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LESCHENAULT WATERWAYS MANAGEMENT PROGRAMME 1992

WATERWAYS COMMISSION
REPORT 26
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LESCHENAULT WATERWAYS

MANAGEMENT PROGRAMME

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Prepared for the Leschenault Inlet Management Authority by the Waterways Commission

WATERWAYS COMMISSION

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LESCHENAULT INLET MANAGEMENT AUTHORITY

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ACKNOWLEDGEMENTS

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The local government representatives on LIMA and staff from the three local government authorities provided advice on issues of concern to their ratepayers. Technical advice was also provided by a large number of government agencies including the Environmental Protection Authority, Bunbury Port Authority, South West Development Authority, Department of Planning and Urban Development, Water Authority of Western Australia, Department of Conservation and Land Management and State Energy Commission.

The maps were prepared by Lyn Hamilton and Greg Baxter, and the photographs by Eric Wright; editorial assistance by June Hutchison.

B.H. Thurlow,
Project Co-ordinator

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MINISTER'S FOREWORD

The waterways of Western Australia are among the State's most precious natural assets providing a focus for conservation, recreation and residential development. The Government is committed to their conservation. The Leschenault system has been fortunate that the need to conserve the waterways was recognised in association with the growth of the Bunbury Region.

In 1965 the Bunbury and Districts Water Advisory Committee was formed to preserve the purity of the water of the Leschenault system and improve its foreshores. In 1976 the Committee was superseded by the Leschenault Inlet Management Authority and in 1983 the Authority released the first Leschenault Inlet Management Programme. However the Bunbury Region has changed considerably since then and a review of the Management Programme was required to keep pace with these changes.

In 1990 the Leschenault Inlet Management Programme Review was released for public comment. I have carefully considered the public submissions and the amendments made to the document and have approved gazettal of the Leschenault Waterways Management Programme 1992. The recommendations contained in the Management Programme will ensure that the estuary continues to be a healthy living system.

I entrust implementation of the Management Programme to the Leschenault Inlet Management Authority knowing that they will continue their excellent work in planning and managing the waterways.

Bob Pearce MLA
Minister for the Environment

Dense vegetation along the Collie River provides a scenic outlook and also protects the foreshore from erosion.

CHAIRMAN'S FOREWORD

The Leschenault estuarine system and Koombana Bay have been a major feature of the development of the Bunbury Region. The Leschenault Inlet, as it was previously termed, has undergone considerable modification resulting in two separate water bodies, the smaller Leschenault Inlet and the larger Leschenault Estuary.

Today the waterways provide the major recreational and landscape feature for the Bunbury Region and are subject to a wide range of pressures. These include a strong community desire for public access and to conserve the waterways as a healthy living system. People want the waterways to support a diversity of recreational activities including fishing, water sports and passive recreation. In addition the waterways continue to provide a major focus for agriculture, residential, commercial and industrial development.

In 1983 the Leschenault Inlet Management Programme was released. In the face of increasing development pressure and an expanding urban population the 1983 document has been reviewed. The Leschenault Inlet Management Programme Review was released for public comment in 1990. The public submissions have been considered and the report amended where necessary. A separate report 'Leschenault Inlet Management Programme Review 1990. Summary of Submissions' outlines issues raised in the public submissions.

The Leschenault Waterways Management Programme 1992 replaces the 1983 report. It addresses a wide range of issues including catchment management, urban expansion, water quality and recreational use. The pressures of the 1990s require an wholistic approach to waterways management if the waterways are to continue to function as a healthy living system. Proposed developments and changing land uses cannot be considered in isolation. Rather the cumulative impact of such developments on the waterways will become the focus for assessment.

The Authority endorses the recommendations contained in the Management Programme and is committed to their implementation. The Leschenault Inlet Management Authority is a local community body. I urge the community to work with the Authority and express their support and indeed their concerns as to how the waterways are being managed in the years to come.

Sir Donald Eckersley OBE
Chairman
Leschenault Inlet Management Authority

GUIDE FOR READERS

THE SUMMARY

The Summary contains an overview of the whole document and includes the major issues and objectives plus a summary of the General Recommendations.

THE RECOMMENDATIONS

All of the recommendations are set out in full on the coloured pages in the order in which they appear in the main document. General Recommendations which apply to the region as a whole, are listed first (1-155) followed by specific Area Recommendations (A1- A39).

THE MAIN BODY OF THE DOCUMENT

Chapters 1 and 2 outline current management structures, describe the study area and identify the major issues.

Chapter 3 sets the aim and objectives of the Management Programme.

Chapters 4 and 5 contain the recommendations by which the objectives are to be attained. General Recommendations in Chapter 4 cover catchment management and waterways issues and form the basis of the report. More specific Area Recommendations appear in Chapter 5. In each case the basis for the recommendations is set out.

Chapter 6 outlines the responsibilities for implementation of the recommendations and the proposed procedures for monitoring implementation.

Appendices 1 and 2 detail administrative procedures and policies. These can be amended separately from the main document.

ABBREVIATIONS

Many State, local government and other organisations are mentioned in the Management Programme. For brevity initials are used in most references. So as to aid the reader a foldout sheet listing the full names for all abbreviations is provided at the back of the document.

PUBLIC SUBMISSIONS

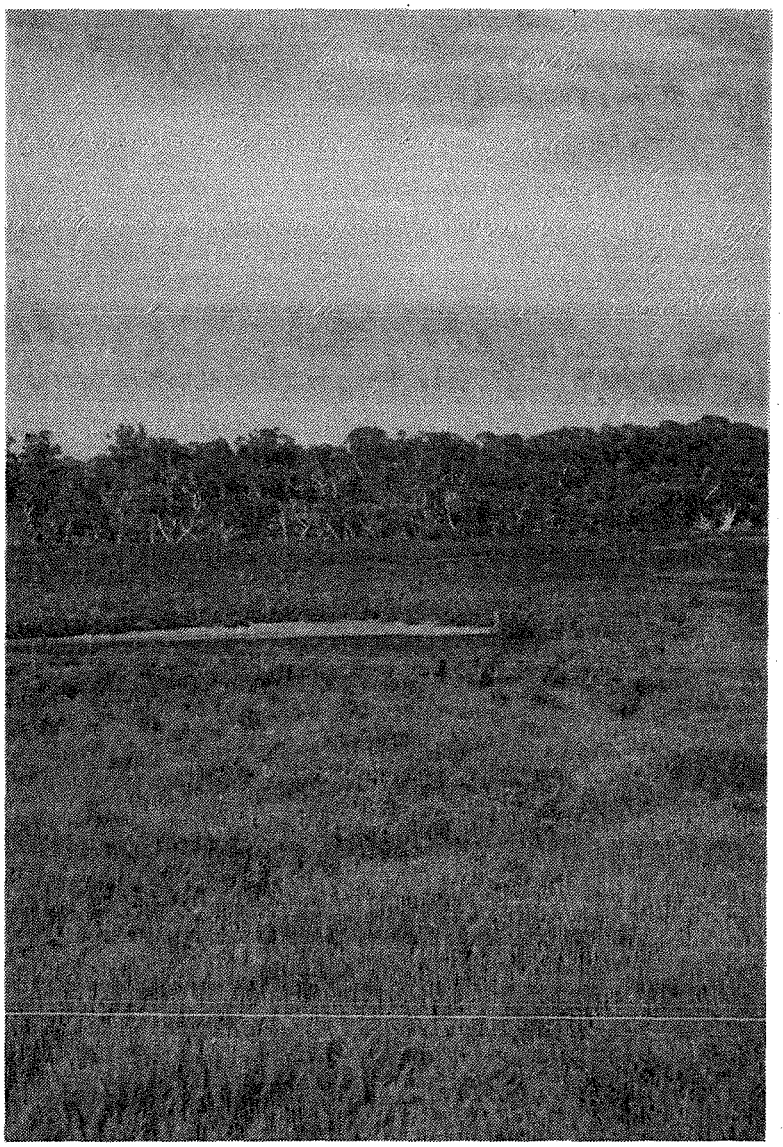
In accordance with the Waterways Conservation Act (Amended) the management programme was released for public comment in 1990. Thirteen submissions were received. None of these were 'pro forma' submissions.

The majority of submissions endorsed the Management Programme Review. Submissions most frequently related to the roles of local government and LIMA, ensuring that the waterways are adequately protected and taking a wholistic and integrated approach to management of the catchment and waterways. Comments indicated that the document was supported as it facilitates co-ordination between the various authorities and public interest groups.

Concern was expressed in one submission about the intrusion into matters controlled by other agencies. It was recommended that agreement should be reached between LIMA and other departments on the definition of areas of responsibility before final adoption of the programme. LIMA has met with the agency concerned to discuss this issue.

One submission commented that the report was not user friendly. Another commented that it was too long. LIMA has attempted to rectify this problem by producing a summary document of the programme.

A total of 43 recommendations were amended and the 'Need for Action' amended in 22 locations as a result of the submissions made. Seven new recommendations have been inserted into the Management Programme. Readers are referred to the report "Leschenault Inlet Management Programme Review 1990 - Summary of Submissions' for a more detailed assessment of the public submissions.



Many samphire marshes around the estuary have been filled. Remaining areas provide important bird breeding and loafing areas.

SUMMARY

The Leschenault Inlet, Estuary and its tributaries provide a major recreational focus for the population of the Bunbury Region. The safe waters, abundant crabbing and fishing and proximity to Perth and the South West make it an ideal holiday destination. It is important that the waterways and catchments are managed in order to maintain their recreational importance as well as conserve the flora and fauna.

The Leschenault Inlet Management Authority was established in 1977. Its primary role is to conserve and enhance the waterways and associated foreshores.

The first Leschenault Inlet Management Programme was gazetted in 1983. In 1990 it was reviewed to bring it up to date with the current issues facing the Leschenault waterways.

Since the original programme was gazetted the population of the Bunbury Region has grown and a number of new industries have been established or are planned for the area. In addition a number of studies have been completed which add to the knowledge of the estuary and its flora and fauna.

The 1991 Management Programme supersedes the 1983 report.

AIM

It is the aim of the programme

> "To fulfil the demands for use and development in so far as they are consistent with the conservation and enhancement of a functional healthy estuarine environment for the enjoyment of present and future generations."

In order to achieve this aim it is recognised that the waterways are a living system and their integrity should be maintained and sustained to the greatest extent possible. This means that a wide range of biological and physical functions should be retained and all proposed uses should be evaluated in terms of their capacity to adversely affect the system.

RECOMMENDATIONS

A wide range of issues were addressed in preparing the management programme. Eight primary objectives were defined to cover these issues. The issues were then grouped under the primary objectives and recommendations developed to achieve the objectives (see Section 2.10).

The summary highlights the main thrust of the recommendations for each primary objective.

LAND USE AND WATERWAY PLANNING

PRIMARY OBJECTIVE 1

> Ensure that land use and development on and adjacent to the waterways maintain or enhance the quality and amenity of the waterway environment.

Regional and Local Planning

The need for integration with regional and local town planning schemes is recognised and mechanisms to ensure plans are prepared in consultation with LIMA and other agencies are identified.

It is proposed that environmental considerations be incorporated into town planning schemes. Similarly policies detailing the planning, development and maintenance of foreshore areas are recommended for incorporation into local town planning schemes.

Foreshore Reserves

The programme sets criteria for the establishment of foreshore reserves to ensure these reserves are of sufficient size to provide for public access and recreation while conserving and enhancing flora and fauna.

The need to fund alternatives to acquisition is recognised. Given the broader nature of this problem it is recommended that it be addressed on a Statewide basis.

Commercial and Urban Development

Criteria are identified for assessing commercial development proposals for the foreshores and waterways. Similarly, criteria for urban development will ensure that the impact on foreshore areas is minimal.

Flooding and Climatic Change

The need for legislation clearly addressing the issue of flooding and the responsibilities of the various agencies is addressed. The impact of climatic change on flooding patterns of the estuary and rises in water level is examined.

CONSERVATION AND ENVIRONMENTAL PROTECTION

PRIMARY OBJECTIVE 2

> Conserve, protect and rehabilitate the waterways and foreshores.

Conservation Areas

The mud and shallow banks of the estuary are an important shelter and feeding habitat for the fauna of the estuary. It is essential that these areas are protected. A mechanism to ensure their protection is identified in the report.

Water Quality

Many aspects of water quality management are examined in the report. The key recommendation is the establishment of an integrated catchment management group to ensure that the waterways are managed on a catchment basis.

