peel Highway

Local
(See table 4)

Subdivisions
(See table 4) (SRZ policy being formulated).

Concept plans
See South East Corridor Strategy Plan (east of Shire in forest/catchment area)
Beechboro-Gosnells Highway (now Tonkin Highway)

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Serpentine River and tributaries
Wungong Brook
Beenyup Brook
Cardup Brook
Manjedal Brook
Medulla Brook
Karnup Brook
Karnet Brook
Dirk Brook
Derek Brook
Myara Brook
Yangedi Swamp
Unnamed swamps

NOTES

LOCAL GOVERNMENT AUTHORITY

South Perth

ADDRESS	**TELEPHONE**
Sandgate Street, South Perth, W.A. 6151	367 6422
CONTACT PERSON	**DATE**
Mr Berkov Mr P. Bennetts (Town Clerk)	16.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No. 5 in preparation	Yes	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Area almost fully developed.

Local roads and subdivisions
See table 4. (Note: Swan and Canning River foreshore development)

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swan River
Canning River
Waterford Lakes (associated with Canning River foreshore)
McDougall Park
Lakes in Collier Park Golf Course

NOTES

Swan and Canning River foreshores subject to System 6 recommendations, nos M67, M66, M60.

Note: Development plan for Sir James Mitchell Park will involve some road construction on Swan River foreshore.

LOCAL GOVERNMENT AUTHORITY

Stirling

ADDRESS	**TELEPHONE**
Civic Place, Stirling, W.A. 6021	344 0044
CONTACT PERSON	**DATE**
Mr Emerson Richardson Mr Larry Smith	22.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS 37	No	Copy of functional road classification plan obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional
Northern Perimeter Highway
Mitchell Freeway
Stephenson Highway
Swan River Drive

Local
Grindleford Place
Moondine Drive

Subdivisions
Future areas as shown on T.P.S.

Concept plans
Marmion Avenue - MRS current amendment

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Lake Careniup - perimeter to be developed for residential purposes
Herdsman Lake - management plan
Little Carine Swamp - ROS
Big Carine Swamp - ROS
Lake Karrinyup - Golf Club
Lake Gwelup - ROS
Jackadder Lake
Star Swamp - management plan in preparation
Jones Street Swamp - semi-urban
Hamilton Street Swamp - to be drained for residential development (TPS 37)
Wishart Street Swamp - residential in long term
Swan River foreshore in Maylands

NOTES

LOCAL GOVERNMENT AUTHORITY

Subiaco

ADDRESS	**TELEPHONE**
Rokeby Road, Subiaco, W.A. 6008	381 5000
CONTACT PERSON	**DATE**
Mr. J. McGeough, Town Clerk	13.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
TPS 1 and 3 TPS 2 soon to be gazetted	No	No map obtained

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Local authority area almost completely developed (See table 4).

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Artificial wetlands in:
Mabel Talbot Reserve (in Jolimont) MWA/Council
Shenton Park Lake
Aberdare and Derby Road drainage sump

Swan River foreshore

NOTES

LOCAL GOVERNMENT AUTHORITY

Swan

ADDRESS	**TELEPHONE**
Great Northern Highway, Viveash, W.A. 6056	274 5133
CONTACT PERSON	**DATE**
Mr Eric Lumsden, Shire Planner	4.12.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
District No. 9 Planning Scheme (in preparation)	Yes	

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional roads
Roe Highway
Northern Perimeter Highway
Lord Street
Lloyd Street
Beechboro-Gosnells Highway (now Tonkin Highway)

Local roads
Information not available (local distributor roads only listed).
Note: Current rural land studies being undertaken by the Shire will result in policies for development, subdivision, land reservation, etc. This will include road rationalization and future uses of wetland areas, and will involve liaison with DCE. Road reserves currently shown, especially in West Bullsbrook area, will be reassessed and may not be constructed. Road planning information will be available by the end of 1985.

Concept plans and subdivisions
See table 4, T.P.S. and Midland Western Road link study.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Swamps in Bullsbrook (privately owned) and State Forest 65.
Ellen Brook and tributaries (mostly in private ownership)
Swan River and tributaries (privately owned except through Walyunga National Park).
Hazelmere Lakes
Jane Brook
Bennett Brook
Note: Twin Swamps reserve for short-necked tortoise

NOTES

Shire planner believes Hazelmere Lakes merit investigation for preservation. Planning policy is to avoid road construction in wetland areas. Little road construction planned in near future (i.e. 1985) until road rationalization study is completed.

LOCAL GOVERNMENT AUTHORITY

Wanneroo

ADDRESS	**TELEPHONE**
Shenton Avenue, Joondalup, W.A. 6027	405 0333
CONTACT PERSON	**DATE**
Mr Bob Ruscoe Mr Phil Thomson Mr Oscar Drescher	23.11.84

TOWN PLANNING SCHEME	**COPIES OBTAINED**	**NOTES**
No.	No	Obtained: NW corridor plan (1:50,000) Shire of Wanneroo Regional Plan (1:50,000) Shire of Wanneroo Road Map and rural sub. (4 sheets; 1:25,000) SRZ plans

SUMMARY OF PROPOSED ROAD DEVELOPMENTS

Regional
Hepburn Avenue, Mirrabooka Avenue, Ocean Reef Road, Marmion Avenue, Connolly Avenue, Shenton Avenue, Moore Drive, Hodges Road, Eddystone Avenue, Mitchell Freeway

Local
Information on unconstructed local roads and road plans not available from Local Authority, too numerous to list completely. See table 4.

Subdivisions
See NW corridor plan for zonings in urban corridor. Eastern part of Shire is rural - development subject to individual applications (see plan of Special Rural Zones). Most of the wetlands are outside the urban corridor. Those in private ownership in eastern part of shire are usually set aside as part of conditions of subdivision if included in special rural zones. Applications for subdivision are considered as they arise - no SRZ policy.

Concept plans
See NW corridor structure plan.

MAJOR WETLANDS IN LOCAL AUTHORITY AREA

Eastern and western chains - see map "Shire of Wanneroo Environment Management Areas"

NOTES

See System 6 report.
Shire has formed a committee to look at management of wetlands.

TABLE 4

PROPOSED ROAD DEVELOPMENT
IN LOCAL GOVERNMENT AUTHORITY AREAS IN THE
PERTH METROPOLITAN REGION

ROAD PLANNING — LOCAL AUTHORITY: ARMADALE

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Beechboro-Gosnells Highway (now Tonkin Highway)	Controlled access highway	Extension to Ranford Road (note - future extension beyond Ranford Rd planned but not marked on M.R.S. Could go through wetland area)	M.R.S.		Wright Lake crosses Southern River and subject to inundation	A/R 1	
Scenic Drive	Important regional road	From Canning Mills Road north	M.R.S.		Crosses Wright Brook and creeks	A/R 2	Through Regional Parkland. May not proceed
Corfield-Spencer Rd link	Important regional road	From Seaforth Road to City of Gosnells boundary	M.R.S.			A/R 3	
Garden St link	Important regional road	From Lake Rd to City of Gosnells boundary	M.R.S.		Crosses Wungong River	A/R 4	
Ranford Rd	Important regional road	Constructed - major upgrading and realignment	M.R.S.		Balannup Lake		

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 7-8

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Local							
Kargotich Road	Local	Rowley to Oxley Rd	T.P.S.		Inundated land	A/L 8	
Oxley Rd	Local	Section south of Forrestdale Lake	T.P.S.		Forrestdale Lake	A/L 1	
Mason Rd	Local	Extension to Nicholson Rd	T.P.S.		Land subject to		
Keane Rd	Local	From Acourt to Anstey Rd	T.P.S.		inundation	A/L 7	
? Ave	Local	Extension to Forrest Rd	T.P.S.		Wungong Brook	A/L 2	
Eleventh Rd	Local	Extension to Mill St	T.P.S.		Wungong Brook	A/L 3	
Kylie Rd	Local	From Mills Rd to Buchanan Rd	T.P.S.				
Towla Rd	Local	From Mills Rd to Coventry Rd	T.P.S.				
? Rd	Local	South from Chevin Rd	T.P.S.				
Robinson Rd	Local	South from Chevin Rd	T.P.S.				
? Rd	Local	Nicholson Rd to Ranford Rd	T.P.S.		Land subject to inundation south of Balannup Lake	A/L 9	
Reilly Rd	Local)		T.P.S.				
Allen Rd	Local)				Southern River,		
Keane Rd (part)	Local)				Wright Lake	A/L 4	
Lake Rd	Local)				Forrestdale Lake	A/L 5	
Commercial Rd	Local)	Not to be constructed			Forrestdale Lake	A/L 6	
Hilbert Rd	Local)						
Bullockbush Rd	Local)						
Old Albany Rd	Local)				Churchman Brook	A/L10	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 7 and 8

ROAD PLANNING — LOCAL AUTHORITY: ARMADALE - continued

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Concept Plans *							
Beechboro-Gosnells Highway (now Tonkin Highway)	Controlled access highway	Extension south from Ranford Road	Armadale 1830-2000		Swamps and land subject to inundation	A/C 1	Structure plan only
Twelfth Rd	Important regional road	South to Nicholson Rd	Armadale 1830-2000		Yes	A/C 2	Structure plan only
Forrest Rd-Hopkinson Road Link	Important regional road		Armadale 1830-2000		Yes	A/C 3	Structure plan only
Wungong Rd	Important regional road	Southern extension	Armadale 1830-2000		Wungong Brook	A/C 4	Structure plan only
Forrest Rd	Important regional road	Extension to Albany Highway	-				
Croydon Rd-Bristol Rd link	Local	(1)	-				Concept only - plans not available so wetland conflicts not identified
Tourist Rd	Local	(3) Across Wungong Valley to Nettleton Rd	-				
	Local	(2), (4), (5) access roads to subdivision or Special Rural Zones in future	-				
Clifton St-Connell Ave link	Local	(6)	-				
Subdivisions	Local	Urban and industrial areas still to be subdivided - see structure map	Armadale 1830-2000		Some wetland areas included	A/U 1 A/I 1	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also South East Corridor Strategy Plan
See M.R.S. Maps 7 and 8

ROAD PLANNING — LOCAL AUTHORITY: BASSENDEAN

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Local							
Hamilton St Ashfield Pde Kitchener Rd Villiers St	Local	Marked as roads on T.P.S. but Shire has no intention of constructing them. (Run through Regional Open Space)	T.P.S.	-	Swan River foreshore	Bas/L1	
Berry Crt Hatton Crt Chapel Pl Collier Rd Fairford St Hanwell Way Standlake St Smythe Rd Chesterton Rd Somerton Rd Filkins St Drayton St Elsfield Way	Local	To be constructed as shown on T.P.S. 3	T.P.S.	Unknown	-		Most in industrial area
Paul St Forfar Carnegie	Local	Marked on T.P.S. Run through Local Open Space reserve - recreation (vested in Shire). Shire does not intend to construct them		-	Wetlands associated with Swan River foreshore	Bas/L2	Wetlands need study for devel. of management plans

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: BAYSWATER

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Swan River Drive	Controlled access highway	Along Swan River foreshore	M.R.S.		Swan River	Bay/R1	M.R.P.A. (not fav. by L.A.)
Beechboro-Gosnells Highway (now Tonkin Highway)	Controlled access highway	Extension north	M.R.S.		Swan River and creeks	Bay/R2	
Local							
Garrett Rd	Local	Join to Grand Promenade and upgrade Garrett Rd (and upgrade Bridge ??)	-		Swan River	Bay/L1	Confidential (under investigatn)
Brian Ave	Local	From Alfreda Ave to Ivanhoe St	T.P.S.				
Ashby Ave	Local	From Charnwood St to Crimea St	T.P.S.				
Thomas St	Local	From York to Arundel Sts	T.P.S.		-		
John St Underwood St Wright St Flinders St Raymond Ave Turnbull St Stanuir St	Local	Extensions	T.P.S.		-		Area covered by road reserve for Beechboro-Gosnells Freeway
Leake St William St Belmont Rd Wyatt Rd River Rd Constance St)	Local	Extensions towards Swan River	T.P.S.	-	Swan River	Bay/L2	No plans to construct these (in area covered by Freeway reserve)
Subdivision	Local roads	Subdivide (single residential) land between Beechboro-Gosnells Freeway, Lockridge High School, Benara Rd and Widgee Rd	-		-		Planned

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: BELMONT

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Beechboro-Gosnells Highway (now Tonkin Highway)	Controlled access highway	Extension south	M.R.S.		Swan River and Creek	Be/R1	
Redcliffe-Bushmead Highway	Controlled access highway	Section from Swan River east through South Guildford	M.R.S.		Swan River and swamps	Be/R2	
Orrong Rd	Important Regional road	To be progressively widened to 38 metres	M.R.S.		-		Boundary between Perth City & Belmont On Local Authority boundary
City Northern Bypass	Controlled access highway	Section to Orrong Road	M.R.S.		Swan River	Be/R3	
Abernethy Rd	Important Regional rd	30 metre reserve - upgrading	M.R.S.				
Esther St	Important regional road	Abernethy Road to link up with Fairbrother Street	M.R.S.		-	Be/R4	Moves to remove from M.R.S.
GGt Eastern HHighway	Other major highway	To be widened to 40 metres	M.R.S.				
Subdivision	Local	Subdivision (residential) bounded by Beechboro-Gosnells Highway, Klem and Epsom Sts	Not avail.		-		Planned
Subdivision	Local	Subdivision (residential) off Leach Highway (Kew Avenue)	T.P.S.	In progress	-		Planned

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME OTHER

See M.R.S. Map 5

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Local							
The Esplanade Waterview Parade Locock St Central Ave Bulong Ave Coolgardie Ave Ben St Lilian Grove	Local	Extension onto Swan River foreshore (see plans)	U.B.D.		Swan River foreshore	Be/L1	In area affected by Redcliffe-Bushmead Highway (partly in R.O.S.). The Esplanade will not be constructed
Northey St	Local	From Daly St to Swan River	U.B.D.		Swan River	Be/L2	In R.O.S. will not be constructed
Esther St	Local	From Knutsford Ave to Fisher St	U.B.D.		-		

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: CANNING

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Roe Highway	Controlled access highway	Extension south	M.R.S.		Canning River and tributaries. Inundated land.	Ca/R1	
Orrong Rd	Controlled access highway	Extension	M.R.S.		Creek	Ca/R2	
South St	Important regional road	Extension Bannister Rd south	M.R.S.	Under construction	Inundated land and swamps	Ca/R3	
McDowell St	Important regional road	Section through Kewdale Freight Terminal	M.R.S.			Ca/R4	
Local							
Rupert) Cockram) Greenfield) Mason) River)	Local	No proposals for construction	T.P.S.	-	Canning River)))))	Ca/L1	In line of proposed Spencer-Manning Rd link
Adenia Rd	Local	Extension to Riverton Drive	T.P.S.	-	Canning River	Ca/L2	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Wharf Bacon Queens Pk Lake Tce Narrow Peninsula Surrey Duff	Local	Road reserves on river foreshore - no proposals for their construction	T.P.S.	-	Canning River foreshore	Ca/L3	
Subdivisions							
Bounded by Metcalf Rd & Keslake Rd	Local	Current subdivision of land zoned residential under T.P.S.	T.P.S.	In progress			
Watts Rd Surrey Rd & Bywater Way, Wilson	Local	Current application for subdivision. Zoned residential in T.P.S.	-		Seasonal lake adj. to Canning	Ca/U1	
Canning Vale Special Rural Zone	Local	Guided development under T.P.S. 31	T.P.S. 31		Subject to inundation	Ca/SR21	
Concept * Plans							
Spencer-Manning Rd link	Important regional road	Under investigation. Subject of E.R.M.P.	-		Canning River	Ca/C1	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also South East Corridor Strategy Plans
See M.R.S. Maps 5-7

ROAD PLANNING — LOCAL AUTHORITY: CLAREMONT

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Subdivision							
John XXIII College	Local	Subdivision of Playing Fields (zoned Residential) near Lake Claremont and Koolyangarra site (zoned R30-R60) on river foreshore.			Lake Claremont	C1/U1	
					Swan River foreshore (Freshwater Bay)	C1/U2	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: COCKBURN

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Rockingham-Mandurah Highway	Controlled access highway	From Roe Highway south	M.R.S.		Lake Coogee and swamps	Co/R1	
Roe Highway	Controlled access highway		M.R.S.		Between North Lake and Bibra. Roe Swamp Hope Road Swamp	Co/R2	See System 6 Submission from Wetlands Conservation Society
Kwinana Freeway	Controlled access highway	Extension south to Yangebup Rd (subject to realignment)	M.R.S.			Co/R3	
Yangebup Rd	Important regional road	Cockburn to Forrest Rd Realignment	M.R.S.		Swamp north of Kogolup Lake and Lake Coogee	Co/R4	Submission from Wetlands Conservation Society
Spearwood Ave	Important regional road	West to Cockburn Rd and south to east-west link road (two sections)	M.R.S.			Co/R5	
North Lake Rd	Important regional road	Section south of Bibra Lake to Forrest Rd (section between Forrest Rd and Yangebup Rd under review)	M.R.S.		Lake Yangebup	Co/R6	
Forrest Rd	Important	Realignment	M.R.S.		South Lake		Submission from Wetlands Conservation Society
Local Roads		Information not available from Local Authority. Local road construction in response to future development plans submitted to Council.					