Erosion Control

It is proposed that erosion prone areas be identified and that LIMA establish a comprehensive tree planting programme in order to retard erosion of foreshore areas.

Dredging

Dredging can have a devastating impact on an estuarine system by removing mud flats and shallow banks. It is recommended that an Environmental Protection Policy be established to ensure that dredging proposals undergo adequate environmental assessment.

Scientific Research

It is a role of LIMA to undertake scientific research which will assist in future planning and management. It is proposed to list aspects requiring investigation and establish priorities for implementation.

RECREATION AND TOURISM

PRIMARY OBJECTIVE 3

> Encourage a range of recreation and tourism opportunities and facilities that reflect and complement local heritage, life style and the natural environment.

Recreation and Tourism

Studies indicate the recreational and tourism importance of the estuarine system for the population of the Bunbury Region. It will be LIMA's strategy to accommodate recreational demands through the establishment of joint development programmes with local government. LIMA will promote activities which are considered compatible with the protection of the environment. Close liaison will occur with the South West Development Authority and the Western Australian Tourism Commission regarding proposed tourist developments.

Boating Activities and Facilities

In order to preserve the mud flat areas LIMA will restrict the establishment of ramps and channels in upstream areas of the Collie River and the northern 3 kilometres of the estuary.

Control of jetski use in the estuary, inlet and rivers will be sought.

Public Access

Public access will be provided to and along the foreshore where appropriate. The establishment of dual-use paths and walkways will follow set criteria.

Boundaries between private and public property on the foreshore will be clearly defined to ensure that people are not deterred from using foreshore areas.

PUBLIC EDUCATION

PRIMARY OBJECTIVE 4

> Promote awareness and appreciation of the waterways and foreshores.

Education Programmes

Education programmes involving public participation will be developed. Where possible, they will be integrated with the programmes of other government agencies.

NAVIGATION AND BOATING SAFETY

PRIMARY OBJECTIVE 5

> Regulate, control and promote measures to ensure the safety of life in connection with all boating activities and to construct, maintain and manage facilities and equipment necessary for that purpose.

Boating Control

Boating use will be monitored in the northern 3 kilometres of the estuary. If necessary mechanisms will be sought to close these waters to protect the mud flats.

An administrative procedure will be established between relevant agencies for the approval of special aquatic events. This will ensure that environmental concerns are adequately assessed.

FISHERY MANAGEMENT

PRIMARY OBJECTIVE 6

> Manage the fish resources of the waterways for the benefit of the community.

Fishing

There will be close liaison with the Department of Fisheries regarding the establishment of aquaculture proposals, policies pertaining to professional and recreational fishing, protection of shallow areas and education programmes.

LIAISON AND CO-ORDINATION

PRIMARY OBJECTIVE 7

> Ensure local government and public participation in planning and management of waterways and foreshores.

Community Involvement

Community representation on the Authority will be maintained. Members will be sought from a cross section of individuals and interest groups.

Community involvement will be encouraged in the preparation and review of plans and programmes.

A close working relationship will be established with interested community groups.

MANAGEMENT

PRIMARY OBJECTIVE 8

> Ensure that a legislative base and appropriately funded body exist to achieve the primary objectives of the management.

Management Area Boundaries

The management area will be extended to include the Ferguson and Preston Rivers. Boundaries will be established to include the coastal plain catchment.

Management and Maintenance of Foreshore Reserves

Agreements will be reached with local government authorities regarding foreshore reserves.

Options for the leaseback of some foreshore areas will be examined.

Development Approval and Implementation

An administrative arrangement will be established between agencies to ensure that conditions of approval for developments are carried out.

Review and Amendment of the Management Programme

The programme will be reviewed after seven years. Administrative Procedures and Policies will be separate from the programme (See Appendices 1 and 2) and will be modified by consultation with affected parties.

RECOMMENDATIONS

All recommendations are listed in numerical order. Chapter 4 General Recommendations are listed first and numbered from 1 to 155 inclusive. Chapter 5 Area Recommendations are numbered from A1 to A39.

GENERAL RECOMMENDATIONS

LAND USE AND WATERWAY PLANNING

Regional and Local Planning

1) Ensure that the Leschenault Waterways Management Programme be complementary to the Bunbury Region Plan (*LIMA*, DPUD).

2) Identify required nodes and linear parks along the foreshores which could ultimately be incorporated into the Region Plan (*LIMA*, DPUD, LGAs).

3) Support DPUD in its desire to provide a statutory and financial framework for ongoing implementation of the Bunbury Region Plan (*DPUD*, LIMA, LGAs).

4) Liaise with local government and DPUD to develop a Regional Open Space plan for the waterway. LIMA should use the Bunbury Region Plan as a means of identifying required recreation areas to accommodate future population growth (*DPUD*, LGAs, LIMA).

5) Develop a system to ensure that LIMA is consulted by DPUD on proposed amendments to the Bunbury Region Plan affecting the waterways (*LIMA*, DPUD).

6) Liaise with local government authorities to promote integration of environmental considerations within the various town planning schemes affecting the management area (*LIMA*, LGAs).

7) Provide comment when town planning schemes and rural strategies become available for review (*LIMA*, LGAs).

8) Encourage the incorporation of policies for foreshores or waterways into local authority town planning schemes, thus giving them a statutory basis (*LGAs*, LIMA, DPUD).

Foreshore Reserves

9) Implement the Waterways Commission Foreshore Management Policy (*LIMA*).

10) Determine the need and priorities for establishment of foreshore reserves (*LIMA*, DPUD, LGA).

11) Ensure that land taken as a condition of subdivision serves a useful function. Criteria for determining width and shape of foreshore reserves should include (*LIMA*):

- future land use
- conservation of natural ecosystems
- educational value
- recreation links including linear parks
- the flood plains
- heritage values
- landscape conservation
- management access
- public access
- local and regional significance
- erosion and accretion processes
- climate change
- wildlife corridors
- fire management

12) Require that all proposed foreshore reserves are pegged and inspected before approval is given (*DPUD*, LIMA).

13) Examine alternatives to acquisition for land adjacent to the waterway within rural areas (*LIMA*, DPUD, LGAs).

14) Investigate the feasibility of entering into agreements with private landowners to ensure the right of public access, while protecting the rights of landowners, and achieving satisfactory public liability arrangements (*LIMA*, DPUD, LGAs).

Commercial Development

15) Identify areas on the foreshore suitable for commercial developments based on the following social, environmental and physical planning criteria (*LIMA*, DPUD, LGA, SWDA):

- Availability of the essential services required by the development including water, sewerage, electricity and telephone.
- Likelihood of the development having an adverse impact on neighbouring residential areas because of noise, traffic and parking.
- Intent of the LGA town planning scheme as it relates to adjacent areas.
- Impact of the development on the amenity of the existing landscape and natural environment.
- Effect the development may have on the hydrology of the floodway and flood plain, and risk of flooding to the development.
- Every proposal for commercial development should be considered on its

individual merits. It should also be considered in context to take into account cumulative impacts.

- Impact of the development on public access to the foreshore.

16) Refer major proposals which involve over-water structures, developmental dredging, filling of the waterway or those which abut or include System 6 recommendations, to the EPA for environmental impact assessment (*LIMA*, EPA).

17) Identify areas suitable for hire and house boat activities (*LIMA*, LGA, DMH, EPA).

18) Assess developments to ensure that they are set back from the waterway where appropriate to allow space for public amenity, and to protect features of natural, scientific, visual and cultural significance (*DPUD*, LGA, LIMA).

19) Ensure that advertising development proposals are assessed by the appropriate agency or agencies (*LGA*, LIMA).

20) Ensure that advertising associated with commercial developments is assessed as part of the approval process (*LIMA*, LGA, DPUD).

Climatic Change - The Greenhouse Effect

21) Support the Government's Policy Statement on "Greenhouse-Meeting the Challenge" (*LIMA*).

22) Ensure that Water Authority advice on flooding takes into account the Greenhouse Effect (*WAWA*, LIMA).

23) Ensure that the width and shape of foreshore reserves are based on topographical features and will be sufficient if water levels rise (*LIMA*, DPUD, LGA, WAWA).

24) Ensure that facilities and structures are of suitable design or can be easily modified to accommodate rises in water level (*LIMA*).

Canal Developments

25) Ensure that proposals for canal developments which comply with "Recommendations for the Development of Canal Estates", endorsed by Cabinet, undergo adequate environmental assessment (*LIMA*).

26) Advise developers that LIMA considers that there are limited opportunities for appropriate canal developments and such developments are unlikely to be approved unless they conform rigidly with LIMA's Policy (*LIMA*, DPUD).

Water Resources

27) Ensure that proposals to upgrade or build dams, weirs or other constructions partially or totally obstructing a water course are referred to the EPA for environmental assessment. Proposals should be reviewed from a local and regional perspective. The assessment should also determine requirements for maintenance of instream flora and fauna (*EPA*, LIMA).

28) Support the Water Authority in efforts to rehabilitate water catchments and reduce salinity levels (*WAWA*, LIMA).

Transport Network and Utility Services

29) Ensure that major road developments within the management area undergo adequate environmental assessment (*DPUD*, LGA, LIMA, EPA).

30) Review proposals for minor roads taking account of their proximity to the estuary, the nature of the area, type of construction methods, impact on the hydrology of the foreshore area, stormwater discharge from the roadway, use and maintenance of catchtraps and the possibility of accidental spillage (*LGA*, DPUD, LIMA).

31) Review the feasibility of incorporating recreational facilities into bridge design when issuing licences for bridge construction (*MRD*, LIMA).

32) Plan service corridors to provide for the combined needs of utilities so that all services cross the river at fewer locations, where the impact can be minimised (*DPUD*, SECWA, MRD, WESTRAIL, WAWA, LIMA).

Industry

33) Extend the Leschenault Inlet Management Area to include that part of the Ferguson River abutting proposed industrial areas (*EPA*, LIMA).

34) Establish an administrative procedure between LIMA, WAWA and EPA to deal with licensing of industrial discharges, sampling of discharge, monitoring of conditions and review of licences (See Section 4.2.2.9) (*LIMA*, EPA, WAWA).

35) Ensure that major industries proposed in the catchment area that are likely to have an impact on the waterways undergo adequate environmental assessment (*LIMA*, EPA).

Flooding and Flood Plain Management

36) Liaise with WAWA and local government on developments within the flood plain (*LIMA*, WAWA, LGAs).

37) Identify key areas where filling of the flood plain may result in loss of important flora and fauna, ensuring that planning authorities are aware of the significance of these areas when assessing development proposals (*LIMA*).

38) Encourage the Water Authority to prepare and update flood plain management plans for the river system. These should consider factors such as flood behaviour, including risk and effects of future developments, conservation of the natural environment, social factors and planning issues (*WAWA*, LIMA).

39) Support an investigation of the need for legislative change, in conjunction with the consolidation of Water Authority Acts and amendments to other planning Acts, to ensure that suitable co-ordination exists between planning authorities and the Water Authority for sound flood plain management (*WAWA*, LIMA).

Urban Development

40) Ensure that any residential development in newly developed or undeveloped river locations has regard for (*LGA*, LIMA, DPUD):

- the nature of the foreshore, whether conservation or recreation based;
- the degree of modification to the foreshore;
- the ability of the foreshore to sustain added usage;
- the predominant characteristics of adjoining residential areas; and
- the degree of protection afforded to the foreshore, particularly to conservation areas.

41) Assess proposed residential developments in riverside locations with due regard for the foreshore. Aspects to be considered include siting of buildings, scale and the shape and form of the development (height, bulk, colour and choice of materials, landscaping, earthworks, etc.) (*LIMA*, LGA, DPUD).

CONSERVATION AND ENVIRONMENTAL PROTECTION

Conservation Areas

42) Evaluate fringing wetlands for establishment and vesting as reserves for the conservation of flora and fauna or the protection of the environment. The evaluation should include detailed assessment of the flora and fauna, permitted uses, definition of boundaries and adjacent land uses (*LIMA*, CALM, DOLA, LGAs).

43) Reserve the following areas for the conservation of flora and fauna and protection of the environment (*DOLA*, LIMA, CALM, LGAs):

- The northern estuary above Waterloo Head.
- Vittoria Bay (Turkey Point to Pelican Point, including the Preston River mouth).
- The Leschenault Inlet affected by System 6 Recommendation C68.