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 5 and 7

ROAD PLANNING — LOCAL AUTHORITY: COCKBURN - continued

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Subdivisions and Developments							
Industrial	Local	Future and existing industrial development on land to west of Cockburn Rd south of Russell Rd	-				
Spearwood-residential	Local	Residential land between Rockingham and Cockburn Rd - future residential development.			Swamps	Co/U1	Swamps need study
Industrial	Local	Future industrial development of land between Phoenix Rd, Forrest Rd and Stock Rd					
East Bibra	Local	Current residential subdivision.		Current			
Yangebup	Local	Future residential sub. of land to south of Yangebup Rd (S.H.C.) west of current Yangebup subdivision (U.L.C.)	-				
Special Rural Zones	Local	In east of Local Authority Area - existing and proposed special rural subdivisions.			Swamps	Co/SRZ1	
Concept * Plans							
Kwinana Freeway	Controlled Access Hwy	Extension south.	Proposed amend-ment to MRS		Creeks and swamps	Co/C1	See MRPA report Perth-Bunbury route, Roe Highway to Thomas Rd

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See South-West Corridor Strategy Plan
See M.R.S. Maps 5 and 7

ROAD PLANNING — LOCAL AUTHORITY: COTTESLOE

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
West Coast Highway	Important regional road		M.R.S.	?		Cot/R1	
Local							
Brixton St	Local	Extension from Jarrad St to Stirling Highway	T.P.S. ?	-	-		No plans to construct
Cable St	Local	On railway reserve	T.P.S. ?	-	-		No plans to construct

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: EAST FREMANTLE

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Fremantle Eastern Bypass	Controlled access highway	Southern approaches to Stirling Bridge	M.R.S.		Swan River	EF/R1	See also Fremantle

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: FREMANTLE

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Fremantle Eastern Bypass	Controlled access highway	Extension from Stirling Bridge south to Leach Highway, and south.	M.R.S.		Swan River	F/R1	Also in East Fremantle. Council is opposed to southern extension past Leach Highway
Roe Highway	Controlled access	Extension to Marine Terrace	M.R.S.			F/R2	Council opposed
Local							
Mather Rd	Local	From Annie to Lefroy Rd	T.P.S.	-	-		
Edmund St	Local	Extension	T.P.S.	?	-		Unlikely to be built
Robinson St	Local	Has been closed - land sold for residential subdivision	T.P.S.	-	-		
Subdivisions	Local	Future subdivisions of large holdings in O'Connor (industrial) and parts of South Fremantle and Beaconsfield (residential)	-	?	-		No plans
Concept Plans							
Parry St	Local	Extension	T.P.S. (yet to be gazetted)	In progress			
Canning Highway (see notes)		Deviation	-				Concept only

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: GOSNELLS

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Roe Highway	Controlled access highway	Welshpool Rd south	M.R.S.		Woodlupine Brook and creeks	G/R1	
Beechboro -Gosnells Highway (now Tonkin Highway)	Controlled access highway	Extension	M.R.S.		Canning River and creeks	G/R2	
Garden St	Important regional road	Extension	M.R.S.		Swamps	G/R3	
Scenic Drive	Important regional road	Around Scarp from Armadale to Kalamunda	M.R.S.		Bickley Brook Reservoir	G/R4	Darling Scarp
Ranford Rd Corfield-Spencer		Largely upgrading; section to be constructed from Eileen St to Shire boundary	M.R.S.			G/R5	
Warton Rd		Largely upgrading			Swamps	G/R6	
Local							
Roads in Canning Loc. 16	Private	Many sections not constructed and some are unlikely to be on alignment shown	T.P.S.		Southern River	G/L1	
Brook Rd Boundary Rd Brock St Cockram Rd Perry Rd Mills Rd	Local	Parts not constructed	T.P.S.		Creek Creek) Creek)	G/L3	
Subdivisions		Future subdivision in industrial and residentially zoned areas as per T.P.S. 6 Industrial area Forest Lakes Subdivision	- none as yet		Bickley Brook Forest Lakes, Swamps	G/I1 G/U1	

Concept Plans*

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See South East Corridor Strategy Plan

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: KALAMUNDA

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Ring Road	Important regional road	Canning Rd connecting to Kalamunda Rd	M.R.S.	? 10 years	-	Ka/R1	
Scenic Drive	Important regional road	Along Darling escarpment	M.R.S.	May not proceed	Creeks	Ka/R2	Excarpment Council not in favour of construction
Concept Plans							
Lewis Rd	Planned (not yet gazetted)	Connect Lewis Rd to Stanhope Rd					
Watsonia Rd	Planned (not yet gazetted)	Subdivision being developed by owner		Near future			
Maida Vale Rd	Planned (not yet gazetted)	Deviation of Maida Vale Rd to join Hawtin Rd		10 years			
Wittenoom Rd	Planned (not yet gazetted)	Connect Redcliffe-Bushmead Highway to Wittenoom Rd				Ka/C1	
Subdivisions	Local	Residential sub. off Pomeroy Rd (T.P.S. guided development)					
	Local	Industrial development T.P.S. 12		1984-1985	Swamps	Ka/I1	
	Local	Residential development Maida Vale T.P.S. 10					

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See MRS Maps 5 and 6

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Local: Note - some road reserves in orchard areas and on scarp will not be constructed. These have not been listed here.							
Brook Rd		Gosnells boundary to Crystal Brook Rd			Swamps	Ka/L1	
Arthur Rd		to Bruce Rd					
Dawson Ave		to Sultana Rd					
Hawk Valley Cres.		to Bridle Drive					
Brewer Rd		to Sultana Rd (not reserved)			Creek	Ka/L2	
Huntley St		Section					
Warlingham Dr		Section					
Keane St		to Rooth Rd (not reserved)					
Edward Rd		Possible construction					
Francis Rd		Possible construction					
Trott Rd		to Glyde Rd					
Annetts Rd		to Television Rd					
Weston Rd		Possible extension					
Television Rd		Section					
Francais Rd		Possible construction					
Elson Rd		Possible construction					
Dodd Rd		Possible construction (gravel)					
Mitchell Rd		Possible construction					
Empire Ave		Possible extension to Canning Rd					
Wall Rd		Possible construction					

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

ROAD PLANNING — LOCAL AUTHORITY: KWINANA

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Wellard Rd	Important regional road	Upgrading to dual carriagway and altered alignment (amendment to M.R.S.)	M.R.S.			Kw/R1	
Fremantle-Rockingham	Controlled access highway	Runs south through Kwinana Note: alignment of southern section will be altered by Leda Interim Policy	M.R.S.			Kw/R2	Council not in favour
Charles St	Important regional road	Patterson Rd to Kwinana Beach part unconstructed	M.R.S.			Kw/R3	
Gilmore Ave	Important regional road	Extension south.	T.P.S./ M.R.S.		Swamp	Kw/R4	Note: Imp. Regional Roads in Leda Plan will have different alignment
	Important regional road	Link Cockburn Road and proposed Fremantle Rockingham Highway	M.R.S.			Kw/R5	
Peel Hwy	Controlled access highway	Kwinana to Mundijong (subject to realignment)	M.R.S.		Creeks	Kw/R6	
Local							
McLoughlin Rd	Local	Will be built but not on alignment currently shown - will be shown in T.P.S. 2	T.P.S.				
Postans Rd	Local	From Hope Valley Rd to Thomas Rd	T.P.S.				
Woolcott Rd	Local	To S.R.Z 10 and 11	T.P.S.		Unnamed swamp	Kw/L1	
Treeby Rd	Local	Extension to Thomas St	T.P.S.		Unnamed swamp	Kw/L2	
Orton Rd	Local	Extension to Casuarina Rd	T.P.S.		Unnamed swamp	Kw/L3	Not found
Subdivisions							
Orelia/ Parmelia	Local	Balance of residential development (S.H.C.)	-	Planning stages			

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Leda	Local	Development by U.L.C.	Leda Interim Policy		See System 6 report	Kw/U1	
Special Rural Zones 10 and 11	Local	S.R.Z.	T.P.S.2		Swamps	Kw/SRZ1	
Special Rural Zone	Local	Future subdivision of Lot 54 for S.R.Z.	-		Swamps	Kw/SRZ2	
Concept * Plans							
Kwinana Freeway	Controlled access highway	Extension south - concept only.	South West Corridor		Swamps and and creeks	Kw/C3	
Cockburn Rd	?	Deviation around Mt Brown to Rockingham Rd	-				See Cockburn Wetlands report
Henry St	Local	Extension to Hope Valley Rd	-				
Lee Rd	Local	Extension north to Wattleup Rd and south to Rockingham Rd	-				
Banksia	Local	Realignment			Subject to inundation	Kw/C1	
Mortimer Rd	Local	Extension to Coyle Rd	-		Swamps	Kw/C2	Runs through Flora and Fauna Reserve
Challenger Rd	Local	Extension to Mortimer Rd	-				

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

(See also South West Corridor Strategy Plan)
See M.R.S. Map 7

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Roe Highway	Controlled access highway	Southern extension of Roe Highway cuts through southeast corner of local authority area					
Kwinana Freeway	Controlled access highway	Extension from South St to southern boundary of local authority	M.R.S.		Swamps	Me/R2	
South St	Important regional road	Upgrading to dual carriageway Karel Ave to eastern boundary	M.R.S.				
North Lake Rd	Important regional road	Upgrading to dual carriageway from Leach Highway south	M.R.S.				
Subdivisions							
Subdivisions	Local	Kardinya Stage 2	T.P.S.2	Current			
		U.W.A. land	T.P.S.2	Current			
		T & C subdivision	T.P.S.2	Current			
		U.L.C. adjacent to Kwinana Freeway	T.P.S.2	Current			
	Local	Proposed future subdivision of land zoned residential and urban deferred in T.P.S.2	No plans yet		-		
Concepts							
Karel Ave	Local	Completion to dual carriageway from South St to Farrington Rd and future extension to Roe Highway	Alignment established				
Murdoch Dr		Dual carriageway and construction south from Farrington Rd	Alignment established				

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: MOSMAN PARK

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Concept Plans							
West Coast Highway	Important regional road	South to Stirling Bridge				MP/R1	
Subdivisions							
Subdivision	Local	Subdivision of land owned by Army, marked North Fremantle Townsite on T.P.S.	T.P.S. 1		-		
Subdivision	Local	Subdivision of land zoned residential between McCabe St and Swan River	T.P.S. 1		Swan River foreshore	MP/U1	Adjoins R.O.S.

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: MUNDARING

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Roe Highway	Controlled access highway	Small part of extension north of Great Eastern Highway.	M.R.S.			Mu/R1	
Scenic Drive	Important regional road	Extension from Park Rd into John Forrest National Park	M.R.S.		Jane Brook and creeks	Mu/R2	Unlikely to be built
Local							
Farrell Rd	Local (District distributor)	Extension between Morrison Rd and Great Eastern Highway	Structure Plan				
Burkenshaw Dr	Local (District distributor)	Extension	Structure Plan		Nyaania Creek	Mu/L1	
Brooking Rd	Local (District distributor)	Extension			Jane Brook	Mu/L2	
Sexton St	Local (District distributor)	Extension to Great Eastern Highway	Structure Plan				
Alice Rd	Local (District distributor)		Structure Plan				
Concept Plans *							
Gt Eastern Highway	Major highway	Realignment (See Eastern Corridor Strategy Plan)	-	Current proposal			
Hills Link Rd					Jane Brook?	Mu/C1	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also Eastern Corridor Strategy Plan
See M.R.S. Maps 4, 5 and 6

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Concept Plans							
West Coast Highway		Northern extension of Servetus St to West Coast Highway (not shown on current M.R.S.)	Concept		-		
Subdivision	Local	Urban Lands Council proposes residential subdivision of Swanbourne-Graylands hospital site	-		-		

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: PERTH

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Stephenson Highway	Controlled access highway	West Coast Highway to Mitchell Freeway	M.R.S.		Perry Lakes Herdsman Lake	P/R1	
Burswood Highway	Controlled access highway	Burswood Park to Great Eastern Highway	M.R.S.		Swan River	P/R2	
City Northern Bypass	Controlled access highway	From Burswood Bridge to Mitchell Freeway	M.R.S.			P/R3	
Local							
Lake Monger Drive	Local	Extension from St. Columbia's Ave to Dodd St will not be built	T.P.S.	-	Lake Monger	P/L1	
Truro Pl	Local	City Beach	T.P.S. and Street Map		-		
Tintagel Pl	Local	City Beach					
Concept Plans							
Underwood Ave	Important regional road	Extension of Underwood Ave to proposed West Coast Highway	-		Lake -	P/C1	Was deleted from MRS to be re-gazetted on new alignmt
Subdivisions							
City Beach	Local	Future subdivision of residential zoned land marked on attached map	-				
Technology Park	Local	Bentley	-				

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Peel Highway Kwinana-Mundijong	Important regional road/ Controlled access highway	Connects Kwinana-Rockingham-Mundijong. Note: Alignment will differ from that shown on current M.R.S.	M.R.S.		?	R/R1	
Garden Island Highway	Controlled access highway	Mandurah Rd to Garden Island causeway. Runs through R.O.S. north of Lake Cooloongup and south-west of Lake Richmond. Unconstructed Ennis Ave to Mandurah Rd and Rae Rd to Mangles Bay	M.R.S.		Swamps to north of Lake Cooloongup Lake Richmond	R/R2	
Fisher St	Important regional road	Garden Island Highway to Railway reserve	M.R.S.		Lake Richmond	R/R3	
Hawker St	Important regional road	Garden Island Highway to Rae Rd	M.R.S.			R/R4	
Leghorn St -Dixon St	Important regional road	Ennis Ave to Fisher St section from Read St to Fisher St to be taken off M.R.S.	M.R.S.			R/R5	
Warnbro Sound Ave -Forty Rd	Important regional road	Extension south of Warnbro subdivision (from Halcome St) Note: Alignment will differ from that shown on current M.R.S.				R/R6	
	Important regional road	Ennis Ave to Warnbro Sound Ave	M.R.S.			R/R7	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 7 and 9

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Local							
Secret Harbour	Local	Access road to Secret Harbour Development	Secret Harbour plans (held by Shire)	Current	Wetlands	R/L1	
? Rd	Local	Council Ave to Patterson Rd	Zoning map				
Warnbro Sound Ave	Local	Part	Zoning map				
Young Rd	Local	Part	Zoning map				
Stakehill Rd	Local	Part	Zoning map				
Jarvis Rd	Local	Part	Zoning map		Wetlands	R/L2	
Stock Route Rd	Local	Through proposed S.R.Z.	Zoning map		Wetlands	R/L3	
		Note: This list is incomplete. See Street Guide - many of the unconstructed roads shown may not be built (e.g. Burma Rd, Haines St, Telephone Lane, roads in proposed Kwinana Freeway alignment; (future local road planning will respond to need, in accordance with development of S.W. Corridor).					
Subdivisions							
North of Port Kennedy Secret Harbour Peelhurst Singleton Waikiki Warnbro Safety Bay Lake Richmond	)	Further subdivision and road development	- - - - - - - Street Guide	Current	Lake Richmond	R/U1	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 7 and 9

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Concept Plans *							
Sixty-eight Road diversion	?	Ennis Ave to Baldivis Rd			Lake Walyungup	R/C1	
Kwinana Freeway	Controlled access highway	Southern extension	S.W. corridor plan and M.R.P.A. plans		Inundated land ass. with Sepentine River	R/C2	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also South West Corridor: Strategy Plan
See M.R.S. Maps 7 and 9

ROAD PLANNING — LOCAL AUTHORITY: SERPENTINE

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Peel Hwy	Controlled access hwy	Kwinana to Mundijong (subject to realignment)	M.R.S.		Creeks	Se/R1	
Concept *							
Beechboro Gosnells Highway (now Tonkin Highway)	Controlled access	To Thomas Road and eventually to Mundijong (concept).	M.R.S.				
Local							
Yangetti Rd	Local	Sections not constructed	M.R.D.**				
Henderson Rd					Dirk Brook	Se/L1	
Jarrah Rd							
Lowlands Rd					Serpentine River	Se/L2	
Rowe Rd							
Fisher Rd							
Atlains Rd							
Hart Rd							
Jolly Rd							
Casuarina Rd							
Taylor Rd							
Rowley Rd							
Bucher Rd							
Wedgetail Dr							
Nettleton Rd							
Chestnut Rd							
Summerfield Rd							
Scott Rd							
Selkirk Rd							
(and some unnamed roads)							

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also South East Corridor Strategy Plan
** M.R.D. State of construction map — Advance Planning Section

See M.R.S. Map 9

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Subdivisions Bounded by South West Hwy, Thomas Rd, Mundijong Rd and Hopkinson Rd		Urban development					

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also South East Corridor Strategy Plan
** M.R.D. State of construction map - Advance Planning Section.

See M.R.S. Map 9

ROAD PLANNING — LOCAL AUTHORITY: SOUTH PERTH

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Local							
Salter Pt Reserve	Local	Road to service WAIT Bowling Club and Salter Point Sea Scouts via Elderfield Rd and associated Waterford subdivision	-		Canning River foreshore		Plans in association with Waterford subdivision - see attached detailed plan
Hope Ave	Local	Between Salter Point Pde and Elderfield Rd (gravel at present) to be removed	T.P.S.		Canning River foreshore	SP/L1	
Elderfield Rd	Local	South to Canning River (gravel at present)	T.P.S.		Canning River foreshore		
Douglas Ave	Local	Extension to Coode St (now gravel)	T.P.S.		Swan River foreshore	SP/L2	
Bickley Cres	Local	Road shown on T.P.S. through Neil McDougal Park will not be constructed	T.P.S.	-	Neil McDougal Park	SP/L3	
Murray Rd	Local	Section from Thelma to Jackson Rd to be constructed. Jackson to Henley may not be constructed	T.P.S.				
Subdivisions							
Waterford	Local	Subdivision of Waterford sub. on Canning River foreshore. Some under construction - further stages yet to be approve	In planning - construction stages	Under construction	Canning River Waterford Lakes	SP/U1	See System 6
Clontarf land	Local	Possible future subdivision	- No plans as yet		Canning River foreshore	SP/U2	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

Note: System 6 PEC covers area road development could intrude into wetland areas. See attached letter from Council.
See MRS Map 5

ROAD PLANNING — LOCAL AUTHORITY: STIRLING

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Northern Perimeter Highway	Controlled access highway	North Beach Rd east	M.R.S.		Big Carine Swamp	St/R1	
Mitchell Freeway	"	Northern extension	M.R.S.			St/R2	
Stephenson Highway	"	Extension north to Mitchell Freeway	M.R.S		Herdsman Lake and swamps	St/R3	
Swan River Drive	"	Along Swan River foreshore	M.R.S.		Swan River foreshore	St/R4	
Local							
Grindleford Place	Local	To join Karrinyup Road	T.P.S37?	Current applic. for bicentennial road funds	Jones St Swamp	St/L1	
Moondine Drive	Local	Around Herdsman Lake foreshore to Powis St	Stirling Functional Road Classification Plan		Herdsman Lake	St/L2	
Selby St	Local	Shown on plan passing through middle of Herdsman Lake - not to be constructed on that alignment	"		Herdsman Lakeq	St/L3	
Concept Plans							
Marmion Ave		Extension to West Coast Highway	?	Current amendment to M.R.S.			
Subdivisions**							
Hamilton St Swamp	Local	As shown in T.P.S.37	T.P.S.37		Hamilton St Swamp	St/U1	
Mirrabooka Subdivision and Regional Centre	Local	Studies incomplete	-		-		

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

** Note: Other areas will be subdivided for urban development in the future. These are indicated on the "functional road classification plan" attached and delineated in Town Planning Scheme 37.

See M.R.S. Maps 5 and 3

ROAD PLANNING — LOCAL AUTHORITY: SUBIACO

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional		No proposals					
Local	Local	Roads shown on TPS2 in Railway lease land near Subiaco Station will not be developed	T.P.S.2		-		
Concept	Hay St	Upgrading to dual carriageway west of railway line to Troy Tce. Link to Roberts Road as a one-way pair road system	-		-		Proposal only - not shown on M.R.S.

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Map 5

ROAD PLANNING — LOCAL AUTHORITY: SWAN

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Lord St	Important regional road	Northern extension. Reserved on MRS but alignment will be changed.	M.R.S.		Bennett Brook	Sw/R1	
Lloyd St	Important regional road	Northern extension to proposed northern perimeter highway	M.R.S.		Blackadder Creek	Sw/R2	
Northern Perimeter Highway	Controlled access highway		M.R.S.		Creeks	Sw/R3	
Roe Highway	Controlled access highway	Extension north from Great Eastern Highway to Northern Perimeter Highway.	M.R.S.		Creek	Sw/R4	
Beechboro-Gosnells Highway (now Tonkin Highway)	Controlled access highway	Extension north to northern Perimeter Highway and further (concept)	M.R.S.		Creeks	Sw/R5	
Local							
Rutland Rd	Local	Construction of district distributor road.					
Coast Rd	Local	Construction of district distributor road.					(not located on map)
Kirby Rd	Local	Construction of district distributor road.			Wetlands	Sw/L1	
Concept Plans							
Vale Rd	Important regional road	Connect Amherst Rd, Midland to Wittenoom Rd, Kalamunda.			Hazelmere Lakes	Sw/C1	
Midland Western Link Rd		Morley Drive to Morrison Rd (new bridge across Swan River)	Held by M.R.P.A.	1995-2000	Swan River Bennet Brook and swamp	Sw/C2	See MRPA report - Midland Western Link Road study

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 5 and 3

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Developments		See District Planning Scheme No.9 for proposed zonings.					
Malaga Industrial Area		Subject of MRPA study	M.R.P.A.		Creeks and Swamps	Sw/I1	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 5 and 3

ROAD PLANNING — LOCAL AUTHORITY: WANNEROO

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Regional							
Hodges Drive	Important regional road	Ocean Reef Rd to Marmion Ave	M.R.S.			W/R1	
Eddystone Ave	"	Joondalup Drive to Ocean Reef Rd	M.R.S.			W/R2	
Mitchell Freeway	Controlled access highway	Northern extension	M.R.S.			W/R3	
Hepburn Ave	"	Wanneroo Rd to northern end of Beechboro-Gosnells Freeway	M.R.S.		Creeks	W/R4	
Mirrabooka Ave	"	Extension north to Hepburn Ave	M.R.S.			W/R5	
?	"	Gnangara Rd to Whitfords Ave	M.R.S.			W/R6	May not be constructed
Ocean Reef Rd	"	Hodges Drive to Burns Beach Rd	M.R.S.			W/R7	
Marmion Ave	"	Extension north from Hodges Rd	M.R.S.			W/R8	Alignment will differ
Connolly Ave	"	Extension north from Shenton Ave	M.R.S.			W/R9	
Shenton Ave	"	Marmion Ave to Joondalup Drive	M.R.S.			W/R10	
Moore Drive	"	Ocean Reef Rd to Hodges Drive	M.R.S.			W/R11	
?	"	Burns Beach Rd to northern end of Joondalup Drive	M.R.S			W/R12	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 1 and 3

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Subdivisions							
Special Rural Zone	Local	SRZ including parts of Badgerup and Little Badgerup swamps may include road across southern end of Little Badgerup	Held by Local Authority	Current	Badgerup and Little Badgerup swamps	W/SR21	
Special Rural Zone	Local	Gnangara S.R.Z. (approved plan) proposes roads which pass close to wetlands to the west of Lake Gnangara	Metropolitan Street Directory		Wetlands to west of Lake Gnangara	W/U1	
Special Residential Zone	Local	Residential subdivision and roads	Supplied by Shire		Lake Joondalup	W/U1	
Special Residential Zone	Local	Residential subdivision and roads	Supplied by Shire		Lake Goolelal	W/U2	
		Information incomplete (some marked on road maps)	Street Guide and Shire Road Map (1:25,000)				
Local							
Unnamed road	Local	Scenic Drive to Lake Island in Lake Joondalup. No plans for construction			Lake Joondalup	W/L1	
Hawkins Rd	Local	Extension north			Lake Joondalup	W/L2	
Rousset Rd	Local	Extension north			Swamps	W/L3	
Estrel Rd	Local	Benmuni to Badgerup Rd			Badgerup Lake	W/L4	

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

See M.R.S. Maps 1 and 3

ROAD	CLASS OF ROAD	PROPOSAL	PLAN *	TIMESCALE OF PROPOSAL	WETLAND AREAS INVOLVED	MAP REFERENCE	NOTES
Concept Plans *							
Eastern Highway	Controlled access highway	Planning stages	T.P.D. SP182		Will pass close to many wetlands in eastern lake chain	W/C1	Not mapped on overlay
Mitchell Freeway	"	Northern extension	N.W. Corridor Structure Plan		Pipidinny Swamp	W/C2	
Ocean Reef Road	Important regional road	Wanneroo Rd to Gnangara Rd	"		Wetland on north-west corner of Gnangara and Sydney Roads	W/C3	
Marmion Ave	"	Northern extension	"				Roads north of Burns Beach are
Connolly Ave	"		"				dedicated road reserves but not shown in M.R.S.yet

* INDICATE IF SHOWN ON MET. REGION SCHEME, TOWN PLANNING SCHEME, OTHER

* See also North West Corridor Strategy Plan
** (There are many major roads on structure plan, several of which pass close to Nowergup Lake and Pipidinny Swamp.)
See M.R.S. Maps 1 and 3

TABLE 5

ROAD RESERVES IN OR ADJACENT TO WETLAND AREAS FOR WHICH THERE ARE NO CURRENT CONSTRUCTION PLANS

ROAD	LOCAL AUTHORITY	WETLAND	COMMENTS
Lake Rd Commercial Rd	Armadale	Forrestdale Lake	
Hamilton St Ashfield Pde Kitchener Rd Villiers St	Bassendean	Swan River foreshore	Road reserves in ROS
Paul St Torfar St Carnegie St	Bassendean	Wetlands associated with Swan River foreshore	Road reserves in recreation reserve vested in Local
Leake St William St Belmont Rd Wyatt Rd River Rd Constance St	Bayswater	Swan River foreshore	
The Esplanade Waterview Pde Locock St Central Ave Bulong Ave Coolgardie Ave Ben St Lilian Grove	Belmont	Swan River foreshore	In ROS and reserve for Redcliffe-Bushmead Highway (The Esplanade will not be constructed)
Rupert Rd Cockram Rd Greenfield Rd Mason Rd River Rd	Canning	Canning River foreshore	In line of proposed Spencer-Manning Road link
Wharf Rd Bacon Rd Queens Park Rd Lake Tce Narrow Rd Peninsula Rd Surrey Rd Duff Rd	Canning	Canning River foreshore	
Selby St	Stirling	Herdsman Lake	Shown on maps as a result of old "paper" subdivision. Will not be constructed on this alignment

TABLE 6

WETLANDS RECOMMENDED BY LOCAL GOVERNMENT AUTHORITIES FOR FURTHER STUDY

WETLAND	LOCAL AUTHORITY AREA	CURRENT STATUS	RECOMMENDATION
Wright Lake	Armadale	ROS owned by Council (adjacent to proposed Beechboro-Gosnells Freeway)	Requires study for the development of a management plan, including recreational use
Wetlands in Pickering Park and nearby Local Open Space) Wetlands at Ashfield Flats (McDonald Park)	Bassendean	ROS	Require study with a view to developing management plans
Swamp in industrial land between Sheffield Street and railway line	Canning	Industrial zone	Requires measure to ensure future conservation
Swamps in Spearwood, west of Rockingham Road	Cockburn	Private ownership - future residential development	Require study with a view to future conservation
Canning River foreshore	Gosnells	ROS	Pressure for further recreational development. Requires study with a view to maintaining some areas in a more natural state
Wetland in reserve adjacent to golf course	Kalamunda	ROS/A-class Reserve	Requires study for development and management of reserve
The Spectacles	Kwinana	Private ownership	Ensure future preservation
Anstey Swamp (south of Lake Walyungup)	Rockingham	Private ownership	Requires study for future conservation
Wetland chain east of Mandurah Road	Rockingham	Private ownership - future residential development	Requires study to ensure appropriate zoning and use in context of future urban development
Hazelmere Lakes	Swan	Private ownership	Require study to ensure future conservation

TABLE 7

PRELIMINARY CLASSIFICATION OF WETLAND TYPES*,+
BASED ON SHAPE, SIZE AND WATER QUALITY AND THEIR OCCURRANCE IN RELATIONSHIP TO THE GEOMORPHIC ELEMENTS OF THE DARLING SYSTEM
(after C.A. Semeniuk, 1985)

GEOMORPHIC ELEMENTS	MESOSCOPIC WETLANDS (5-50KM^2)		MACROSCOPIC WETLANDS (1-5km^2)					MESOSCOPIC WETLANDS (less than 1km^2)				
	ELLIPTICAL	SINUOUS	IRREGULAR	CIRCULAR-ELLIPTICAL	LINEAR	CHANNEL	FLAT	IRREGULAR	CIRCULAR-ELLIPTICAL	LINEAR	CHANNEL	FLAT
QUINDALUP								1$_g$	2$_g$ & 3	4		
QUINDALUP/SPEARWOOD CONTACT	5								2			
SPEARWOOD			6$_g$	7$_g$	8$_g$			9$_g$	10$_g$			
SPEARWOOD/BASSENDEAN CONTACT	11			7				9$_g$	10$_g$			
BASSENDEAN				7				9$_g$	10$_g$	4$_g$	12$_g$	
PINJARRA PLAIN		13				14	15				16	17
DARLING PLATEAU		18			19	14		9	10	20	16 & 21	
ESTUARY							22				16	23

* 1, 2, 3 indicates Type 1, Type 2, Type 3 etc.; * see also Figure 5.1; g indicates intergradation between any of the two wetlands within a geomorphic system e.g. with the Quindalup System Type 1 intergrades with Type 2.