Amend the Land Act 1933 to allow for the reservation of land below low water mark for the conservation of flora and fauna and protection of the environment and identify the appropriate management agencies for vesting.

44) Prepare and release for public comment management plans for all areas reserved for the purpose of conservation of flora and fauna and protection of the environment, giving particular consideration to the following aspects where appropriate (*CALM*, LGA, LIMA):

- Commercial and amateur fishing and crabbing.
- Boating activities.
- Other recreational activities adjacent to and in various parts of the reserve.

45) Develop management agreements with private landowners for the protection of wetlands and fringing vegetation on private property (*LIMA*, LGAs).

46) Ensure that development and activities on the foreshore involve the maintenance and restoration of native vegetation and natural landforms (*LIMA*, DPUD, LGA).

47) Prepare a strategy for rehabilitation of the foreshore and waterways margins covering issues such as: (*LIMA*, CALM, LGAs)

- identification of fringing vegetation;
- controlled eradication of declared plants and animals;
- current ownership and management;
- work to protect and rehabilitate areas of vegetation; and
- research to determine effective techniques for rehabilitating degraded fringing vegetation, weed control, use of biological filters on proposed drainage systems and encouragement of community groups to become involved with rehabilitation of foreshore areas.

WATER QUALITY

Water Quality Monitoring

48) Assess the data from the five year monitoring programme with the view to developing a management plan to reduce nutrient inputs if necessary (*WWC*, LIMA, EPA, LICMG, SWDA).

49) Determine an on-going monitoring programme based on the results of the five year study (*LIMA*, WWC).

Integrated Catchment Management

50) Develop a regional catchment and waste disposal management strategy. The strategy should cover all issues affecting water quality including the development of fertiliser and soil management practices as well as industrial waste disposal both in the catchment and to the waterways (*LICMG*, LIMA, WWC).

Algal Growth and Water Quality

51) Monitor sediments in the inner and outer harbour adjacent to woodchip loading areas for toxic dinoflagellate cysts during the summer period (*LIMA*, BPA).

52) Support moves to control the quality of ballast water discharge in all WA ports(*LIMA*, DMH, BPA).

53) Ensure that macrophyte biomass sampling coincides with the appearance of macrophyte blooms (*LIMA*).

54) Monitor macrophyte and phytoplankton blooms in the waterways to provide base line data on their occurrence (*LIMA*).

Heavy Metals and Air-Conditioning Bleed Off

55) Determine the need for an investigation of heavy metal discharges into the Leschenault Inlet based on the results of the Swan River Study (*LIMA*, WWC, SRT).

Stormwater Disposal

56) Develop a co-ordinated policy on stormwater disposal within the management area and encourage local government to reduce stormwater outlets in accordance with this policy. (*LIMA*, LGA, DPUD)

57) Ensure that urban development proposals minimise nutrient and stormwater input to the waterways (*LIMA*, LGA, DPUD).

58) Encourage landowners and local authorities to minimise fertiliser use on gardens and parklands (*LIMA*).

Pesticides

59) Endorse the recommendation that a survey of pesticide levels in the Preston River be undertaken in 1992 to assess the success of deregistration of organochlorine pesticides for agricultural use in July 1987 (*LIMA*).

60) Monitor changing land use practices in the catchment for possible increased or decreased sources of pesticides (*LIMA*, DOA).

61) Liaise with the Department of Agriculture on recommended uses of pesticides in agriculture and horticulture (*LIMA*, DOA).

Emergency Procedures

62) Endorse the contingency plan for combating pollution of the waterways. Plans to be updated and modified as required (*LIMA*, DMH, BPA, SES, WAFB, BP OIL, EPA, LGA).

63) Ensure that management agencies have adequate equipment to control chemical and oil spills in the waterway and that staff are adequately trained (*LIMA*, DMH, BPA, SES, WAFB, BP OIL, EPA, LGA).

64) Assess development proposals to ensure that potential problems from accidental spillage are minimised (*LIMA*, DPUD, LGA).

Sewage Disposal

65) Encourage the Water Authority to provide infill sewerage to unsewered areas likely to be contributing to nutrient loading to the estuary (*WAWA*, LIMA).

66) Ensure that all new subdivisions smaller than 1 hectare are sewered, or incorporate the technologies to reduce nutrient leachate entering the groundwater. The latter should only be endorsed when sewering is not economically feasible (*WAWA*, LIMA, DPUD).

67) Assess proposals for new sewage treatment plants and monitor existing sewage treatment plants in the catchment area to minimise leaching to waterways (*EPA*, LIMA, WAWA).

68) Review the impact of hobby farm subdivisions as part of the catchment management programme proposed in Recommendation 50 and the review review of local government rural strategies (Recommendation 7) (*LIMA*).

Industrial Discharge

69) Develop an administrative arrangement between EPA, WAWA and LIMA regarding the issuing of industrial licences and monitoring of conditions. The arrangement should address (*LIMA*, WAWA, EPA, LGAs):

- review of existing licences;
- monitoring of conditions and referral of data;
- policy on establishment of new licences; and
- issuing of Pollution Abatement Notices and Pollution Abatement Directions.

Underground Storage Tanks

70) Liaise with the EPA and Department of Mines on the development of an Environmental Protection Policy addressing the issue of underground storage facilities (*EPA*, LIMA, DOM).

71) Monitor areas where leakage from underground storage facilities is possible (*LIMA*).

Erosion Control

72) Develop a long term tree planting programme integrating with management plans for foreshore areas (*LIMA*, LGA).

73) Identify and monitor areas of the river at risk from erosion and implement a long term erosion control programme. Control measures should include (*LIMA*):

- Foreshore stabilisation with native vegetation, particularly species endemic to the area.
- Tree planting adjacent to the waterway.
- Encouragement to provide access at nodes and discouragement of access to erosion prone areas.
- Beach renourishment, walling, groynes, flow redirection, use of baffle boards to dissipate wave action.
- Modification to recreational activities in very serious erosion areas.

74) Provide information to private landowners to encourage appropriate methods of erosion control (*LIMA*).

75) Encourage landowners to fence foreshore areas to restrict stock access and damage to foreshore bed and banks. Provision should still be made for access to the waterway for stock watering (LIMA, Landowners, LGAs).

Dredging

76) Modify the Dredging Guidelines prepared by the EPA for the Swan River so they address the issue of dredging of waterways on a Statewide basis. Implement the guidelines as an Environmental Protection Policy under the Environmental Protection Act 1986 (*EPA*, LIMA, SRT).

77) Use the LIMA policy on dredging in the interim until the EPA policy has been developed (*LIMA*).

Mosquitoes

78) Support the Mosquito Control Advisory Committee in its effort to develop a regional mosquito strategy which improves control methods and reduces environmental impact. This should include a review of mosquito control methods used Australia-wide and overseas (*MCAC*, LIMA).

79) Develop a policy detailing State and local government responsibilities for mosquito control (*MCAC*, LIMA).

80) Provide advice to LGAs and DPUD on rezoning and development applications ensuring that such proposals are not in close proximity to mosquito breeding areas (*LIMA*).

Landscape Protection

81) Determine a suitable means of land use control which enables the character of rural areas to be maintained while avoiding the necessity for public authorities to purchase land (*LIMA*, DPUD, LGA, DOLA).

82) Encourage local government authorities to protect high valued landscapes through town planning schemes, particularly in rural areas where much of the foreshore remains in private ownership (*LGA*, LIMA).

83) Prepare an overall landscape plan in consultation with local government and the SWDA for incorporation into the proposed South West Landscape Restoration Masterplan. Encourage individual landowners to participate in the scheme (*LIMA*, LGA, SWDA).

84) Develop site design criteria and development guidelines for recreation nodes (*LIMA*, LGA).

85) Ensure landscape proposals within the floodway comply with WAWA's guidelines (*LIMA*, WAWA).

Scientific Research and Education

86) Establish a sub-committee of LIMA to oversee approval and co-ordination of research programmes undertaken on the waterways (*LIMA*).

87) Establish research programmes in consultation with the Waterways Commission to meet the management requirements of LIMA (*LIMA*, WWC).

88) Identify areas for scientific research (*LIMA*).

Fire Management

89) Prohibit lighting of fires on the foreshore except in properly constructed fire places in accordance with Section 25 (1a) (1b) and (1c) of the Bush Fires Act (*LGA*, LIMA).

90) Develop a public education programme informing people about the danger of fire in the area, and the responsibilities of people in relation to the lighting of fires (*LIMA*).

91) Develop roads, tracks, carparks and dual-use paths as fire breaks and determine the appropriate location of fire breaks when locating such facilities (*LIMA*, LGA).

92) Encourage Councils to develop their fire fighting capacity by obtaining and upgrading equipment (*LIMA*, LGA).

93) Develop a fire management plan for the Leschenault Estuary, Inlet and tributaries in co-operation with the Bush Fires Board, local government and landowners. This should address the issue of controlled burns and loss of landscape quality (*LIMA*, LGA, BFB).

Heritage and Cultural Sites

94) Consult with the Department of Aboriginal Sites, WA Museum, and other community groups and individuals, on management and development plans to ensure Aboriginal sites are not inadvertently disturbed (*LIMA*, WAM).

95) Incorporate historic sites into management plans to provide a recreation and tourism attraction (*LIMA*, WAM, HCWA, NT).

RECREATION AND TOURISM

Recreation

96) Monitor trends in recreational use and participation through survey, observation and public consultation to determine requirements for future recreation facilities and opportunities, and environmental and user conflict (*LIMA*).

97) Liaise with managers of other recreational areas regarding proposed developments, undertaking joint management and development plans where appropriate (*LIMA*, LGA, CALM).

98) Develop management plans for recreation nodes in consultation with local government and other affected parties. Incorporate a works development programme into the plan outlining implementation and funding of facilities on a five year basis (*LIMA*, LGA).

99) Encourage activities compatible with the protection and conservation of the Leschenault waterways (*LIMA*).

100) Encourage developers in accordance with the 'Foreshore Management Policy' to contribute towards the cost of development and maintenance of adjacent foreshore areas (*LIMA*).

101) Assess subdivision developments to ensure that adequate public open space is provided as well as foreshore reserves (*DPUD*, LIMA, LGA).

Tourism

102) Encourage tourist promoters and marketers to include information on 'How to Care for Our Waterways' as part of promotional brochures (*LIMA*, WATC).

103) Develop a close working relationship with the WA Tourism Commission and South West Development Authority to ensure that possible environmental and use conflict problems associated with tourist developments are addressed during the early stages of a project (*LIMA*, WATC, SWDA).

104) Identify areas suitable for tourist development and develop environmental guidelines for such developments addressing issues of scale, height, density, pollution etc. (*LIMA*, DPUD, SWDA, LGA).

105) Ensure that tourist developers and operators contribute to on-going management of the waterways and foreshores and that maintenance will not become a financial burden to government or local government bodies (*LIMA*, Proponent).

Boating Activities and Facilities

106) Encourage the development of ocean boating facilities and maintenance of existing boating areas outside the estuary (*DMH*, LIMA).

107) Ensure that public access along the foreshore of marinas/boat haven facilities is provided and that the public is not discouraged from using that access (*DPUD*, LGA, LIMA).

108) Restrict new boat ramps and navigation channels in upstream areas of the Collie River and the northern estuary where boating opportunities are limited (*DMH*, LIMA).

109) Ensure that marina, jetty, boat ramp and boat haven facilities are only located in areas that (*EPA*, LIMA, LGAs):

- Require only minor site modifications so that maintenance works that may generate compounding environmental problems are not required.
- Do not impinge on sensitive environmental areas.
- Do not impinge on other legitimate competing uses.

Refer significant developments to EPA for environmental assessment where necessary.

110) Ensure that boating facilities are designed to blend in with the surrounding environment (*DMH*, LIMA, LGA).

111) Liaise with DMH on issues of boating education (*DMH*, LIMA).

112) Monitor rowing use on the Inlet once the Wellington Dam facility is operational (*LIMA*).

113) Promote the northern estuary as a 'no boating' area monitoring the success of the programme (*LIMA*, DMH).

114) Ensure that provision and condition of boat ramps, navigation channels and carparking are addressed in management plans for recreation areas. Examine the desirability of temporary parking areas during peak periods and jetties to ensure efficient use of ramps (*LIMA*, LGA, DMH).