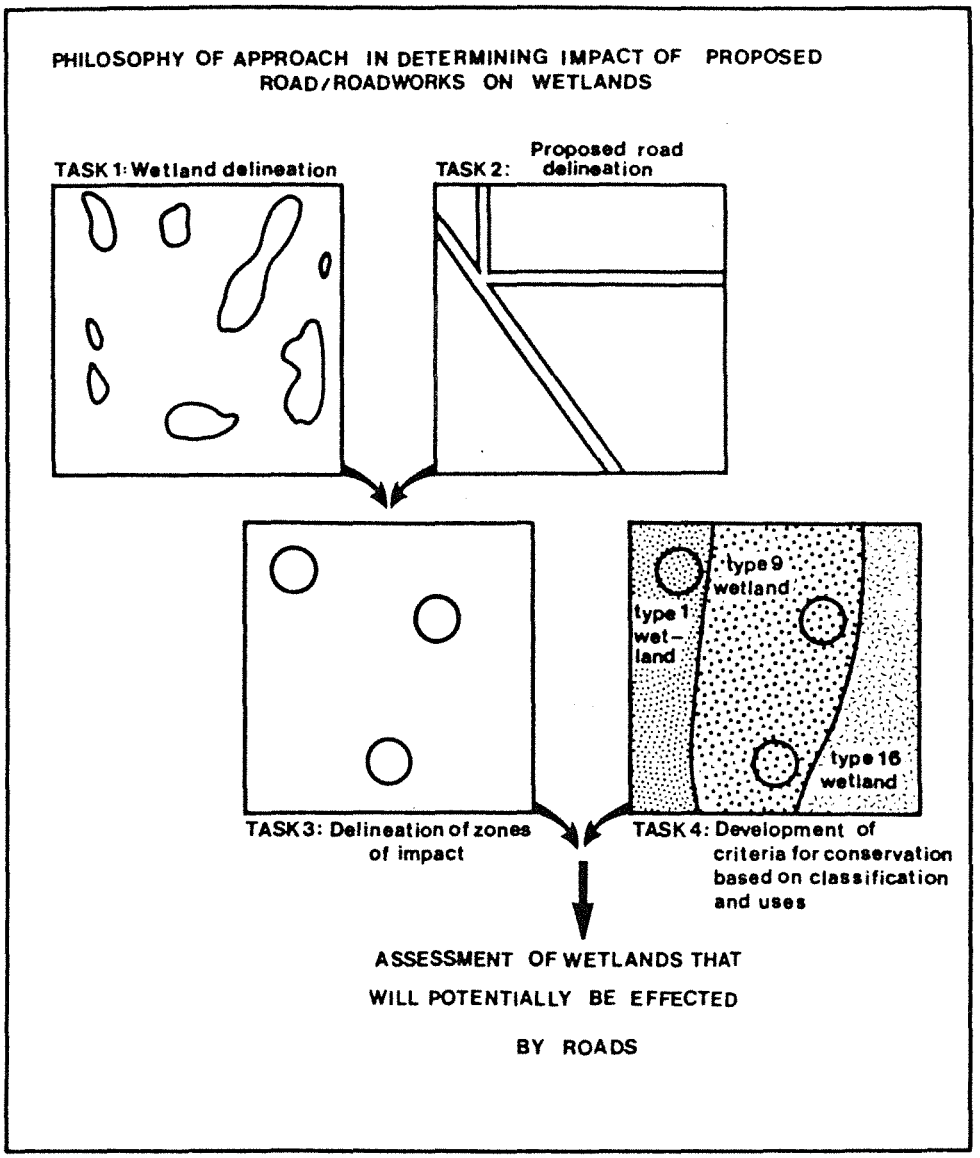


Figure 1: Philosophy of approach.

KEY

Important regional roads
Possible highways and main roads
} roads shown on MRS — not constructed
Amendments to MRS currently in hand
Routes under investigation for inclusion into MRS
Symbols e.g. A/L1 Local roads, (unconstructed), concept plans for roads, and other land use development plans in or near wetlands

KEY TO SYMBOLS:

A	Armadale	Ka	Kalamunda	St	Stirling
Bas	Bassendean	Kw	Kwinana	Su	Subiaco
Bay	Bayswater	Me	Melville	Sw	Swan
Be	Belmont	MP	Mosman Park	W	Wanneroo
Ca	Canning	Mu	Mundaring	L	Local road plan
Cl	Claremont	N	Nedlands	R	Regional road plan
Co	Cockburn	P	Perth	C	Conceptual road plan
Cot	Cottesloe	PG	Peppermint Grove	Srz	Proposed special rural zone
E F	East Fremantle	R	Rockingham	U	Proposed urban development
F	Fremantle	Se	Serpentine	I	Proposed industrial development
G	Gosnells	SP	South Perth		

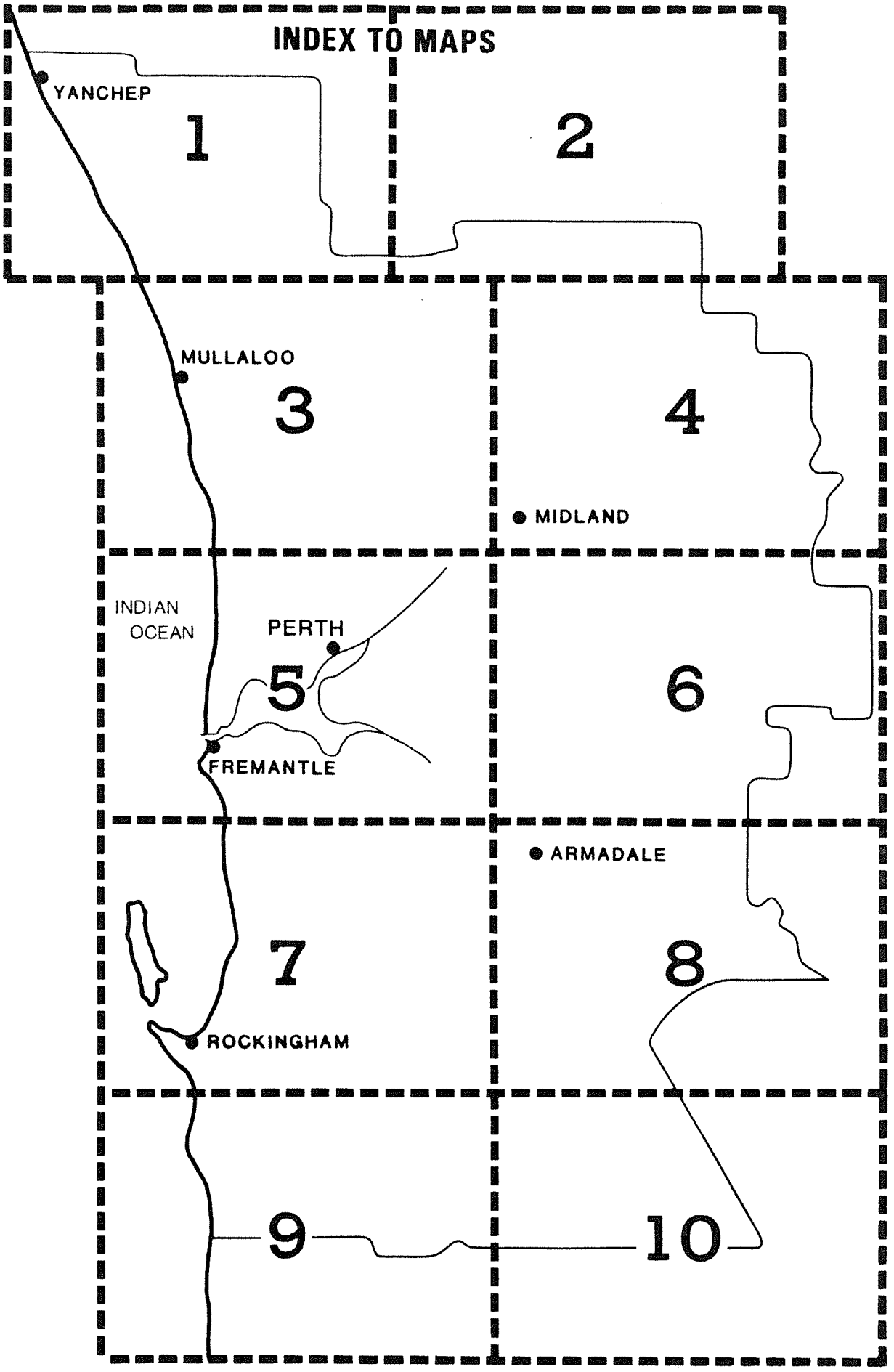
e.g. Ca/R2 refers to a regional road plan in Canning. (For details see tables in study report.)

★ Subject to realignment.

• Planned regional roads in or near wetlands

Source of information: Main Roads Department
Town Planning Department
and Local Authorities.

Figure 2: Wetlands and future road construction in the Perth Metropolitan Region (set of ten maps on MRS base maps, 1:50,000).

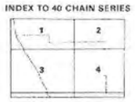


The Perth Metropolitan Region and boundaries of the ten Metropolitan Region Scheme maps (1:50,000).

METROPOLITAN REGION SCHEME MAP

METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 40 CHAIN SERIES



LEGEND

SCHEME BOUNDARY

RESERVED LANDS

PARKS & RECREATION

RESTRICTED PUBLIC ACCESS

RAILWAYS

PORT INSTALLATIONS

STATE FORESTS

WATER CATCHMENTS

CIVIC & CULTURAL

WATERWAYS

ROADS

PUBLIC PURPOSES

ZONES

URBAN

URBAN DEFERRED

CENTRAL CITY AREA

INDUSTRIAL

SPECIAL INDUSTRIAL

RURAL

PRIVATE RECREATION

NOTE:

1. This sheet is one of twelve actively active copies of the Metropolitan Region Scheme Map as adopted on the 20th October 1963 and incorporates all amendments of the scheme up to 13th September 1984.
2. The series has been converted from imperial to standard metric values.
3. Sheets 11 and 12 are enlargements of parts of sheet 3 showing Perth and Fremantle.

NUMBER 1

FUTURE ROAD CONSTRUCTION (SEE KEY)

- Important regional roads
- Possible highways and main roads
- Amendments to MRS currently in hand
- Routes under investigation for inclusion in to MRS
- Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed
- Subject to realignment
- Planned regional roads in or near wetlands

} roads shown on MRS—not constructed

R.F. 1:50,000

Metres 1000 0 1 2 3 4 5 6 Kilometres

WETLANDS

Lakes, Streams and Drains.

- Perennial
- Intermittent
- Mainly dry
- Subject to inundation

Swamps.

- Perennial
- Intermittent
- Wetlands not classified due to scale

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1978-1979), (reduced to 1:50,000).
Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.

INDEX TO MAPS

AREAS SHOWN ON THIS MAP ARE IN HECTARES

THIS PLAN WAS PREPARED BY THE CARTOGRAPHIC SECTION, TOWN PLANNING DEPARTMENT, PERTH, WESTERN AUSTRALIA

A. G. YOUNG CHIEF DRAFTSMAN

INDIAN OCEAN

BOONGARA

JARRAHSEND

PARROT RIDGE

STATE FOREST No. 65

S W A N

BAMPANUP

MAMBIBBY

NATIONAL PARK

See North West Corridor: Preferred Strategy

W/C2

See North West Corridor: Preferred Strategy

KAROBORUP

ALKIMOS

NEERABUP NATIONAL PARK

GNANGARA WATER RESERVE

STATE FOREST No. 65

Mitchell Freeway — Northern Extension

STATE FOREST No. 61

CHITTERING

MANDOWN

CLARINA

BIBNOORN

JULIMAR

BERGALA

S W A N

KYOTMUNGA

LOWER CHITTERING

A V O N

GARBUNGA

MUCHELA

MUCHEA

WANDENA

JANDARLUP

COCKMAN

COCKMAN BLUFF

KARAKATY

AVON VALLEY NATIONAL PARK

MOONDYNE

SWAN

MOONDYNE

C.G.

LEGEND

SCHEME BOUNDARY

RESERVED LANDS

PARKS & RECREATION

RESTRICTED PUBLIC ACCESS

RAILWAYS

PORT INSTALLATIONS

STATE FORESTS

WATER CATCHMENTS

CIVIC & CULTURAL

WATERWAYS

ROADS CONTROLLED ACCESS HIGHWAYS

OTHER MAJOR HIGHWAYS

IMPORTANT REGIONAL ROADS

PUBLIC PURPOSES

DENOTED AS FOLLOWS

HOSPITAL ..... H

HIGH SCHOOL ..... H.S

TECHNICAL SCHOOL ..... T.S

CAR PARK ..... C.P

UNIVERSITY ..... U

COMMONWEALTH GOVERNMENT ..... C.G.

STATE ENERGY COMMISSION ..... S.E.C.

SPECIAL USES ..... S.U

METROPOLITAN WATER SUPPLY

SEWERAGE & DRAINAGE BOARD ..... W.S.D.

PRISON ..... P.

ZONES

URBAN

URBAN DEFERRED

CENTRAL CITY AREA

INDUSTRIAL

SPECIAL INDUSTRIAL

RURAL

PRIVATE RECREATION

NOTE

1. This sheet is one of twelve sheets forming a copy of the Metropolitan Region Scheme Map as adopted on the 30th October 1963 and incorporates all amendments of the scheme made to 13th September 1984
2. This series has been corrected from original to standard metric values.
3. Sheets 11 and 12 are enlargements of parts of sheet 5 showing Perth and Fremantle.

N

NUMBER 2

METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 40 CHAIN SERIES

2 | 4 | 5

METROPOLITAN REGION SCHEME MAP

WETLANDS

Lakes, Streams and Drains.
- Perennial
- Intermittent
- Mainly dry
- Subject to inundation

Swamps.
- Perennial
- Intermittent
- Wetlands not classified due to scale

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1979), (reduced to 1:50,000).
Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.