115) Liaise with SWDA and CALM on the redevelopment of the Collie Gorge area to ensure provision of suitable canoeing and raft launching areas (*CALM*, SWDA, LIMA).

116) Request DMH to regulate the use of jetskis and any fast powerboats on the waterways particularly in relation to noise, speeding, erosion and disturbance of the river bed and conflict with other users (*DMH*, LIMA).

117) Monitor windsurfing use on the waterways with the view to providing a separate launch site for these craft to avoid conflict with other users and protect foreshore vegetation (*LIMA*).

Public Access

118) Liaise with DPUD on the feasibility of developing agreements with private landowners to ensure the right of public access, while protecting the rights of landowners, and achieving satisfactory public liability arrangements (See Recommendation 14) (*DPUD*, LIMA).

119) Restrict public access in environmentally sensitive wetlands and other conservation areas according to management plans developed for these areas (*LIMA*, CALM, LGA).

120) Liaise with local government and Bikewest regarding the development of dual-use paths around the waterways (*LIMA*, LGA, Bikewest).

121) Design dual-use paths on the foreshore in accordance with the "Environmental Guidelines for Dual-Use Paths" ensuring they (*LGA*, Bikewest, LIMA):

- Are set back from the water's edge where possible.
- Avoid environmentally sensitive areas.
- Avoid unsuitable topography where construction costs are high.
- Avoid existing and planned foreshore developments.
- Avoid isolating areas of the foreshore from adjacent parklands.
- Avoid destruction of native vegetation.
- Detour away from the foreshore to other areas of scenic, historic or scientific interest.

122) Ensure that the boundary between private property and the foreshore reserve is clearly defined. Development of private property should not intrude onto the foreshore reserve, or discourage public access or use (*LIMA*, LGA, DPUD).

123) Promote the development of Heritage Trails in scenic and historic areas, so as to develop an awareness of the natural and cultural heritage of the waterways, and improve access to them (*HCWA*, LIMA).

124) Design foreshore areas and facilities to provide access for the disabled (*LIMA*, LGA, DPUD).

125) Monitor problems of public access to the foreshore and develop, in association with local government, strategies to manage problems (*LIMA*, LGA, DPUD).

NAVIGATION AND BOATING SAFETY

Boating Control

126) Liaise with DMH on the gazettal of special use areas having regard for (*DMH*, LIMA):

- Boating safety.
- Recreational use.

- Impact on the foreshore including vegetation bank stability.
- Compatibility with the overall plan for the area.

127) Monitor boating use of the northern estuary and liaise with DMH on closure of these waters to boating if necessary to protect the environment (See Recommendation 43) (*LIMA*, DMH).

128) Liaise with DMH regarding navigation and boating control measures and encourage environmental information to be incorporated into DMH boating guides (*LIMA*, DMH).

129) Incorporate boating regulation information into LIMA public information brochures (*LIMA*).

Special Events

130) Establish an administrative procedure with DMH, Port of Bunbury, local government and LIMA for the assessment of aquatic events on the waterways. Develop guidelines for establishing conditions of approval. Ensure that organisers of events are aware of their responsibility to ensure that events are conducted within conditions of approval, particularly environmental conditions (*LIMA*, DMH, BPA, LGA).

LIAISON AND CO-ORDINATION

Community Involvement

131) Retain community representation on LIMA, advertising locally for community representatives from individuals and interest groups (*LIMA*).

132) Consult with the community during preparation of plans and programmes in addition to calling for submissions on the draft documents (*LIMA*).

133) Develop and maintain a list of community groups and individuals who wish to be involved with the preparation and implementation of plans and programmes (*LIMA*).

State and Local Representation

134) Retain local government representatives on LIMA selected from the authorities within the management area (*WWC*, LIMA).

135) Ensure that government agencies are represented on LIMA or seconded for committees of LIMA (*LIMA*).

Administrative Procedures

136) Develop a streamlined referral and approval procedure with local and State government bodies. These referral procedures should appear as appendices to the management programme and be updated as required (*LIMA*).

FISHERY MANAGEMENT

Fishing

137) Liaise with Fisheries on aquaculture proposals to assess the impact on the estuary including the potential impact on other recreational uses (*LIMA*, DOF).

138) Liaise with Fisheries on policy preparation for management of the professional and recreational fishery (*LIMA*, DOF).

139) Provide and encourage where appropriate the development of jetties and other facilities for fishing (*LIMA*, DOF, LGAs).

140) Protect the shallow areas and other fish habitats of the waterways as nursery and breeding grounds for fish (*LIMA*, DOF, CALM).

141) Combine with Fisheries to develop education programmes on conservation of the fishery resource (*DOF*, LIMA).

PUBLIC EDUCATION

Education Programmes

142) Implement public education and interpretative programmes which promote awareness, appreciation, understanding and active concern for the natural and cultural values of the waterways environment. These programmes should be designed to involve active public participation (*LIMA*).

143) Combine education programmes with other agencies. Incorporate waterway management philosophies into material of other agencies where appropriate (*LIMA*, DMH, DOF, CALM, LGAs).

144) Consider the release of media statements on specific issues which arise on a seasonal or regular basis (*LIMA*).

MANAGEMENT

Management Area Boundaries

145) Extend the LIMA management area to include the Ferguson and Preston Rivers in consultation with EPA and SWDA. All boundaries should be determined on a catchment management basis (*LIMA*, EPA, SWDA, LGAs).

Management and Maintenance of Foreshore Reserves

146) Adopt the criteria detailing funding for management and maintenance of foreshore reserves (*LIMA*).

147) Develop a works programme for new and upgraded foreshore reserves outlining responsibility for works and a time schedule for implementation (*LIMA*, DPUD, DOLA, LGA).

148) Develop an administrative arrangement between LIMA, DPUD, DOLA and local government for the lease back of foreshore reserves subject to conditions of use. (*LIMA*, DPUD, DOLA, LGAs)

Staff and Finance

149) Develop a more diversified staff structure at LIMA to ensure effective waterways management (*WWC*, LIMA).

Development Approval Implementation

150) Develop an administrative procedure between local government and government agencies to ensure that conditions of approval are implemented to specifications (*LIMA*, LGA, DPUD).

151) Ensure that construction and works staff carrying out works on or abutting the foreshore are made aware of the sensitive nature of the work. Wherever possible foreshore reserves should be pegged and staff made aware that works should not intrude into this area (*LIMA*, LGA, DPUD).

Review and Amendment of the Management Programme

152) Consult with affected persons and agencies regarding proposed amendments to the management programme. Wherever possible this should be by personal correspondence as well as advertising in local papers (*LIMA*).

153) Monitor use of the waterways for problems and issues not addressed in the management programme and amend the programme if required (*LIMA*).

154) Review the complete management programme after seven years (*LIMA*).

155) Policies and administrative arrangements to be listed separately from the management programme allowing a more flexible approach to modification and amendment (*LIMA*).

AREA RECOMMENDATIONS

AREA 1 - LESCHENAULT INLET

A1) Support the implementation of the Bunbury Harbour City plan encouraging early completion of the Anglesea Island and associated waters component of the plan (*SWDA*, LIMA).

A2) Develop a joint policy on transfer, renewal and construction of jetties in the Inlet with Bunbury Port Authority and LIMA (*LIMA*, BPA, DMH).

A3) Encourage the develop of a management plan for Anglesea Island and associated areas focusing on conservation of the waterbird habitat and mud-flats, mosquito control and public access to the area (NB if vesting remains with the City of Bunbury DOLA to require plan as a condition of vesting) (*EPA*, BCC, CALM, DOLA, LIMA).

AREA 2 - LESCHENAULT PENINSULA AND NORTHERN ESTUARY

A4) Liaise with CALM on the development of a management plan for the Peninsula ensuring it is complementary to the Leschenault Waterways Management Programme (*CALM*, LIMA).

A5) Amend System 6 Recommendation C66 to include the southern part of the estuary and implement the general recommendations (*EPA*, LIMA).

A6) Ensure mosquito control is in accordance with the Mosquito Control Advisory Committee recommednations (*MCAC*, LIMA, LGAs).

A7) Monitor nutrient levels in Parkfield Drain. Encourage changes in land use and land use practices in order to reduce nutrient levels in the drain (*LIMA*, LICMG).

AREA 3 - EASTERN FORESHORE

A8) Maintain the policy of reducing boat channels to a maximum of eight (*LIMA*).

A9) Restrict unauthorised boat launching (*LIMA*).

A10) Develop a co-ordinated landscape plan for the area to: (*LIMA*, LGAs)

- Stabilise foreshore erosion;
- Provide scenic views across the estuary;
- Minimise bush fires; and
- Restrict public access and boat launching.

A11) Upgrade Christina Place Reserve (*LIMA*, HSC).

A12) Ensure that Cathedral Avenue does not become a major road as a result of subdivision in the vicinity (*DPUD*, HSC, LIMA).

A13) Develop a management plan for the Cathedral Avenue area and eastern escarpment addressing issues including nutrient input and landscape protection (*LIMA*, HSC).

AREA 4 - VITTORIA BAY

A14) Develop a recreation plan for the Cut area taking into account the proposed facility on the southern tip of the Peninsula (*LIMA*, SECWA, BCC, HSC)

A15) Develop a foreshore plan for Vittoria Bay covering the area from Preston River mouth to Pelican Point (*LIMA*, BCC, BPA).

A16) Amend the System 6 boundary in the area to include the waters of Vittoria Bay (*LIMA*, EPA).

A17) Restrict the expansion of existing fly ash pond areas adjacent to the foreshore (*LIMA*, EPA).

AREA 5 - LOWER COLLIE

A18) Develop guidelines for the redevelopment of the Shoalhaven boat ramp area ensuring that there is adequate provision for boat ramps, parking and a public recreation area (*LIMA*, BCC).

A19) Develop a continuous foreshore walkway (*LIMA*, BCC).

A20) Undertake foreshore erosion works (*LIMA*, LGAs).

A21) Establish fishing facilities to discourage indiscriminate access to the foreshore (*LIMA*, LGAs).

A22) Establish foreshore reserves as subdivision occurs in upstream areas (*DPUD*, LGA, LIMA).

A23) Implement System 6 Recommendation C67 (*LIMA*, EPA, LGAs).

AREA 6 - BRUNSWICK RIVER AND TRIBUTARIES

A24) Ensure developments at Kemerton Industrial Park are environmentally acceptable to the health of the estuary (*EPA*, LIMA).

A25) Monitor land uses to determine potential nutrient loading changes to the waterways (*LIMA*, LICMG, DOA).

A26) Develop foreshore reserves along the Brunswick River as a condition of subdivision including the townsite of Brunswick Junction (*LIMA*, LGA).

A27) Implement System 6 Recommendation C67 (*LIMA*, EPA, LGAs).

AREA 7 - MID COLLIE

A28) Restrict stock access to the river to reduce erosion, localised eutrophication and loss of vegetation (*LIMA*, HSC, DSC).

A29) Develop a joint fire management plan with local government, LIMA and landowners (*LIMA*, HSC, DSC, Eaton and Australind Fire Brigades).

A30) Enter into agreement with landowners to provide public or statutory access where appropriate (*LIMA*, DOLA, HSC).

AREA 8 - COLLIE GORGE

A31) Implement System 6 Recommendation C87 (*CALM*, LIMA).

A32) Liaise with the Wellington Dam Planning Committee on the development of the gorge area and Wellington Dam. Ensure that the plan for the gorge addresses issues of: (*CALM*, SWDA, LIMA)

- camping;
- rehabilitation;
- public access to the foreshore;
- a safe and attractive scenic road;
- recreation nodes; and
- suitable effluent disposal facilities.

AREA 9 - THE FERGUSON

A33) Extend the LIMA management area to include Ferguson River in accordance with Recommendation 145 (*EPA*, LIMA).

A34) Monitor industrial land use in the area (*LIMA*, EPA).

A35) Revegetate foreshore areas adjacent to industrial areas (*LIMA*, DSC).

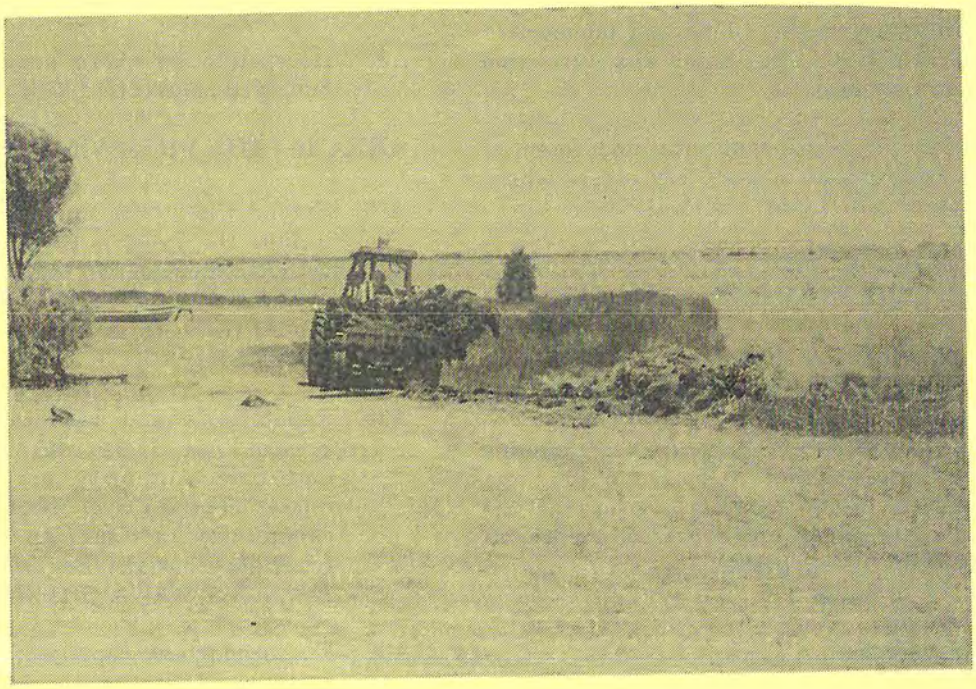
AREA 10 - THE PRESTON RIVER

A36) Extend the LIMA management area to include the Preston River in accordance with Recommendation 145 (*EPA*, LIMA).

A37) Protect the delta as a bird feeding habitat (*LIMA*, BPA).

A38) Rehabilitate and landscape the lower Preston River. Liaise with Water Authority and Port Authority on flooding and relocation of the river mouth. Encourage community groups to assist with rehabilitation works (See Recommendation 133) (*LIMA*, WAWA, BPA, BCC).

A39) Encourage landscaping of the river to provide a focus for the communities of Donnybrook and Boyanup (*LIMA*, LGAs).



Removal of algae and rubbish is required along foreshore areas.

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

The Leschenault Inlet Management Authority (LIMA) is required under Section 35 of the Waterways Conservation Act 1976, as amended, to prepare a management programme for the management area under its control. It is also required to keep the management programme under review (Section 35(5)). LIMA is bound to ensure that its decisions and advice are consistent with the programme.

The first management programme was gazetted in 1983. In 1990 it was reviewed to bring it up to date with the current issues facing the Leschenault waterways. This review was released for public comment. A total of 17 submissions were received. As a consequence 43 recommendations have been amended and the 'Need for Action' amended in 22 locations. Seven new recommendations have also been added. Readers are referred to the report 'Leschenault Inlet Management Programme Review 1990 - Summary of Submissions' for a more detailed assessment of public submissions.

In addition to the management programme the Authority has developed a number of policies and administrative arrangements on specific issues and locations. These appear in Appendix 1 and 2 respectively.

1.1.1 Nomenclature

The Department of Land Administration (Nomenclature Division) has advised that due to the man-made alteration to the previously termed Leschenault Inlet the small water body abutting Bunbury centre is to be known as Leschenault Inlet and the main water body is known as the Leschenault Estuary. This terminology is used consistently throughout this document.

1.2 MANAGEMENT RESPONSIBILITIES

1.2.1 History of Management of the Leschenault Inlet

In 1965 the Bunbury and Districts Water Advisory Committee was formed by the local authorities of Bunbury, Dardanup and Harvey. Its area of concern was the preservation of the purity of the waters of the Leschenault Estuary and the improvement of its foreshores.

The Committee was only advisory and its success depended on the co-operation of the three local authorities. It was visualised at its inception that the Advisory Committee would eventually lead to a statutory authority responsible for management of the waterways.

It was considered that as the Departments of Local Government and Town Planning were so directly involved, the Committee should report to the Hon. Minister for Local Government and Town Planning who had agreed to liaise between the Committee and the Government.

The objectives and functions of the Committee were:

- To co-ordinate the efforts of the three local authorities to:

  i) Maintain the purity of the waters of the estuary and rivers flowing into it; and

  ii) Maintain the cleanliness of the foreshores, and plan for beautification and public usage.

- To advise local authorities on the effect which any development or subdivisional proposals, industrial projects, road construction etc. might have on the purity or use of the waters.

- Of its own volition and on its own responsibility to consider and make suggestions to the appropriate local authority or government departments as to what improvements might be effected to the waters and foreshores within the respective jurisdictions.

For the Committee to operate successfully it was necessary for each local authority or government department to refer to the Committee for advice, any proposal affecting or likely to affect the purity or use of the waters or foreshores.

Aspects of particular concern were the development of recreation areas, and building permits on the water front or where effluents or drainage waters were likely to enter the estuary or rivers.

This Committee continued to function until 1977 when the Waterways Conservation Act was proclaimed. The Act was designed to consolidate and expand the functions previously carried out by the Advisory Committee.

1.2.2 Waterways Conservation Act 1976, Amended

The Waterways Conservation Act was proclaimed on 21 July 1977 resulting in the formation of the Waterways Commission and Leschenault Inlet Management Authority.

1.2.3 The Waterways Commission

The Waterways Commission (WWC) is responsible for the administration of the Waterways Conservation Act 1976-1982. Under this Act its broad role is to:

- Conserve the rivers, inlets and estuaries and advise the Environmental Protection Authority (EPA).
- Preserve and enhance the quality of the environment and amenity of the waters and associated land.
- Control and wherever practicable prevent any act or omission which causes or is capable of causing pollution to the waters or land.
- Provide advice and disseminate knowledge on the conservation and good management of rivers, inlets, and estuaries and associated land.
- Consult, act and make arrangements and agreements wherever practicable with persons or agencies affected by the Waterways Conservation Act, while having regard to the interests of navigation, fisheries, agriculture, water supply, drainage, recreation and leisure time occupation for the benefit of the public, natural beauty and amenity of the area, the preservation of public rights and the rights of persons with boathouses, jetties and other structures.

The Waterways Commission provides administrative and co-ordinating services to the management authority to assist it in:

- The conservation and management of waters and associated land within the area so as to achieve the objectives of the Act.

The Commission may delegate to a Management Authority any of the duties or powers of the Commission in relation to the management area of that Authority.

1.2.4 The Leschenault Inlet Management Authority

The Leschenault Inlet Management Authority (LIMA) is responsible for the management of the Leschenault Inlet Management Area declared under the Waterways Conservation Act. The first meeting area of LIMA was held on 29 July 1977.

Its broad role is similar to that of the Waterways Commission but is confined to its management area. Its more specific roles include:

- Preparation of a management programme for the Leschenault Inlet Management Area.
- The day-to-day management of the river including such aspects as beach cleaning, erosion control works, water quality sampling.
- Liaison with local government on the management of the area.
- Establishment of facilities such as jetties, boat ramps, change rooms, toilets, recreation areas and barbecue sites, normally in conjunction with local government.
- Advising the Department of Planning and Urban Development (DPUD) and the Department of Marine and Harbours (DMH) on the impact of developments on the foreshore and river.
- Making and enforcing by-laws pursuant to the Waterways Conservation Act.
- Control of pollution and the licensing of industrial discharges under powers delegated by the EPA.

1.2.5 Membership

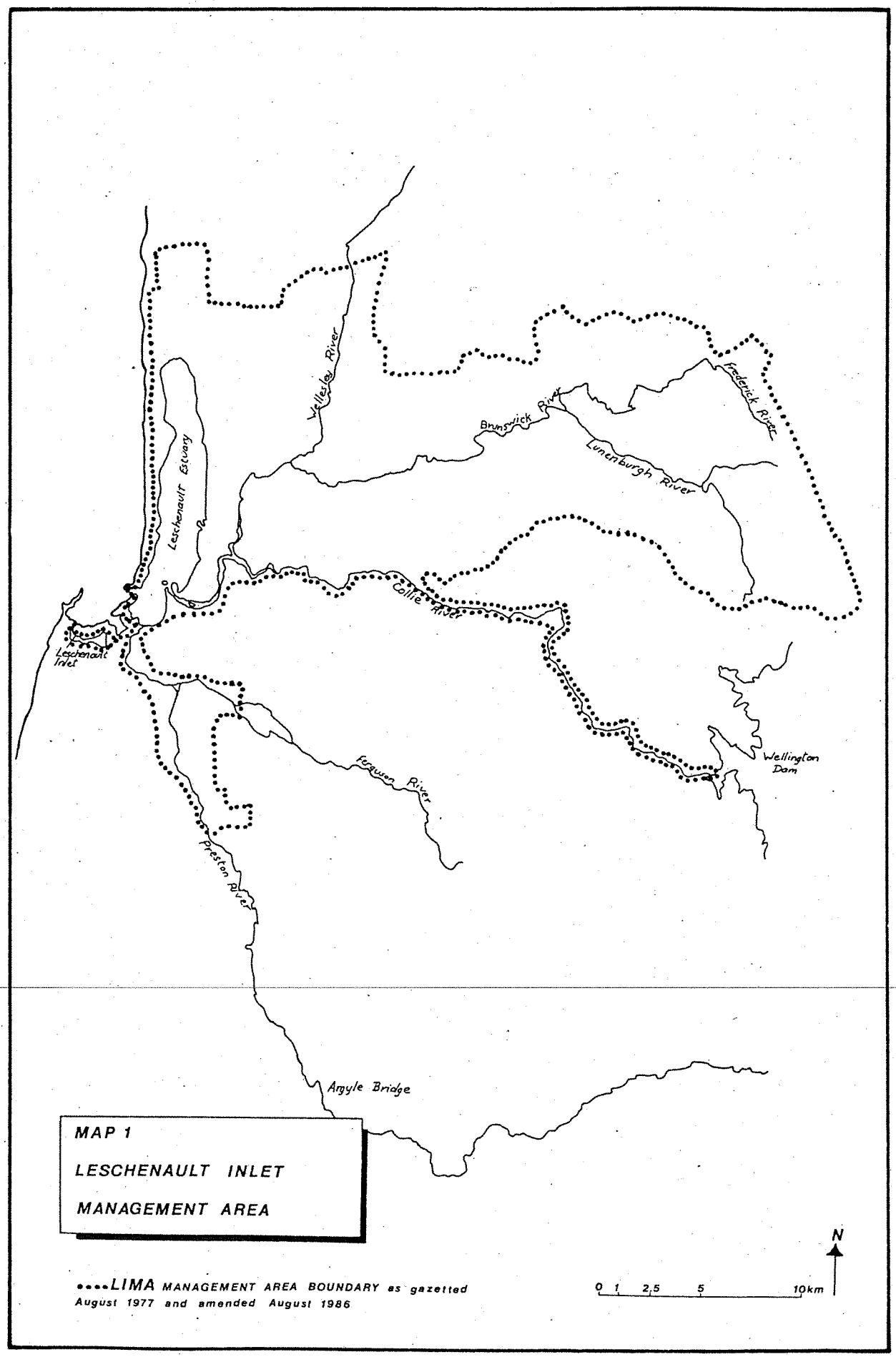
Section 14 of the Waterways Conservation Act 1976 details the membership requirements of the various management authorities established under the Act.

Members should as far as is practical be selected from persons resident in the local community or who are representatives of local government authorities, and from State government officers having responsibility for and knowledge of local issues.

Members are selected by the Minister for Waterways from a panel of nominations and are recommended for appointment by the Governor.

Each of the local government authorities in the management area must be represented on the Leschenault Management Authority. Current membership of LIMA is:

- Three local government representatives, one each from the Shires of Harvey and Dardanup and the City of Bunbury.
- Representatives of the Department of Marine and Harbours, the Bunbury Port Authority and Department of Conservation and Land Management.
- Five local community representatives having an interest in boating, fishing, conservation and other community activities.


Wellesley River
Leschenault Estuary
Brunswick River
Frederick River
Lunenburgh River
Collie River
Leschenault Inlet
Ferguson River
Preston River
Wellington Dam
Argyle Bridge
MAP 1
LESCHENAULT INLET
MANAGEMENT AREA
••••LIMA MANAGEMENT AREA BOUNDARY as gazetted August 1977 and amended August 1986
N
0 1 2,5 5 10km

- One Chairman selected from the community.