R.F 1:50 000

Metres 1000 0 1 2 3 4 5 Kilometres

INDEX TO MAPS

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

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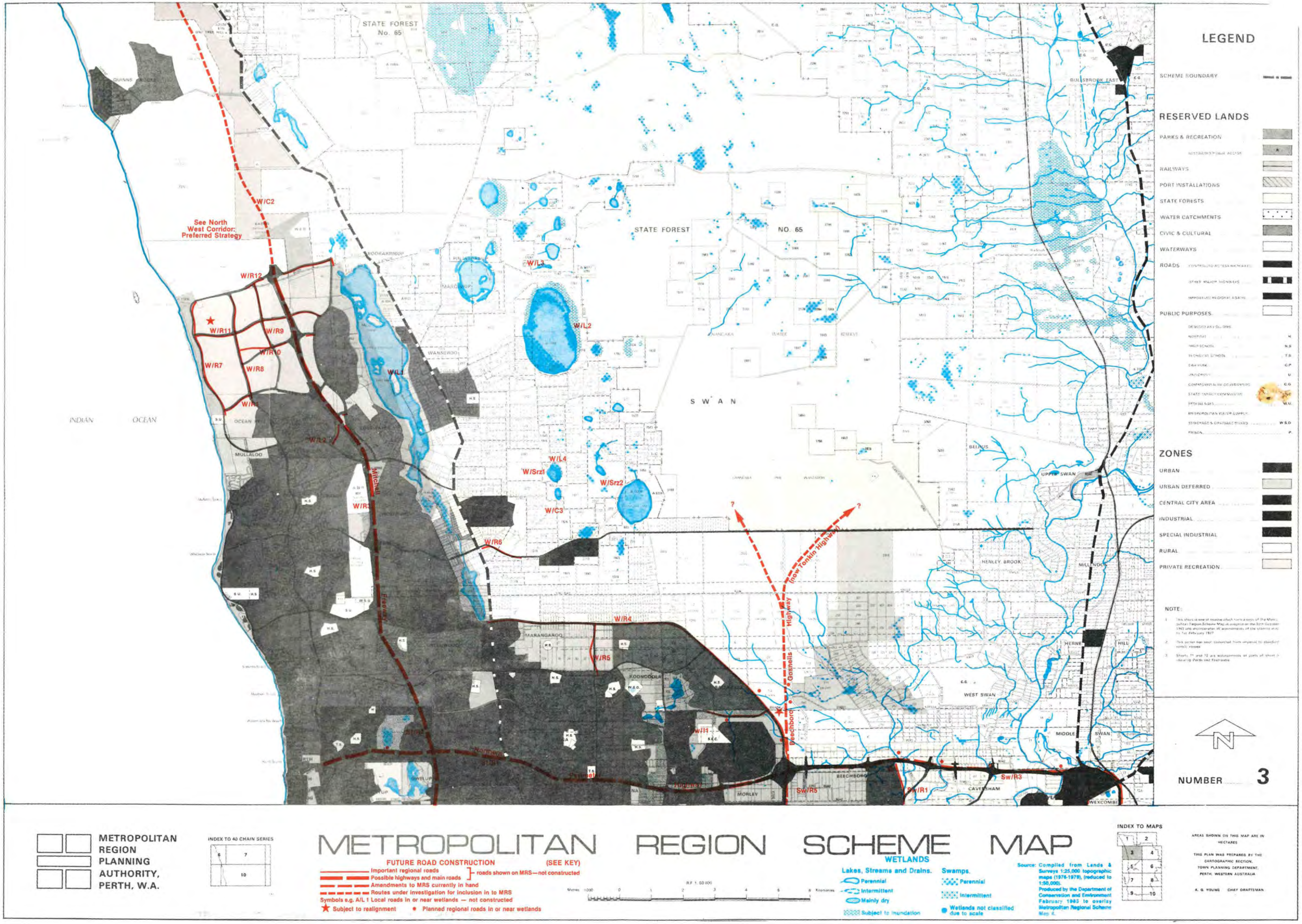
THIS PLAN WAS PREPARED BY THE CARTOGRAPHIC SECTION, TOWN PLANNING DEPARTMENT, PERTH, WESTERN AUSTRALIA

A. G. YOUNG CHIEF DRAFTSMAN



LEGEND
SCHEME BOUNDARY
RESERVED LANDS
PARKS & RECREATION
RAILWAYS
PORT INSTALLATIONS
STATE FORESTS
WATER CATCHMENTS
CIVIC & CULTURAL
WATERWAYS
ROADS
PUBLIC PURPOSES
ZONES
URBAN
URBAN DEFERRED
CENTRAL CITY AREA
INDUSTRIAL
SPECIAL INDUSTRIAL
RURAL
PRIVATE RECREATION
NOTE:
NUMBER 3
STATE FOREST No. 65
STATE FOREST
NO. 65
SWAN
INDIAN OCEAN
See North West Corridor: Preferred Strategy
W/C2
W/R12
W/R11
W/R9
W/R10
W/R7
W/R8
W/L1
W/L2
W/L3
W/L4
W/Srz1
W/Srz2
W/C3
W/R3
W/R6
W/R4
W/R5
W/I1
Sw/R1
Sw/R3
Sw/R5
Mitchell Freeway
Gosnells Highway
Beechboro
(now Tonkin Highway)
UPPER SWAN
HENLEY BROOK
WEST SWAN
MIDDLE SWAN
HERNE HILL
MILLENDON
BELHUS
MARANGAROO
KOONDOOLA
MULLALOO
WANNEROO
CAVERSHAM
BEECHBORO
MORLEY
WEXCOMBE
BULLSBROOK EAST
QUINNS ROCKS
METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.
INDEX TO 40 CHAIN SERIES
METROPOLITAN REGION SCHEME MAP
FUTURE ROAD CONSTRUCTION (SEE KEY)
Important regional roads
Possible highways and main roads
roads shown on MRS—not constructed
Amendments to MRS currently in hand
Routes under investigation for inclusion in to MRS
Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed
Subject to realignment
Planned regional roads in or near wetlands
R.F. 1: 50 000
Metres 1000 0 1 2 3 4 5 6 Kilometres
WETLANDS
Lakes, Streams and Drains.
Perennial
Intermittent
Mainly dry
Subject to inundation
Swamps.
Perennial
Intermittent
Wetlands not classified due to scale
Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1979), (reduced to 1:50,000).
Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.
INDEX TO MAPS
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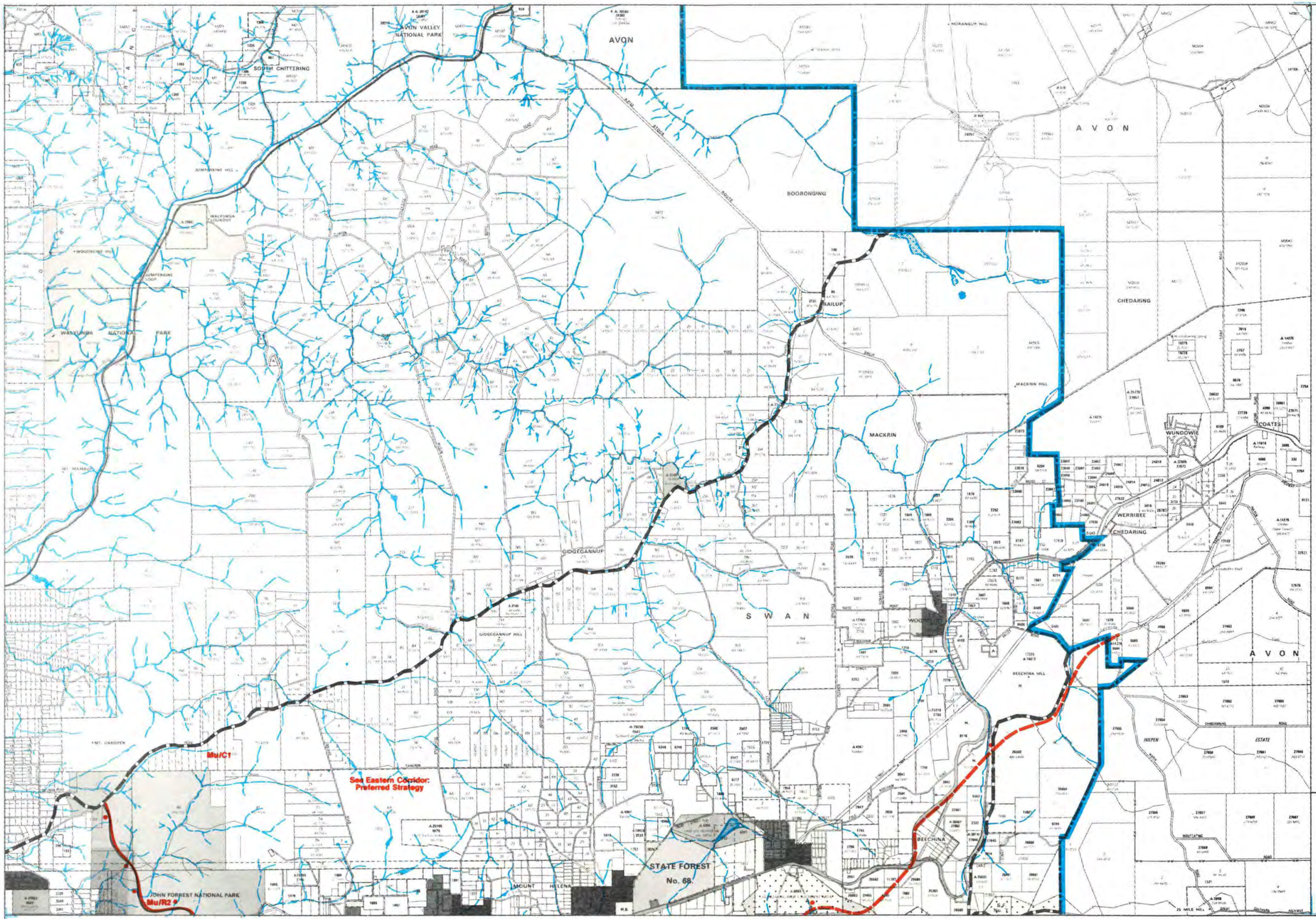
A. G. YOUNG CHIEF DRAFTSMAN



LEGEND

SCHEME BOUNDARY

RESERVED LANDS

- PARKS & RECREATION
  - RESTRICTED PUBLIC ACCESS
- RAILWAYS
- PORT INSTALLATIONS
- STATE FORESTS
- WATER CATCHMENTS
- CIVIC & CULTURAL
- WATERWAYS
- ROADS
  - CONTROLLED ACCESS HIGHWAYS
  - OTHER MAJOR HIGHWAYS
  - IMPORTANT REGIONAL ROADS
- PUBLIC PURPOSES

DENOTED AS FOLLOWS

HOSPITAL	H
HIGH SCHOOL	H.S
TECHNICAL SCHOOL	T.S
CAR PARK	C.P
UNIVERSITY	U
COMMONWEALTH GOVERNMENT	C.G
STATE ENERGY COMMISSION	S.E.C
SPECIAL USES	S.U
METROPOLITAN WATER SUPPLY, SEWERAGE & DRAINAGE BOARD	W.S.D
PRISON	P

ZONES

- URBAN
- URBAN DEFERRED
- CENTRAL CITY AREA
- INDUSTRIAL
- SPECIAL INDUSTRIAL
- RURAL
- PRIVATE RECREATION

NOTE:

1. This sheet is one of twelve which form a copy of the Metropolitan Region Scheme Map as adopted on the 30th October 1962 and incorporates all amendments of the scheme made to 13th September 1984.
2. This series has been converted from imperial to standard metric values.
3. Sheets 11 and 12 are enlargements of parts of sheet 5 showing Perth and Fremantle.

NUMBER 4

METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 40 CHAIN SERIES

8	9
11	12

METROPOLITAN REGION SCHEME MAP

FUTURE ROAD CONSTRUCTION (SEE KEY)

- Important regional roads
- Possible highways and main roads } roads shown on MRS—not constructed
- Amendments to MRS currently in hand
- Routes under investigation for inclusion in to MRS

Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed

★ Subject to realignment ● Planned regional roads in or near wetlands

R.F. 1: 50 000

Metres 1000 0 1 2 3 4 5 6 Kilometres

WETLANDS

Lakes, Streams and Drains.
- Perennial
- Intermittent
- Mainly dry
- Subject to Inundation

Swamps.
- Perennial
- Intermittent
- Wetlands not classified due to scale

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1978), (reduced to 1:50,000).
Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.

INDEX TO MAPS

1	2	
3	4	
5	6	
7	8	
9		10

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A. G. YOUNG CHIEF DRAFTSMAN

METROPOLITAN REGION SCHEME MAP

THE METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 1:25,000 SERIES

15	16
19	20

LEGEND

SCHEME BOUNDARY

RESERVED LANDS

PARKS & RECREATION

RESTRICTED PUBLIC ACCESS

RAILWAYS

PORT INSTALLATIONS

STATE FORESTS

WATER CATCHMENTS

CIVIC & CULTURAL

WATERWAYS

ROADS

CONTROLLED ACCESS HIGHWAYS

OTHER MAJOR ROADWAYS

LESSER ROADS

PUBLIC PURPOSES

HOSPITAL	H.
HIGH SCHOOL	H.S.
TECHNICAL SCHOOL	T.S.
CAR PARK	C.P.
DEPOT	U.
COMMONWEALTH GOVERNMENT	C.G.
STATE ENERGY COMMISSION	S.E.C.
STATE UTILITY	S.U.
METROPOLITAN WATER SUPPLY	
SEWERAGE & DRAINAGE BOARD	W.S.D.
PRISON	P.

ZONES

URBAN

URBAN DEFERRED

CENTRAL CITY AREA

INDUSTRIAL

SPECIAL INDUSTRIAL

RURAL

PRIVATE RECREATION

NOTE

1. This map is one of a set of 12 which depicts the zones and reservations of the Metropolitan Region Scheme as adopted on 30th October 1963 and incorporates all amendments to the scheme made to 12th September 1984.
2. This series has been converted from imperial to standard metric values.
3. Maps 11 and 12 are enlargements of parts of map 5 showing Perth and Fremantle.

NUMBER 5

INDEX TO MAPS

1	2	
3	4	
	6	
7	8	
9	10	

This map is based on the Australian Map Grid with a deviation from the standard rectangular sheet system.

Projected on the Universal Transverse Mercator Projection Zone No. 50 with horizontal datum the Australian Geodetic Datum 1966.

Produced by the Cartographic Section Town Planning Department Perth, Western Australia.