Membership of the Authority is for a three year term.

1.2.6 Management Area

The Leschenault Inlet Management Area was gazetted on 10 August 1977 and defined as the waters and associated land within the boundaries shown marked in red on Leschenault Inlet Management Authority Plans 1 to 27 (both inclusive) held at the offices of the Leschenault Inlet Management Authority.

Essentially the management area included the waters and associated land of the Leschenault Inlet and Estuary, the Collie River to the Wellington Dam, the Brunswick River to its confluence with the Wellesley River and the Preston River to Dardanup Road.

On 18 August 1986 the management area was extended to include most of the Brunswick, Lunenburgh and Wellesley Rivers and their catchments. The management area is marked on Map 1.

1.2.7 Staffing

On its establishment the Leschenault Inlet Management Authority was assisted by the administrative officer and secretarial staff of the Waterways Commission. A part-time inspector was appointed in 1978.

Currently one full-time inspector carries out all supervision and inspection tasks for LIMA, assisted by casual labour and a full-time secretarial service.

Waterways Commission officers provide assistance to LIMA in the disciplines of corporate services, engineering, scientific services and planning and management. Figure 1 indicates the staff structure .

1.2.8 Role of Other Bodies

A number of other agencies are responsible for various aspects of planning and management for the waterways and catchments within the Leschenault Inlet Management Area.

Local government has considerable local planning powers. The Department of Marine and Harbours (DMH) and LIMA have power to approve and license certain types of development.

Management responsibilities for the river are spread across LIMA, local government,Department of Conservation and Land Management (CALM), DMH, Water Authority of Western Australia (WAWA), the Department of Fisheries, as well as the Department of Planning and Urban Development (DPUD). Some of these agencies also have a planning role.

Agencies with broad or multi-purpose roles affecting the river are listed below.

The main function of the *Department of Planning and Urban Development* (DPUD) is :

- To co-ordinate and promote urban, rural and regional land use planning and land development in the State.

- To prepare a planning strategy for the State as a basis for co-ordinating and promoting regional land use planning and development.

- To provide advice and assistance on land use planning and development.

The primary objective of DPUD in planning for the Bunbury Region is to ensure that land use and development on and adjacent to the river maintains or enhances the quality of the river environment for the use and enjoyment of current and future generations.

There are two major Acts controlling planning in the Bunbury Region:

- The State Planning Commission Act 1985.

- The Town Planning and Development Act 1928.

Subordinate legislation includes regulations dealing with such matters as the procedure for appeals, the making and amending of town planning schemes.

With specific reference to the Leschenault area DPUD's role is to:

- Control the subdivision and development of land.

- Promote and provide for the appropriate use and zoning of land.

- Ensure public access to and around the waterways.

- Promote and review, as required, the Bunbury Region Plan.

- Ensure compatibility of any proposed development with the waterway environment.

- Minimise the environmental impact of the development.

Local Government Authorities (LGA) are responsible for local planning and development control, provision of recreation facilities, and management and maintenance of foreshore reserves.

WATERWAYS COMMISSION AND SWAN RIVER TRUST

ORGANISATIONAL STRUCTURE

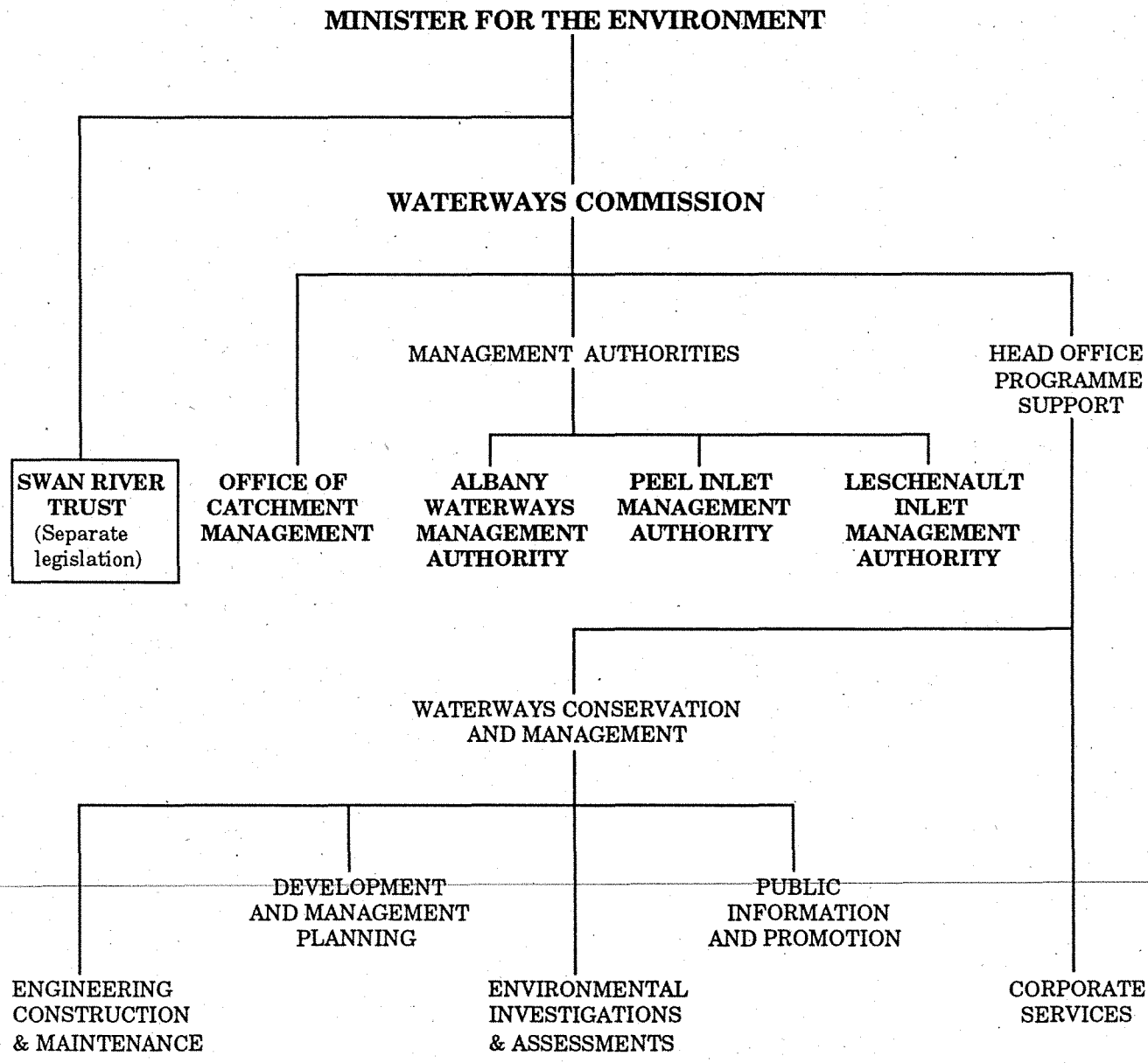


FIGURE 1 STAFF ORGANISATION STRUCTURE

Each local government authority can prepare a detailed town planning scheme for its area.

There are three local government authorities with boundaries adjacent to or including the waterways:

- City of Bunbury
- Shire of Dardanup
- Shire of Harvey

All three have town planning schemes. These are generally reviewed five yearly.

More specific roles are carried out by the following departments:

The Department of Marine and Harbours (DMH) has statutory responsibilities relating to marine and river waters.

The primary objective of DMH is to provide for efficient and safe shipping and effective boating and port administration through the provision of certain facilities and services.

Legislation administered by DMH relates either to all navigable waters or to particular ports. Acts with particular relevance to the river include:

- Marine and Harbours Act 1981.
- Western Australian Marine Act 1982.
- Shipping and Pilotage Act 1976.
- The Jetties Act 1926-1976.
- Lights (Navigation Protection) Act 1938.
- Marine Navigation Aids Act 1973-1976.
- Prevention of Pollution of Waters by Oil Act 1960.

Regulations have also been declared to administer these Acts.

The Department may construct, provide and maintain facilities and services on land and water to meet the needs of recreational and commercial shipping and boating, including jetties, moorings, launching ramps, navigation aids and marine craft. It is responsible for leases on waterways other than in the Port of Bunbury.

DMH is also responsible for the survey and operation of commercial ferries and hire and drive vessels, registration and control of pleasure craft, enforcement of safe navigation, granting of mooring licences, closure of navigable waters, and limiting of boat speeds. It has power to set aside navigable waters for particular purposes.

The *Bunbury Port Authority* is a corporate body constituted under the Bunbury Port Authority Act 1909-1967 and comprising five members. The Authority is responsible for the exclusive control of the port, planning, and construction and maintenance of port facilities, and it provides a number of port services, such as mooring of ships, power and water supply, and energy and security services. The Authority is also responsible for the leasing of land within the port.

The Port of Bunbury comprises the waters of the Leschenault Inlet, Koombana Bay, Bunbury Inner Harbour and all waters of the Leschenault Estuary south from the northern shoreline of the Cut across to Pelican Point.

DMH has the control of private pleasure craft within the Port and responsibility for administration of the Jetties Act.

The Environmental Protection Authority (EPA) was established under the Environmental Protection Act 1986 for the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. The Act makes it an offence to pollute.

The EPA's major objective for the waterways is to ensure that their existing environmental value is maintained and enhanced. This means that a full complement of biophysical functions must be retained in the system and its catchment.

The EPA carries out environmental impact assessment (EIA). Any proposed development that appears likely, if implemented, to have a significant effect on the environment, or a proposal of a prescribed class, shall be referred to the EPA by a decision-making authority. A proponent or any other person may refer a proposal and the EPA can call proposals in. The EPA determines whether a proposal is likely to have a significant effect on the environment, and reports to the Minister on its assessment. The Minister for Environment may then set conditions on the proposal.

The EPA is responsible for the control, prevention and abatement of pollution on behalf of the Minister for Environment. It issues licences, works approvals and notices. Certain pollution control powers and duties have been delegated by the EPA to LIMA and the Water Authority of WA.

The Water Authority of Western Australia (WAWA) is responsible for supplying water-related services to the State: public water supply, sewerage, irrigation and major drainage networks. WAWA also carries out assessment of water resources, and planning and management of their allocation, development, use and conservation for the continuing benefit of the community.

As the major centre for drainage expertise in Western Australia, WAWA is responsible for formulating safe management practices for development on flood plains.

WAWA has a special interest in the Leschenault Estuary because of the water resources potential of the rivers and the concentration of population in its lower catchment. Other responsibilities relevant to the Leschenault Estuary are the mitigation of floods, and the protection of the waters of the Estuary and Inlet by limiting drainage to normal storm runoff and natural groundwater flow. A five year plan for flood forecasting and warning has also been developed for the area by the Bureau of Meteorology.

There are a number of Acts, by-laws and regulations which the Authority either administers or uses to carry out delegated powers. These include:

- Water Authority Act 1984.
- Metropolitan Water Authority Act 1982.
- Metropolitan Water Supply, Sewerage and Drainage Act 1909.
- Country Towns, Sewerage Act 1974.
- Land Drainage Act 1925.
- Rights in Water and Irrigation Act 1914.
- Environmental Protection Act 1986 (Pollution Control and Licensing of Industrial Discharges).
- Public Works Act 1902.

The *Department of Land Administration* (DOLA) has no direct responsibility for waters of the river but certain Sections of the Land Act 1933 are relevant to foreshore reserves, high and low water marks, and land below low water mark and the beds of water courses. By virtue of the definition in Section 3 of the Act on Crown lands, and the Department's corporate objective of administering Crown owned land for present and future activities, DOLA has a clear involvement in the land adjacent to and under rivers.

The Land Act allows DOLA to reserve lands above low water mark on the banks of tidal waters for whatever purpose is deemed in the public interest. Current legislation does not permit the reservation of land below low water mark on the banks of tidal waters. The Act also provides that the Minister may require an authority to submit management plans for any reserve which is vested in that authority. The beds of water courses beyond tidal waters are under the control of the Minister for Lands for the purposes of vesting or leasing.

The *Department of Conservation and Land Management's* (CALM) primary responsibility is to conserve Western Australia's wildlife and manage public lands and waters entrusted to the Department for the benefit of present and future generations. CALM and three statutory controlling bodies were established under the Conservation and Land Management Act 1984. The controlling bodies are the Lands and Forest Commission, the National Parks and Nature Conservation Authority and the Forest Production Council.

The Department:

- Carries out the conservation and land management function according to sound well-researched scientific principles.
- Prepares and implements management plans and wildlife management programmes.
- Develops opportunities for the recreational use of entrusted lands and waters that are consistent with the purpose of the area.
- Undertakes public education and information programmes designed to increase community understanding and support for nature conservation and natural land management.
- Encourages public participation in the development of policies and implementation of management and research regulations.

The Department administers the Wildlife Conservation Act 1950 and associated regulations.

This Act applies to any native or migratory fauna and any flora native to the State, whether found on Crown land, private land or territorial waters of the Commonwealth.

The study area comes under the jurisdiction of CALM's Central Forest Region.

The Department of Fisheries (DOF) is responsible for management of the fish resources of the river system for the benefit of the community. This involves optimising yields, which should ideally be distributed equitably amongst different user groups, consistent with the conservation of fish species and habitats.

Legislation governing fishing in Western Australia is contained in:

- The Fisheries Act 1905 amended.
- Regulations made under the Fisheries Act.
- Notices and proclamations issued under the Fisheries Act and published in the Government Gazette.

The Leschenault Estuarine Fishery was declared by Ministerial approval in 1970 and is managed as a 'Restricted Entry' fishery which restricts the issue

of new estuarine fishing licences and prohibits the transfer of individual licences.

The *Health Department of Western Australia* (HD) is responsible for bacteriological water quality analyses and the possible impact of unacceptable water quality on human use of the river and environs. Standards for pesticide and heavy metal levels in food and drugs are also the Department's responsibility. The Department also registers pesticides for use in Western Australia.

The principal Act is the Health Act 1911. Food and Hygiene Regulations control the licensing of commercial food outlets and may be administered by the Health Department or local government authority.

It is the role of the *South West Development Authority* (SWDA) to encourage, promote, facilitate or assist economic and social development in the South West Region. The Authority consults with State and Commonwealth agencies, local government authorities and statutory bodies. The Authority co-ordinates projects involving local and State agencies, industry and commerce, employer and employee organisations and the community. Its more specific responsibilities are to:

- Undertake major economic and other studies of the Region as a basis for planning and co-ordinating regional development.

- Provide local authorities with information on the findings of commissioned studies and other research.

- Promote investment and expansion in the Region.

The *Department of Agriculture* (DOA) is responsible for advising on farming practices, implementation of the Soil Conservation Act, and advising on the use of pesticides for agricultural and urban uses.

The *Department of State Development* (SD) was responsible for the disposal of effluent from the SCM Chemicals plant until the new plant became operational, and for the rehabilitation of the Leschenault Peninsula after effluent disposal ceased in 1990. Management of the Peninsula will become the responsibility of CALM once the area has been sufficiently rehabilitated.

1.2.9 Liaison

It is a major responsibility of LIMA to liaise with the many State and community groups on the planning and management of the river environment.

The Act specifically identifies LIMA's responsibility to liaise with local government on land use proposals and the development and maintenance of foreshore reserves. It enables LIMA to undertake works on the foreshore and develop joint funding programmes with local government.

LIMA recognises that local government has a vital and positive role to play in the protection and good management of the waterways. A good working relationship with LIMA will ensure that help and support is available to local government on waterways matters.

1.3 CURRENT USE

The Bunbury Region had an estimated population of 35,000 in June 1987 and this is expected to grow to 50,000 by the year 2001. The Leschenault Inlet, the Estuary and its tributaries provide a major recreational focus for the population of the region.

The safe waters, abundant crabbing and fishing and its proximity to Perth and the South West make it an ideal holiday destination.

The Collie and Preston Rivers supply irrigation waters to many farms in the area. Horticulture, dairying, beef cattle and cropping are the main agricultural land uses.

A number of major industries are located in the area: Worsley Aluminium Smelter and SCM Chemicals; the Port of Bunbury adjacent to the estuary; and Kemerton Industrial Park to the north-east of the estuary on the Wellesley River.

All this adds to the pressure on the waterways and foreshores. It is essential that any management programme review these issues to ensure the healthy functioning of the system.

There have been a number of studies of the estuary and its flora and fauna. The results and recommendations of these studies should be incorporated into the management programme. Some have been adopted as Government policy.

Studies include:

System 6 Report (DCE, 1983a). Part II of this report identifies specific locations of regional significance adjacent to or in the waterways, to be managed for the purposes of conservation and recreation. General recommendations in Part I suggest the designation of some reserves as Regional Parks. Cabinet has agreed in principle to the recommendations in Part I and that specific locality recommendations contained in Part II should be implemented as far as possible.

State Conservation Strategy (SCSWA Consultative Committee, 1987). The Consultative Committee was established by Government to oversee the development of a State Conservation Strategy. The purpose of this strategy is to identify long term directions in which the community might move over the next two or three decades. Five objectives have been identified:

- To maintain essential ecological processes and life support systems.
- To preserve genetic diversity.
- To ensure the sustainable utilisation of species and ecosystems.
- To maintain and enhance environmental qualities.
- To optimise the quality of life for Western Australians.

The Government seeks to ensure that its immediate policies and activities are consistent with the long term direction of the State Conservation Strategy.

Recommendations for the Development of Canal Estates (Steering Committee on Canal Developments, 1984). This report recommends procedures and guidelines which will ensure that adequate study is undertaken by developers and by authorities before approval for a canal estate is granted. This report is currently being reviewed.

Bunbury 2000 Policy Document (South West Development Authority, 1983). This Policy seeks the development of the Bunbury Region as an urban alternative to Perth, diverting projects and people from Perth to the South West. The report concentrates on economic expansion through resource development, tourism, agriculture, forestry and timber production. Service Industry Development focuses on commerce and industry, administration, transport, education, culture, housing, law and order, communication, public utilities and health and community welfare. Improved employment opportunities in the region are also a major focus of the Bunbury 2000 concept. In 1987 the Bunbury 2000 Second Stage Report was released. It had three main areas of focus:

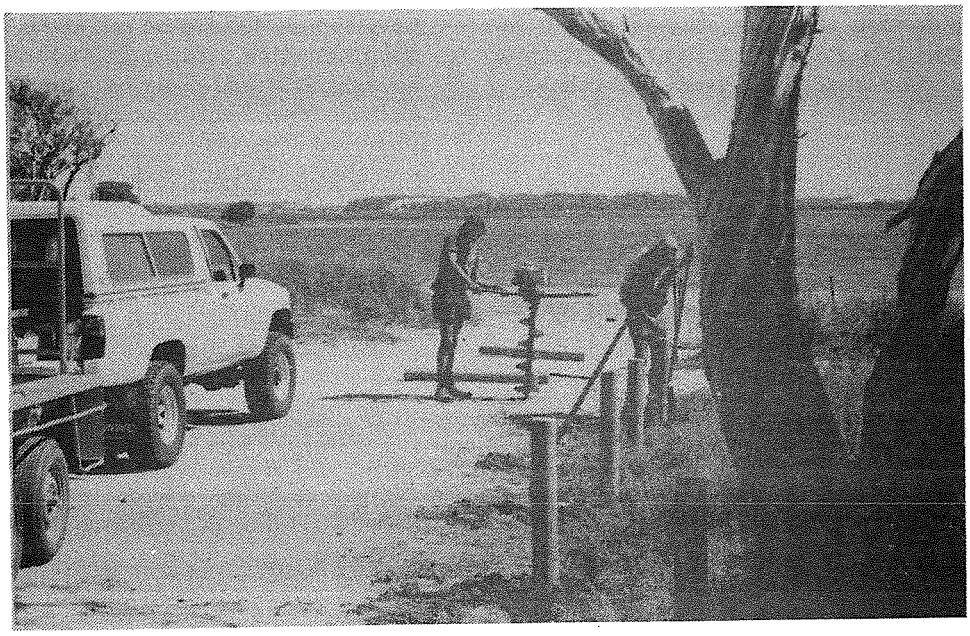
- To provide a wide range of community services.
- To promote private enterprise to provide a sound future for the region.
- To provide more jobs and further economic activity through tourism and recreation in the region.

Bunbury Region Plan - Policy Statement (State Planning Commission, 1987) provides the framework for the co-ordinated development of Greater Bunbury. The Region Plan guides councils when dealing with district planning matters, promotes development by providing prospective developers with comprehensive technical information on the region, and contributes to efficient servicing of the region by providing a 'blue print' for servicing authorities. The Policy identifies the opportunities and constraints which will affect the future growth of the Region. The Policy Statement has been submitted to the State Government for adoption as a Statement of Planning Policy under the Town Planning and Development Act.

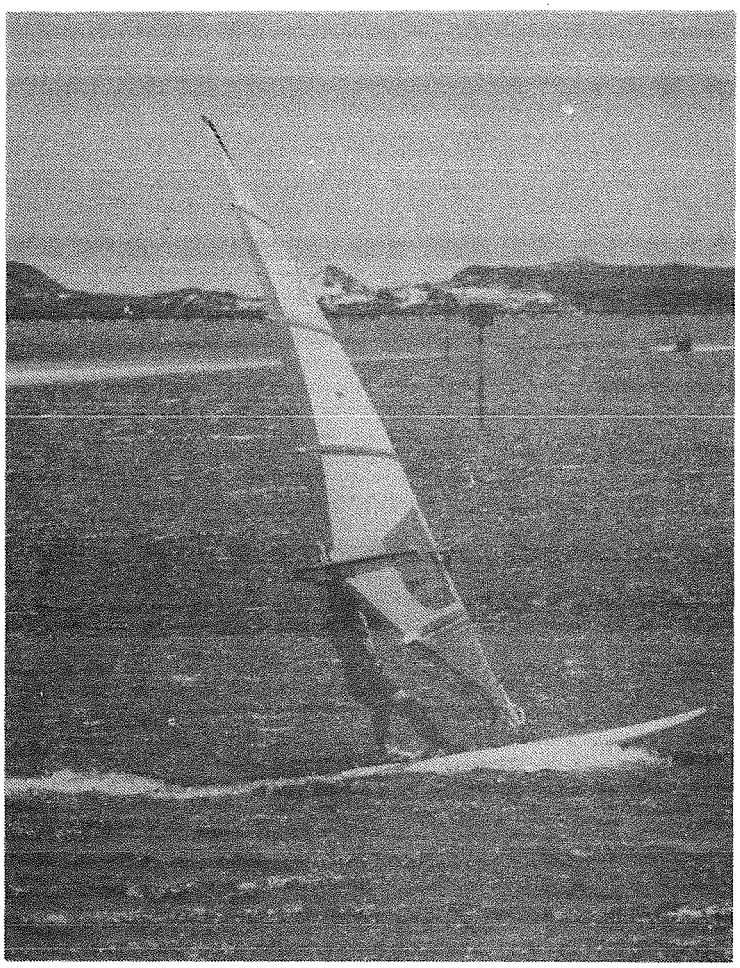
Draft Integrated Mosquito Control Strategy for Leschenault Estuary Region, Western Australia (Chester and Klemm, 1990). The aim of the Strategy is to implement a co-ordinated and environmentally responsible approach to mosquito control. It identifies control measures to reduce the mosquito health risk and nuisance in the Bunbury Region while preserving valuable wetland areas.

South West Strategy - A People's Plan (SWDA, 1988). This report identifies the future direction of planning, development, conservation and community development in the South West.

The following chapter describes the study area and outlines the various issues that affect the planning and management of the waterways and their catchments.



Barriers are required to restrict vehicle access to foreshore areas.



The popularity of windsurfing requires monitoring to ensure no damage occurs to the environment or conflict arises between other users.

CHAPTER 2
THE STUDY AREA

This chapter outlines the physical, biological and social factors affecting waterway management within the study area. It does not describe the study area in great detail and readers are referred to references quoted throughout the chapter for more information.

2.1 LOCATION

The Leschenault Estuary is located in the Bunbury Region of Western Australia (33° 21' S 115° 42' E).

It is a long, narrow, shallow interdunal estuarine lagoon approximately 11 km long and 2 km wide. It is connected to the ocean by an artificial channel at its southern end and runs parallel to the coast. The estuary is protected from the Indian Ocean by Leschenault Peninsula. The area of the estuary is about 25 km^2.