A. G. Young Chief Draftsman

FUTURE ROAD CONSTRUCTION (SEE KEY)

- Important regional roads
- Possible highways and main roads
- Amendments to MRS currently in hand
- Routes under investigation for inclusion in to MRS
- Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed
- ★ Subject to realignment
- • Planned regional roads in or near wetlands

} roads shown on MRS—not constructed

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- Intermittent
- Mainly dry
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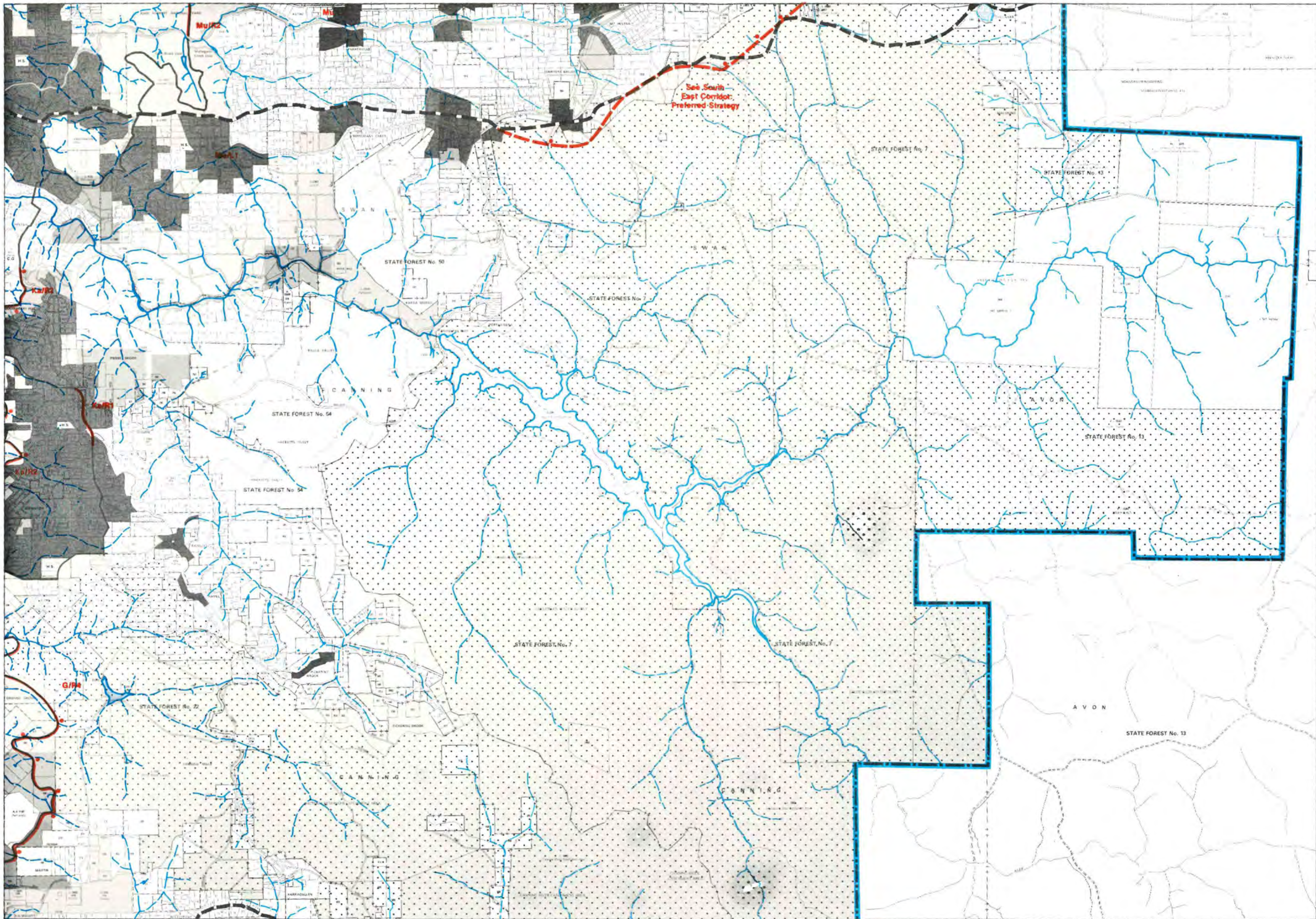
- Perennial
- Intermittent
- Wetlands not classified due to scale

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1979), (reduced to 1:50,000). Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.



LEGEND

SCHEME BOUNDARY

RESERVED LANDS

- PARKS & RECREATION
- RAILWAYS
- PORT INSTALLATIONS
- STATE FORESTS
- WATER CATCHMENTS
- CIVIC & CULTURAL
- WATERWAYS
- ROADS
- PUBLIC PURPOSES

	H.
	H.S
	T.S
	C.P.
	U.
	C.G.
	S.E.C.
	S.U.
	W.S.D.
	P.

ZONES

- URBAN
- URBAN DEFERRED
- CENTRAL CITY AREA
- INDUSTRIAL
- SPECIAL INDUSTRIAL
- RURAL
- PRIVATE RECREATION

NOTE

NUMBER 6

THE METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

METROPOLITAN REGION SCHEME MAP

FUTURE ROAD CONSTRUCTION (SEE KEY)

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- Possible highways and main roads } roads shown on MRS—not constructed
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- Routes under investigation for inclusion in to MRS

Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed

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• Wetlands not classified due to scale

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1979), (reduced to 1:50,000).
Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.

INDEX TO MAPS

1	2
3	4
5	
7	8
9	10

This map is based on the Australian Map Grid with a deviation from the standard rectangular sheet system.

Projected on the Universal Transverse Mercator Projection Zone No. 50 with horizontal datum the Australian Geodetic Datum 1966.

Produced by the Cartographic Section, Town Planning Department, Perth, Western Australia.

Harvey J. Tipping Chief Draftsman

METROPOLITAN REGION SCHEME MAP

THE METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 1:25000 SERIES

23	24
27	26

LEGEND

SCHEME BOUNDARY

RESERVED LANDS

PARKS & RECREATION

RESTRICTED PUBLIC ACCESS

RAILWAYS

PORT INSTALLATIONS

STATE FORESTS

WATER CATCHMENTS

CIVIC & CULTURAL

WATERWAYS

ROADS
- CONTROLLED ACCESS HIGHWAY
- OTHER MAJOR HIGHWAYS
- IMPORTANT REGIONAL ROADS

PUBLIC PURPOSES
- DENOTED AS HOSPITAL — H
- HOSPITAL — H
- HIGH SCHOOL — H.S.
- TECHNICAL SCHOOL — T.S.
- CIVIC PARK — C.P.
- UNIVERSITY — U.
- COMMONWEALTH GOVERNMENT — C.G.
- STATE ENERGY COMMISSION — S.E.C.
- ELECTRICITY — S.U.
- METROPOLITAN WATER SUPPLY
- SEWERAGE & DRAINAGE BOARD — W.S.D.
- PRISON — P.

ZONES

- URBAN
- URBAN DEFERRED
- CENTRAL CITY AREA
- INDUSTRIAL
- SPECIAL INDUSTRIAL
- RURAL
- PRIVATE RECREATION

NOTE

1. This map is one of a set of 12 which depicts the zones and reservations of the Metropolitan Region Scheme as adopted on 30th October, 1963 and incorporates all amendments to the scheme made to **12th September 1984**.
2. This series has been converted from imperial to standard metric values.
3. Maps 11 and 12 are enlargements of parts of map 5 showing Perth and Fremantle.

NUMBER **7**

FUTURE ROAD CONSTRUCTION (SEE KEY)

- Important regional roads
- Possible highways and main roads — roads shown on MRS—not constructed
- Amendments to MRS currently in hand
- Routes under investigation for inclusion in to MRS

Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed

★ Subject to realignment ● Planned regional roads in or near wetlands

WETLANDS

Lakes, Streams and Drains.
- Perennial
- Intermittent
- Mainly dry
- Subject to inundation

Swamps.
- Perennial
- Intermittent
- Wetlands not classified due to scale

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1979), (reduced to 1:50,000).
Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.

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1	2
3	4
5	6
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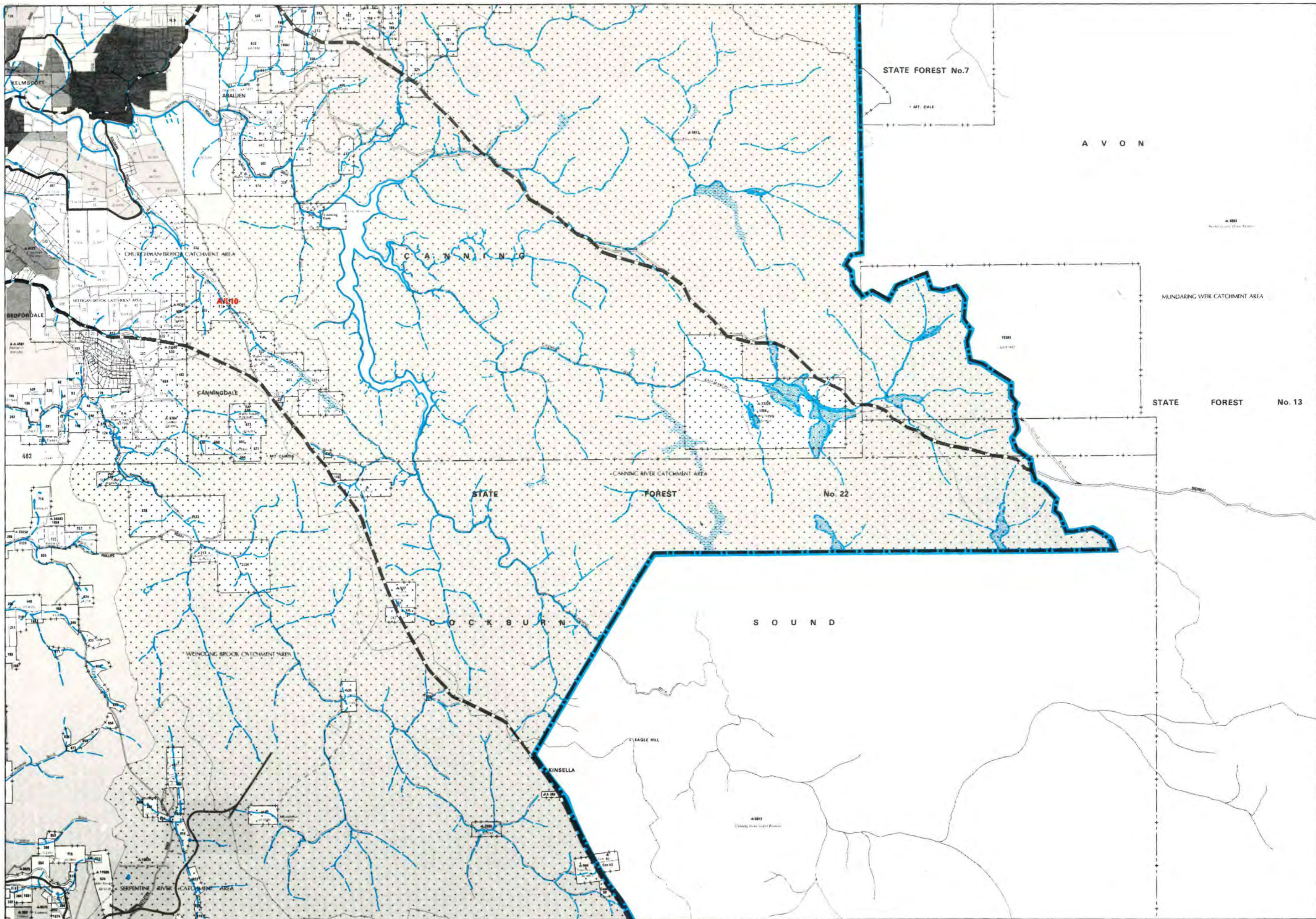
Produced by the Cartographic Section, Town Planning Department, Perth, Western Australia.

A. G. Young — Chief Draftsman

000223



LEGEND

SCHEME BOUNDARY

RESERVED LANDS

- PARKS & RECREATION
  - RESTRICTED PUBLIC ACCESS
- RAILWAYS
- PORT INSTALLATIONS
- STATE FORESTS
- WATER CATCHMENTS
- CIVIC & CULTURAL
- WATERWAYS
- ROADS
  - CONTROLLED ACCESS HIGHWAYS
  - OTHER MAJOR HIGHWAYS
  - IMPORTANT REGIONAL ROADS
- PUBLIC PURPOSES
  - DENOTED AS FOLLOWS
  - HOSPITAL — H
  - HIGH SCHOOL — H S
  - TECHNICAL SCHOOL — T S
  - CAR PARK — C P
  - UNIVERSITY — U
  - COMMONWEALTH GOVERNMENT — C G
  - STATE ENERGY COMMISSION — S E C
  - SPECIAL USES — S U
  - METROPOLITAN WATER SUPPLY
  - SEWERAGE & DRAINAGE BOARD — W S D
  - PRISON — P

ZONES

- URBAN
- URBAN DEFERRED
- CENTRAL CITY AREA
- INDUSTRIAL
- SPECIAL INDUSTRIAL
- RURAL
- PRIVATE RECREATION

NOTE:

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3. Sheets 11 and 12 are enlargements of parts of sheet 5 showing Perth and Fremantle.

NUMBER 8

METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 40 CHAIN SERIES: 20, 21, 24

METROPOLITAN REGION SCHEME MAP

FUTURE ROAD CONSTRUCTION (SEE KEY)

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- Possible highways and main roads } roads shown on MRS—not constructed
- Amendments to MRS currently in hand
- Routes under investigation for inclusion in to MRS
- Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed
- ★ Subject to realignment
- • Planned regional roads in or near wetlands

R.F. 1: 50 000

Metres 1000 0 1 2 3 4 5 6 Kilometres

WETLANDS

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- Mainly dry
- Subject to inundation

Swamps.
- Perennial
- Intermittent
- Wetlands not classified due to scale

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Produced by the Department of Conservation and Environment February 1985 to overlay Metropolitan Regional Scheme Map 4.

INDEX TO MAPS: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

AREAS SHOWN ON THIS MAP ARE IN HECTARES

THIS PLAN WAS PREPARED BY THE CARTOGRAPHIC SECTION TOWN PLANNING DEPARTMENT. PERTH, WESTERN AUSTRALIA

A. G. YOUNG CHIEF DRAFTSMAN

METROPOLITAN REGION SCHEME MAP

LEGEND

SCHEME BOUNDARY

RESERVED LANDS

PARKS & RECREATION
RESTRICTED PUBLIC ACCESS
RAILWAYS
PORT INSTALLATIONS
STATE FORESTS
WATER CATCHMENTS
CIVIC & CULTURAL
WATERWAYS
ROADS
CONTROLLED ACCESS HIGHWAYS
OTHER MAJOR HIGHWAYS
IMPORTANT REGIONAL ROADS
PUBLIC PURPOSES

DENOTED AS FOLLOWS

HOSPITAL	H
HIGH SCHOOL	H.S.
TECHNICAL SCHOOL	T.S.
CAR PARK	C.P.
UNIVERSITY	U.
COMMONWEALTH GOVERNMENT	C.G.
STATE ENERGY COMMISSION	S.E.C.
SPECIAL USES	S.U.
METROPOLITAN WATER SUPPLY, SEWERAGE & DRAINAGE BOARD	W.S.D.
PRISON	P.

ZONES

URBAN
URBAN DEFERRED
CENTRAL CITY AREA
INDUSTRIAL
SPECIAL INDUSTRIAL
RURAL
PRIVATE RECREATION

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NUMBER 9

INDIAN OCEAN

WARNBRO SOUND

COCKBURN SOUND

PORT KENNEDY
PEEL ESTATE
KARNUP
STATE FOREST No. 70
PEARSHURST
SINGLETON
MADORA
LAKE SIDE
GOEGRUP
HALLS HEAD
MANDURAH
COWERUP
WARALONG
KEYSBROOK
STATE FOREST No.22
MURRAY
NORTH DANDALUP

R/L1
R/L2
R/L3
R/C1
R/C2
Se/L1
Se/L2

See South West Corridor: Preferred Strategy

See South West Corridor: Preferred Strategy

STATE FOREST No.22

METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 40 CHAIN SERIES

22 23 28

FUTURE ROAD CONSTRUCTION (SEE KEY)

- Important regional roads
- Possible highways and main roads
- Amendments to MRS currently in hand
- Routes under investigation for inclusion in to MRS

} roads shown on MRS—not constructed

Symbols e.g. A/L 1 Local roads in or near wetlands — not constructed

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R.F. 1: 50 000

Metres 1000 0 1 2 3 4 5 6 Kilometres

WETLANDS

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- Subject to inundation

Swamps.
- Perennial
- Intermittent
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INDEX TO MAPS

1 2 3 4 5 6 7 8 9 10

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A. G. YOUNG CHIEF DRAFTSMAN

GOSNELLS

SERPENTINE RIVER CATCHMENT AREA

COCKBURN SOUND

CANNING RIVER CATCHMENT AREA

STATE FOREST No. 13

SERPENTINE RESERVOIR

STATE FOREST No. 22

MT COOKE

AVON

MT. SOLUS

MURRAY

MYARRA HILL

SERPENTINE RIVER CATCHMENT AREA

STATE FOREST No. 14

S.F. No. 67

LEGEND

SCHEME BOUNDARY

RESERVED LANDS

PARKS & RECREATION

RESTRICTED PUBLIC ACCESS

RAILWAYS

PORT INSTALLATIONS

STATE FORESTS

WATER CATCHMENTS

CIVIC & CULTURAL

WATERWAYS

ROADS — CONTROLLED ACCESS HIGHWAYS

OTHER MAJOR HIGHWAYS

IMPORTANT REGIONAL ROADS

PUBLIC PURPOSES

DENOTED AS FOLLOWS

HOSPITAL	H.
HIGH SCHOOL	H.S.
TECHNICAL SCHOOL	T.S.
CAR PARK	C.P.
UNIVERSITY	U.
COMMONWEALTH GOVERNMENT	C.G.
STATE ENERGY COMMISSION	S.E.C.
SPECIAL USES	S.U.
METROPOLITAN WATER SUPPLY, SEWERAGE & DRAINAGE BOARD	W.S.D.
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ZONES

URBAN

URBAN DEFERRED

CENTRAL CITY AREA

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NUMBER 10

METROPOLITAN REGION PLANNING AUTHORITY, PERTH, W.A.

INDEX TO 40 CHAIN SERIES

METROPOLITAN REGION SCHEME MAP

WETLANDS

Cockburn Sound

Source: Compiled from Lands & Surveys 1:25,000 topographic maps (1976-1978), reduced to 1:50 000.

R.F. 1: 50 000

Metres 1000 0 1 2 3 4 5 6 Kilometres

INDEX TO MAPS

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A. G. YOUNG CHIEF DRAFTSMAN

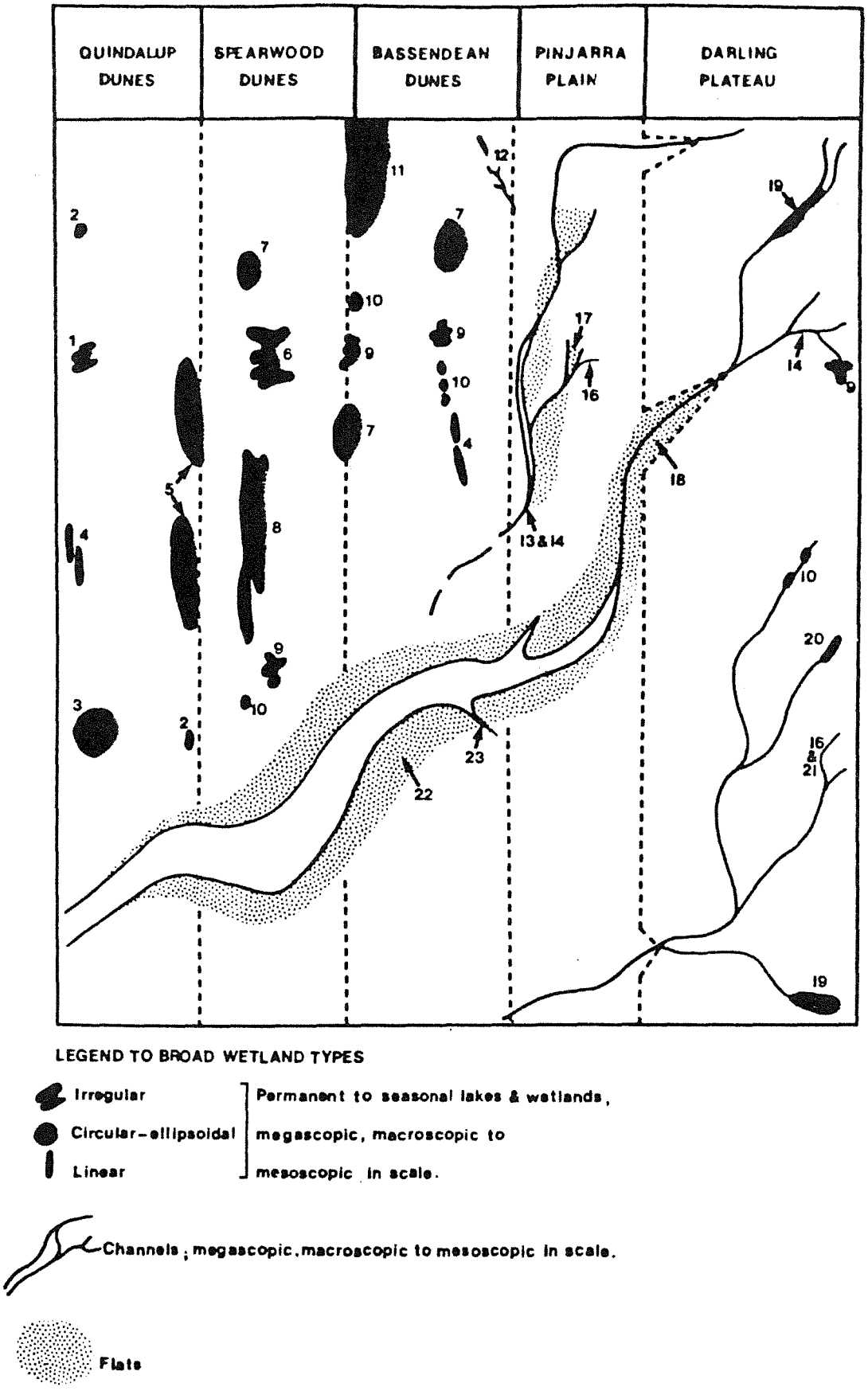

Figure 3: Preliminary schematic diagram showing wetland types and their distribution across the Darling System according to C.A. Semeniuk (in prep.).

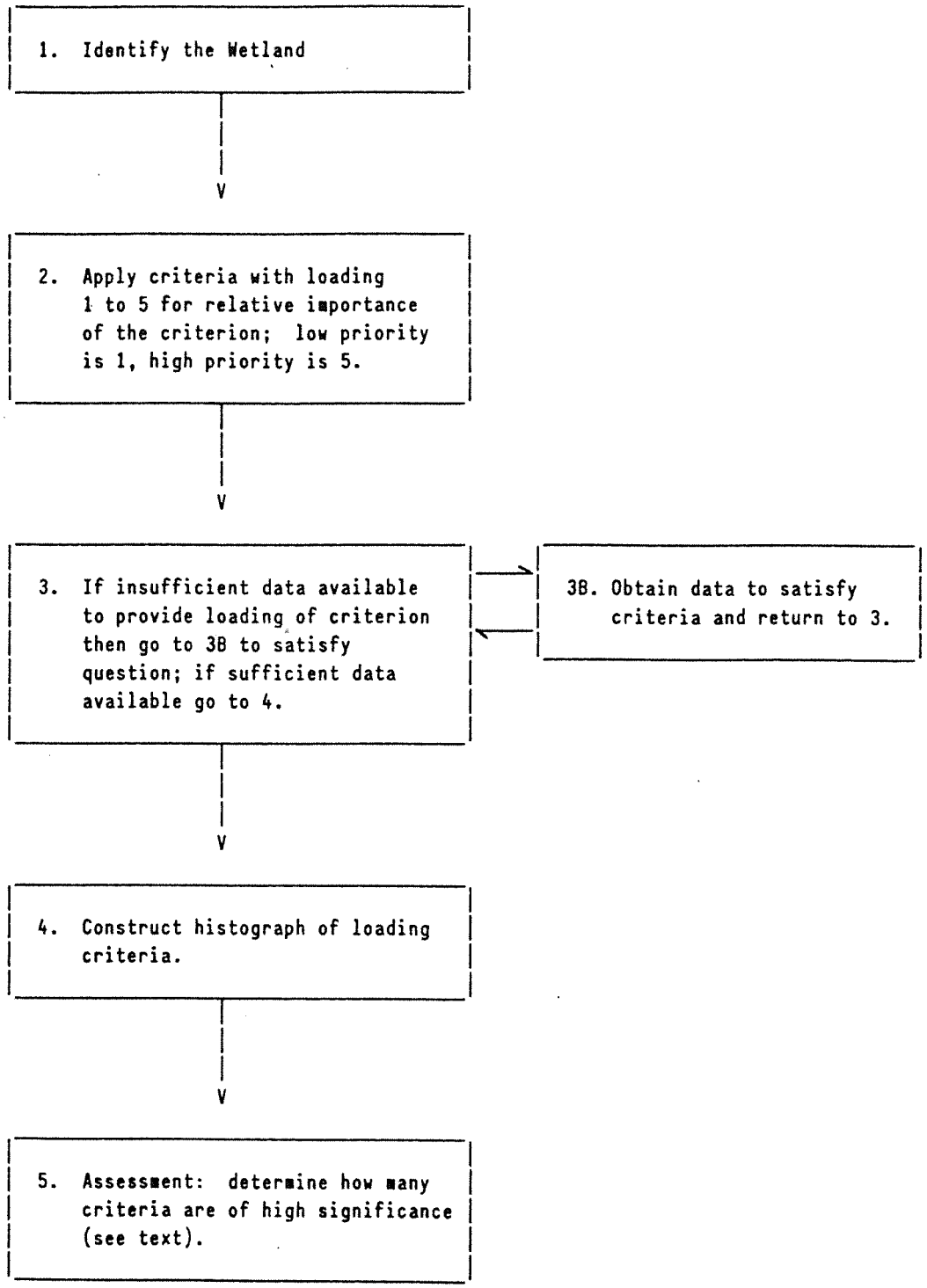

Figure 4: Flow chart for assessing the conservation value of a wetland.

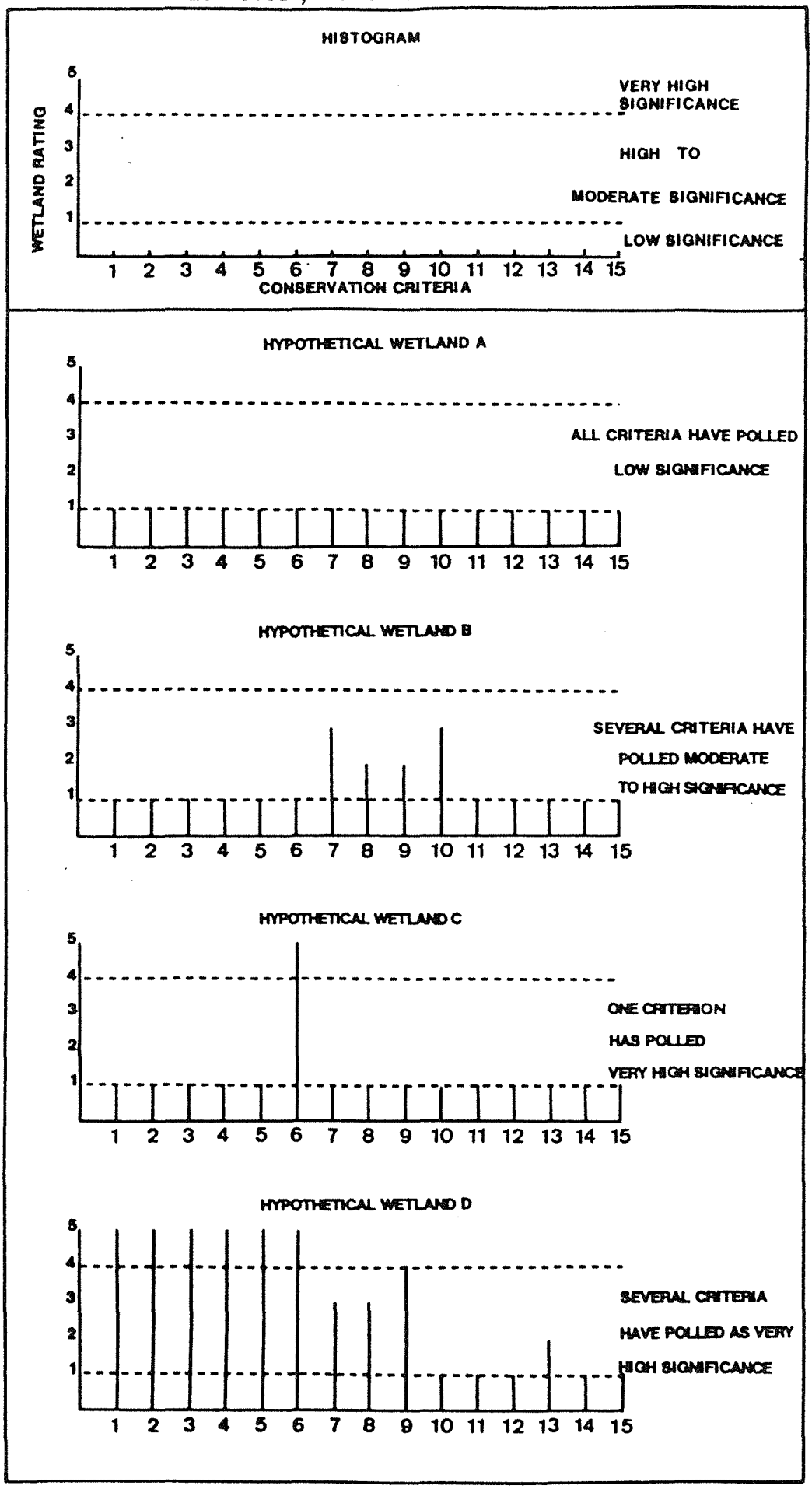

Figure 5: Histographs illustrating techniques for assessing the conservation value of a wetland utilising 15 criteria, each scored on a scale of 1-5.

APPENDIX 1

WETLANDS-ROADWORKS STUDY

LIST OF ORGANISATIONS AND INDIVIDUALS SUPPLYING INFORMATION

LIST OF ORGANISATIONS AND INDIVIDUALS SUPPLYING INFORMATION

DEPARTMENT OR ORGANISATION	CONTACT PERSON	DATE FIRST CONTACTED
Department of Conservation and Environment	Dr Jenny Arnold	23.10.84
	Mr Paul Holmes	23.10.84
	Mr Peter Skitmore	23.10.84
	Mr Norman Orr	24.10.84
	Mr Bill Carr	24.10.84
	Ms Sally Robinson	22.10.84
Town Planning Department	Mr Lloyd Graham (Commissioner for Town Planning)	1.11.84 (telephone)
	Mr Mike Pearson	2.11.84
	Mr Ian MacRae	2.11.84
	Mr Alan Keil	2.11.84
	Mr Dave Everill	31.10.84
	Mr Jim Singleton	31.10.84
Main Roads Department	Mr Mofflin (Deputy Commissioner for Main Roads)	30.10.84 (telephone)
	Mr George Hackett	1.11.84
	Mr Kevin Gale	1.11.84
LOCAL GOVERNMENT AUTHORITIES	**CONTACT PERSON**	**DATE FIRST CONTACTED**
Armadale	Mr John Adderley	9.11.84
	Mr Greg Elsegood	9.11.84
Bassendean	Mr Clarrie McCreed	6.11.84
	Mr Bob Milne	6.11.84
Bayswater	Mr Greg Rowe	4.11.84
	Mr Edwin Long	4.11.84
Belmont	Mr Adrian Oats	6.11.84
	Mr Britt Payne	6.11.84
Canning	Mr Chris O'Neal	
Claremont	Mr Ron Brooks	9.11.84
Cockburn	Mr Russell Candy	22.11.84
	Mr Keith Rimmer	22.11.84
	Mr Bob Jeans	22.11.84

LOCAL GOVERNMENT AUTHORITIES	CONTACT PERSON	DATE FIRST CONTACTED
Cottesloe	Mr Malcolm Doig	14.11.84
East Fremantle	Mr Cowan	15.11.84
Fremantle	Mr Les Croxford	15.11.84
Gosnells	Mr Keith Thomas	16.11.84
Kalamunda	Mr Geoff Dutton	7.11.84
Kwinana	Mr David Porter	15.11.84
	Mr Doug Smith	15.11.84
Melville	Mr Laurie Wills	19.11.84
	Mr Bruce Guthrie	19.11.84
Mosman Park	Mr Doug Walker	14.11.84
Mundaring	Mr Keith Weymes	20.11.84
Nedlands	Mr Kerry Martin	14.11.84
Peppermint Grove	Mr Graham Partridge	14.11.84
Perth	Mr V Klyne	19.11.84
Rockingham	Mr Paul Garnett	6.12.84
Serpentine	Mr Richard Watson	21.11.84
South Perth	Mr Berkov	16.11.84
	Mr P Bennetts	16.11.84
Stirling	Mr Emerson Richardson	22.11.84
	Mr Larry Smith	22.11.84
Subiaco	Mr J McGeough	13.11.84
Swan	Mr Eric Lumsden	4.12.84
Wanneroo	Mr Bob Ruscoe	23.11.84
	Mr Phil Thomson	23.11.84
	Mr Oscar Drescher	23.11.84

APPENDIX 2

MAIN ROADS DEPARTMENT

ENVIRONMENTAL CHECKLIST

ENVIRONMENTAL ASSESSMENT

M.R.D. 111

DIVISION: _____ L.A.: _____ YEAR: _____

ROAD: _____ CLASS: _____

SECTION: _____ WORK: _____

Project assessed as category

	A	No further action required
	B	Statement attached/being prepared by Division
	C	Report attached/being prepared by Division/H.O.
	D	Notice of Intent/ERMP being prepared

Has this project been discussed with:-

C & ME Yes/No

Land. Arch. Yes/No

Mats. Eng. Yes/No

Assessing Officer: _____ Section Head/Div. Eng. _____ Date: _____

ROAD WIDENING

For projects involving clearing of vegetation fill in the table below. Only approximate, or typical, dimensions are required.

SLK		WIDTH AND TYPE OF VEGETATION				REMARKS
		BEFORE		AFTER		
FROM	TO	LHS	RHS	LHS	RHS	

ENVIRONMENTAL CHECKLIST

For projects likely to have any environmental significance complete this checklist before making the environmental assessment.

Urban Projects (including rural townsites and settlements)

Rural Projects

		Environmental Area affected by Project	Effect: Project: Nil	Effect: Project: Minor	Effect: Project: Major	Effect: Materials: Nil	Effect: Materials: Minor	Effect: Materials: Major	Solution: Construction	Solution: Design	Solution: Study: required	Solution: Study: in progress	Solution: Study: complete	Specialist advice has been obtained from:	Remarks (in Effect column show beneficial effects + and negative effects -)	Reminders
Physical	Earth	Unique Features														Geological Landforms
		Raw Materials														Minerals, borrowpits
		Structural Stability														Slides, slumps, springs
		Erosion Sedimentation Potential														Concentr of flow, soiltype, veg. cover
		Drainage														Backwater, deprivation of water
		Wetlands														Drainage, siltation
		Salinity														Leaching, saturation
	Water	Surface														Debris, refuse, chemicals
		Underground														Watertable
		Siltation														Scour, sediment
		Drinking														Catchments, bores, contamination
		Irrigation														" " "
	Atmosphere	Dust														Construction, unsealed road, wind
		Sunglare														Intersections
		Fog														Depressions, sheltered locations
	Flora	Native														Ecology, visual effects
		Crops/Plantations														Ecology, dust, visual effects
		Rare Species														To be avoided
		Noxious Weeds														Take-over of native species
	Fauna	Native														Habitat, accidents, migration
		Introduced														Watering points, accidents
		Rare/Endangered Species														Short neck tortoise, noisy scrub bird
	Land Use	Forests														Dieback, plantations, timber resources
		Grazing														Dairy, sheep, cattle, Abo. Pastoral Leases
		Agriculture														Crops, Market Gardens
		Residential														Intersections, design speeds
		Commercial														Shops, parking
		Industrial														Heavy vehicle movements
		Reserves Recreation														Playing fields, swimming, hiking, fishing
		Flora & Fauna														Disturbance to vegetation & fauna, access
		Aboriginal														Entry with approval only
		National Park														Noise, dust, speed, access, pollution
		Significant Site														See Sig. Site register
	Cultural	Visual Intrusion														Road/landscape relationship
		Historic Sites														Monuments, buildings
		Aboriginal Sites														Rock carvings, paintings, camp sites
Sociological		Access														Alterations to travel pattern
		Severance														" " " "
		Traffic Pattern														Volumes, speeds, types of vehicles
		Services														Bus routes, deliveries
		Safety														Children, Pedestrians, Bicycles
		Institutions														Schools, Hospitals, Libraries, Museum etc.
		Damage to Property														Vibrations
		Personal Comfort														Noise, fumes, vibration
Economical		Planning Schemes														M.R.P.A., L.A.
		Loss of Income														Parking prohibition, bypass, job opportunities

APPENDIX 3

ENVIRONMENTAL ASSESSMENT OF ROADWORKS : GUIDELINES FOR LOCAL AUTHORITIES DCE BULLETIN No. 184

Environmental Assessment of Roadworks

Guidelines for Local Authorities

Department of Conservation and Environment
Perth Western Australia

Bulletin 184 December 1984

APPENDIX 4

4.1 Copy of the draft guidelines for assessing wetland conservation value forwarded to various government authorities, university personnel, conservation groups and individuals who actively work in, are interested in wetlands, or could contribute ideas to wetland conservation.

4.2 Copy of the letter forwarded to the various bodies.

4.3 List of organisations and personnel to whom draft guidelines for assessing wetland conservation value were forwarded for comment.

4.1 DRAFT GUIDELINES FOR ASSESSING CONSERVATION VALUES OF WETLANDS

A rational approach to land management and conservation is to formulate a strategy whereby a given terrain is compartmentalised into its natural history components, and each component is assessed from a point of view of the value of resources available against resources at risk. Components of a given land system may be at any nominated scale. The assessment of the conservation, social, or scientific value of any component is based on the following criteria:

- regional significance of the system - is it regionally widespread and common, or is it restricted to local areas?
- if it is restricted, then does it contain unique landforms, biota or other natural features that provide it with state-wide, national or international status?
- does it offer social, recreational, educational, scientific/research wildlife santuary/habitat, potential not offered by other areas?

To this objective the following section provides guidelines to assess the conservation significance of any wetland.

(1) Is the wetland type regionally widespread or is it restricted in distribution? If the latter, then it may warrant conservation. (If the former, it may still be significant for conservation purposes - see below).

Having identified why a given wetland is regionally significant and thus requires conservation and management, it would then be necessary to identify the range of conservation values which apply to specific resources within the wetland. To do this, one needs to resolve the various other conservation criteria listed below. These criteria would require input from a range of natural history scientists but would mainly draw on the experience of geomorphologists and biologists.

(2) Is the wetland important as a productive area upon which depend such commercial endeavours as fisheries, forestry, and agriculture (e.g. in coastal areas mangroves function as nursery areas for fisheries)?

For terrestrial wetlands of the Swan Coastal Plain this may not be relevant but may be relevant for the estuarine flats adjoining the Swan River system.

(3) Is the wetland important to maintain the quality of human or animal life (e.g. to maintain low salinity in drinking water; vegetation to arrest soil erosion)?

For wetlands on the Swan Coastal Plain and Darling Plateau this aspect would involve water quality and natural recharge/discharge processes.

(4) Does the wetland have important ecological or geological features of national or international significance (comparable to the significance of the Shark Bay stromatolites, Pinnacles at Cervantes, Ayers Rock)?

For wetlands this includes landforms, vegetation assemblages and numerous other examples of regionally unique ecological and geological features.

(5) Is the wetland important in providing pristine environments or habitats (or system of these units) which are a research resource (comparable to the corals of the Ningaloo Reef; terrestrial vegetation of the Mitchell Plateau; strandplain of the Gascoyne delta)?

For wetlands this includes the range of interactions between landforms and habitats, the evolution of landforms, stratigraphic history of wetlands, ecological relationship between the above and population dynamics of various species of flora, aquatic fauna and other vertebrate fauna such as tortoises, avifauna.

(6) Could the wetland function as an important pristine to semi-pristine environment for use by primary, secondary or tertiary educationalists because of scientific features and accessibility (e.g. geological localities for illustrating earth science principles, wetland localities for illustrating ecological principles)?

For wetlands this would include any of the suite of landforms, their associated biota, interdependence and evolution.

[Note: In Western Australia, there is inadequate reservation for scientific/educational purposes of the various types of wetland types which occur within or close to the Metropolitan Area. These areas are under intense pressure for recreational and other development. This trend has been identified by numerous authors and must be expected to continue to grow as population pressures increase.]

(7) Does the wetland function as the habitat of rare and endangered species?

(8) Does the wetland function as an important regional wildlife sanctuary, even if the flora/fauna are not rare or endangered?

For wetlands this would include those areas that provide water, refuge or breeding grounds for a variety of reptiles, avifauna, macropods, marsupials, etc.

(9) Is the wetland important as either the temporary habitat or breeding ground of large numbers of transitory or migratory animals?

For wetlands in general this factor is likely to be important.

(10) Can the wetland function as a semi-pristine to pristine area or wilderness for use by naturalists, bush-walkers, etc. (e.g. Kakadu National Park)?

Wetlands close to the population centre of Perth have special value to naturalists, professional ornithologists, amateur bird observers, outdoor enthusiasts, etc.

(11) Does the wetland have importance from the point of view of aesthetics?

Well-vegetated and/or water-filled wetlands provide a contrast to the adjacent, heavily-developed residential areas.

(12) Does the wetland have importance as an historic or actively-utilised Aboriginal heritage site?

There are as yet no recorded Aboriginal sites and therefore this factor may not be relevant.

(13) Does the wetland have value for active water-based recreation?

There is increasing pressure for use of wetlands for boating and other water sports.

(14) Does the wetland regardless of whether it is pristine or degraded, constitute part of a linked natural system such that its destruction or alterate use would result in disturbance/alteration to adjoining wetlands?

(15) Does the wetland have social values evidenced by community concern for its conservation, regardless of scientific values?

Conclusion

The significance of a wetland in relation to the above criteria may be summarised in a Table giving a loading to each criteria.

If all members of this community are to derive benefit from wetland systems, it will be necessary to ensure that any proposed development or management of wetlands is compatible with the range of alternative potential uses of the resources. To this end, the criteria above have identified in a preliminary fashion the range of potential conservation values which apply to the resources of any given wetland.

4.2 THE LETTER ACCOMPANYING DRAFT GUIDELINES

Dear Sir/Madam,

WETLANDS AND ROADWORKS STUDY

You are probably already aware that LeProvost, Semeniuk & Chalmer currently are undertaking a study of the potential impact of planned roadworks in the Perth Metropolitan Region on wetlands. The study is being supervised by the Department of Conservation and Environment. An objective is to define those wetlands at risk due to future road development. It will also be necessary to establish a conservation value or index to evaluate those wetlands which are identified as at risk and for which further work is needed.

As part of the project LeProvost, Semeniuk & Chalmer need to identify wetlands of significance and therefore need to develop criteria to establish their significance. Consequently the study will involve the development of guidelines for assessing wetland conservation values.

In order to take into account the many and different values of wetlands, we are seeking input from people with interests and expertise in various aspects of wetland use and management. We would welcome any contribution you wish to make to achieving the aims outlined above, including comments on the preliminary draft of guidelines for assessing wetland conservation values which is appended. For example, are there any other areas you would wish to see included, or areas which require expansion. You could for instance provide details of specific flora or fauna habitats or perhaps provide specific guidelines from your field of experience for determining the significance of some individual criteria listed in the Appendix attached.

It would be appreciated if you could make any comments on these guidelines, or make alternative submissions, as soon as possible to assist us in meeting report deadlines.

4.3 LIST OF ORGANISATIONS/PERSONNEL TO WHOM DRAFT GUIDELINES FOR ASSESSING WETLAND CONSERVATION VALUE WERE FORWARDED FOR COMMENT

Prof. A. McComb,
Botany Department,
University of Western Australia,
NEDLANDS WA 6009

Mr Barry Carbon,
c/- Alcoa of Australia Ltd,
Marmion Street,
BOORAGOON WA 6154

Dr John Bailey,
Conservation Council of W.A. Inc,
794 Hay Street,
PERTH WA 6000

The Director,
Department of Agriculture,
Jarrah Road,
SOUTH PERTH WA 6151

Mr J.A.K. Lane,
Department of Fisheries & Wildlife,
Wildlife Research Centre,
Ocean Reef Road,
WOODVALE WA 6026

Mr Grant Pearson,
Department of Fisheries & Wildlife,
Wildlife Research Centre,
Ocean Reef Road,
WOODVALE WA 6062

The Director,
Department of Youth, Sport & Recreation,
Perry Lakes Stadium,
WEMBLEY WA 6014

The Director,
Forest Department
50 Hayman Road,
SOUTH PERTH WA 6151

Dr A. Allen,
Hydrology Branch,
Geological Survey of Western Australia,
66 Adelaide Terrace,
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Dr Malcolm Hollick,
c/- Department of Civil Engineering,
University of Western Australia,
NEDLANDS WA 6009

Dr P. Wycherley,
Kings Park Board,
Kings Park and Botanic Gardens,
WEST PERTH WA 6005

Mr R. Becu,
Metropolitan Water Authority,
629 Newcastle Street,
LEEDERVILLE WA 6007

Mr M. Caldwell
Metropolitan Water Authority,
629 Newcastle Street,
LEEDERVILLE WA 6007

Mr B. Muir,
National Parks Authority of W.A.,
Hackett Drive,
NEDLANDS WA 6009

Mr R. May,
National Parks Authority of W.A.,
Hackett Drive,
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Dr Peter Newman,
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Murdoch University,
South Street,
MURDOCH WA 6150

Dr Barbara Porter,
c/- Department of Environmental & Life Sciences,
Murdoch University,
South Street,
MURDOCH WA 6150

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VICTORIA PARK WA 6100

Mr Roger Jaensch,
Royal Australasian Ornithologists Union,
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CANNING BRIDGE WA 6153

Mr R. Atkins,
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PERTH WA 6000

Dr A. Tingay,
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STONEVILLE WA 6554

Mr J. Singleton,
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PERTH WA 6000

The Director,
Western Australian Herbarium,
Jarrah Road,
SOUTH PERTH WA 6151

Dr N. Marchant,
Western Australian Herbarium,
Jarrah Road,
SOUTH PERTH WA 6151

The Director,
Western Australian Museum,
Francis Street,
PERTH WA 6000

The Secretary,
W.A. Naturalists Club (Inc.),
794 Hay Street,
WEST PERTH WA 6005

Prof. P. Jennings,
Wetlands Conservation Society,
c/- 14 Stone Court,
KARDINYA WA 6163

Dr D. Edwards,
Zoology Department,
University of Western Australia,
NEDLANDS WA 6009

Mr B. Clay,
c/- Zoology Department,
University of Western Australia,
NEDLANDS WA 6009