To the south is the Leschenault Inlet which was cut off from the estuary by reclamation for the new harbour development in 1968-1969. It is approximately 2 km long and is about 200 m in mean width. It is connected to Koombana Bay via a short but narrow entrance channel. Anglesea Island is located at its eastern end.

The two main tributaries of the estuary are the Collie River and the Preston River. The former flows in from the east through the Collie catchment area and is fed by the smaller Brunswick, Wellesley and Lunenburgh Rivers. The Wellington Dam is located on the Collie River just south of the Collie township. Water is used for irrigation and water supply. A new dam is currently being constructed on the Harris River upstream from the Wellington Dam. The catchment of the Collie River and its tributaries is 3500 sq km.

The Preston River feeds into the estuary from the south-east. Tributaries of the Preston are the Ferguson River, Joshua Brook and Crooked Brook. The Glen Merven Dam is located on the upper reaches of Preston River and its water is used for irrigation. The Preston catchment area is 1400 sq km.

The catchment boundaries of the Preston and Collie Rivers are shown on Map 2. Approximately 1890 km^2 of the total catchment area is undammed.

2.2 CLIMATE

The region experiences a Mediterranean climate with rainfall mainly occurring from May to August (871 mm annually). The average annual rainfall is about 1000 mm. In winter the average maximum temperature for Bunbury in July is 16.8°C. Inland days can be warmer and nights cooler. In comparison February is the hottest month with a mean daily maximum of 27.6°C and 15.1°C average minimum.

Easterly airflows predominate during the summer months with a strong south-west breeze occurring on most afternoons.

2.3 GEOLOGY

The Darling System comprises two distinct geological provinces on the south-west margin of Australia. These areas are separated by the Darling Fault, one of the major tectonic features of the Earth's crust.

East of the Darling Fault is the Yilgarn Block, a relatively stable shield area composed of Archaean crystalline rocks. Here, linear belts of metamorphosed sedimentary and volcanic rocks have been invaded by large areas of granite.

The Darling Fault marks the western margin of the Yilgarn Block and is located approximately 1 to 3 km west of the Darling Scarp.

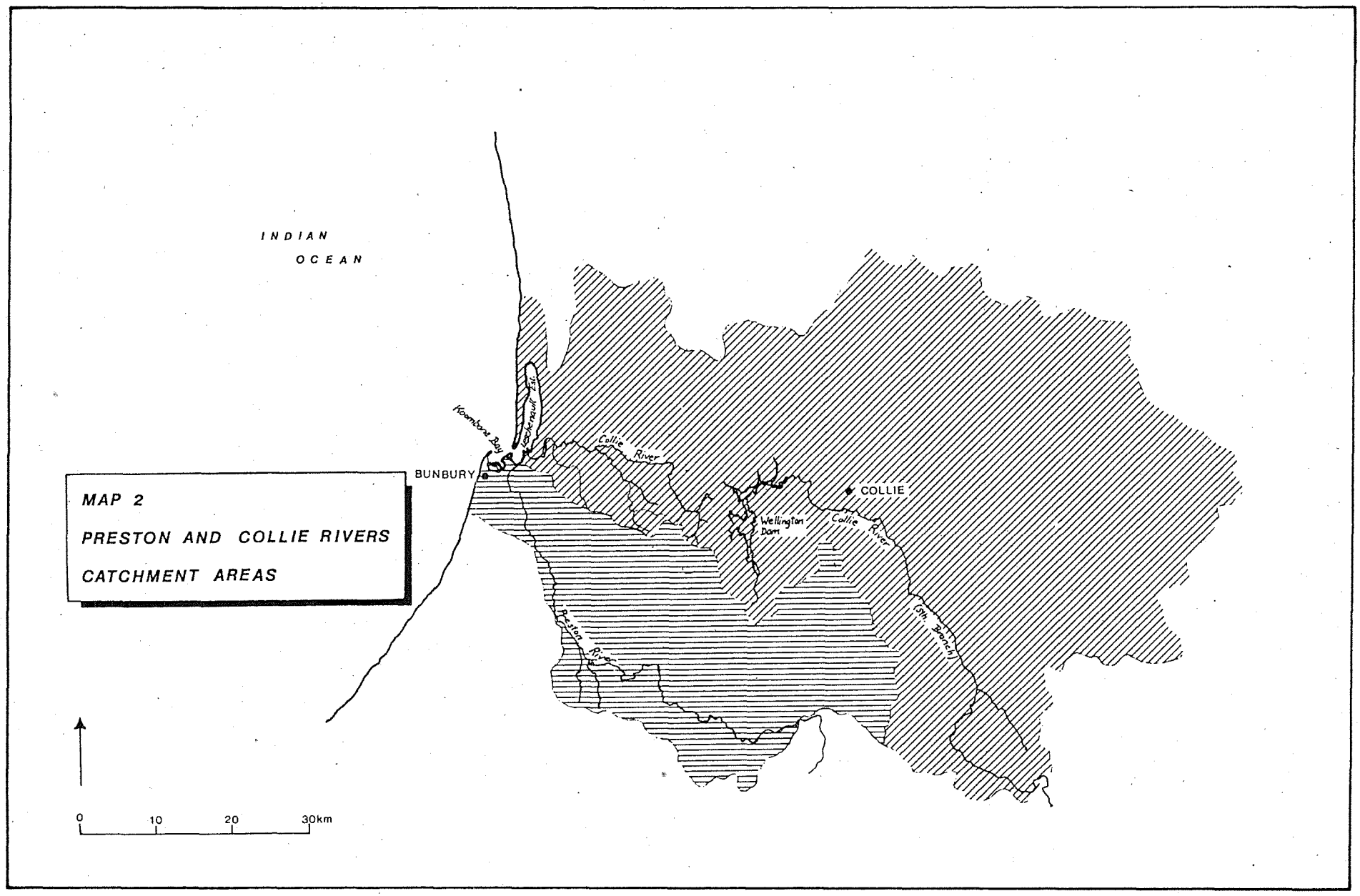
The Perth Basin lies to the west of the Darling Fault and is a deep trough filled with Phanerozoic sedimentary rocks. It is about 1000 km long and averages 65 km in width. The total thickness of sediment may exceed 15 km in places (DCE, 1980).

2.4 SOILS AND LANDFORMS

The slope and relief of the land and nature of the soils are basic considerations in planning, determining to a large extent how land may be used and the ease or difficulty associated with various activities (DCE, 1980).

The Collie and Preston River catchments consist of a coastal belt extending inland for approximately 7 km and an alluvial plain bounded on the east by the Whicher and Darling Scarps some 15 to 20 km inland. It can be divided into a number of landform units (DCE, 1980). The majority of the Collie and Preston River catchments are to the east of the Darling Scarp within the Darling Plateau.

In this province the lateritic uplands are dominated by duricrust, gravels and sands and form a gently undulating surface. On the main surface there is a trend from north to south in elevation, relief, incidence of duricrust and the nature and extent of gravels.



MAP 2

PRESTON AND COLLIE RIVERS

CATCHMENT AREAS

The coastal plain catchment consists largely of sand over clay soils, extending from the Darling Scarp to meet deep grey sands midway to the estuary. Brown and yellow sands are located along the Brunswick, Collie and Preston river valleys. Nutrient release from these soil complexes varies, with deep grey sands releasing relatively more nutrients than sand over clay, which in turn release more nutrients than brown and yellow sands (DCE, 1983b). The coastal plain catchment therefore consists largely of soils that may readily lose their nutrient components to drainage (Klemm et al, 1987). Table 1 indicates soil type for each catchment.

Parallel to the coast between the ocean and the plain lie the Spearwood and Quindalup Dune systems, a series of sand dunes and limestone ridges with interdunal swamp, lagoons and inlets. Inland of the coastal belt, the low, irregular sand dunes of the Bassendean system merge into the Pinjarra Plain and the Ridge Hill Shelf.

Table 1 Leschenault Estuary Catchment Soil Types for Cleared Coastal Plain Area.

Brunswick-Collie Catchment:

	%
Brown & Yellow Sand	22.7
Deep Grey Sand	10.7
Lateritic Uplands	6.0
Loams, Clays, Peats	2.0
Sand over Clay	58.6
	100.0

Preston-Ferguson Catchment:

Brown and Yellow Sand	8.0
Deep Grey Sand	48.0
Lateritic Uplands	21.0
Loams, Clays, Peats	4.2
Sand over Clay	18.0
	100.0

(Area Calculations by Geographical Information Service Group - Department of Agriculture in Davis, 1989)

2.5 VEGETATION

The vegetation of the study area can be divided into three areas: aquatic, peripheral (or fringing) and catchment.

2.5.1 Aquatic Vegetation

The seagrass *Halophila ovalis* is widely distributed in the estuary and is only absent from a small area of deep water in the centre of the estuary. Two other seagrasses *Ruppia* and *Heterozostera* are largely confined to shallower sections of the sandy marginal platform on the eastern side of the estuary. *Zostera* are found around the entrance channel to the ocean.

The dominant green alga is *Chaetomorpha linim* which is largely confined to the northern section of the estuary. In contrast *Hormophysa triquetra* is the dominant brown alga and is distributed widely in the northern estuary and along the eastern side south to the entrance of the Collie River.

The red alga are widely distributed with *Gracilari* a being the dominant genus. Distribution is similar to *Halophila* with some occurring as epiphytes on *Halophila*.

Lukatelich (1989) reports that at the present time rooted *(Halophila)* and attached *(Hormophysa)* macrophytes dominate the aquatic plant biomass of the estuary. However, if conditions change to reduce the dominance of free floating green alga then the estuary may experience beach fouling problems especially in the northern section of the estuary.

2.5.2 Peripheral Vegetation

Much of the peripheral or fringing vegetation of the estuary and rivers has been destroyed or modified since European settlement. Glover (in Schwinghammer, 1978) has described the foreshore vegetation in some detail.

The Peninsula area comprises high dunes many of which are devoid of indigenous vegetation; others support high shrubland of many species and low open forest dominated by Peppermint *(Agonis flexuosa)*. Closer to the estuary are large areas of Tuart woodland *(Eucalyptus gomphocephala)* with peppermint in the understorey.

The eastern areas of the estuary mainly support open woodland of Tuart, Jarrah and Marri with a diverse understorey particularly on and over the ridge which overlooks the estuary. Between the estuary and ridge, most of the original vegetation has been cleared but there are small swamps dominated by low woodlands of Swamp Paperbark *(Melaleuca rhaphiophylla)*. The immediate foreshore comprises mainly a mosaic of sedgeland dominated by *Juncus krausii* and samphire herblands with *Arthrocnemum halocnemoides* as the principal plant. Immediately inland small clumps of Saltwater Paperbarks *(Melaleuca cuticularis)* and Swamp Sheoak *(Casuarina obesa)* occur tolerating the saline conditions in the area.

A dense samphire herbland with areas of low open forest dominated by Swamp Paperbarks previously occurred to the north of the estuary. Much of this area has been cleared in recent years.

The southern shoreline supports samphire herblands together with low woodlands and high shrublands dominated by Swamp Sheoak mixed with Saltwater Paperbark and Flooded Gum *(E. rudis)*.

The vegetation on the rivers has largely been cleared leaving a fringing woodland of Flooded Gum and Swamp Paperbark with occasional flood plain swamps supporting wildlife. Animal grazing in these areas has contributed to destruction of undergrowth vegetation. Just downstream of Wellington Dam on the Collie the vegetation remains intact where areas have been protected by State Forest, or Management Priority Area status.

The Leschenault Inlet has been cut off from the estuary by reclamation for the Inner Harbour development and vegetation on the southern shore has been removed and replaced in most part by walling and grassed areas. Anglesea Island is located on the eastern tip of the inlet. Along the eastern and southern sides of the Island the mangrove *Avicennia marina* grows. The remainder of Anglesea Island is vegetated by samphire.

2.5.3 Catchment Vegetation

The vegetation of the region is determined by the soil types and landforms. Much of the area has been cleared for agricultural purposes.

Along the coast associated with the Quindalup Dunes, the main species are wattles, Swan River Cypress and Rottnest Island Tea-tree. Inland one or two kilometres eucalypts occur on the Spearwood Dune system. Initially these are tall open stands of Tuarts, however the number of Jarrah and Marri increase to the east on the deeper soil.

Further inland on the Bassendean Dune system are open forests of Banksia, Pricklybark and Sheoak, with diverse understorey shrubs.

On the Pinjarra Plain and Ridge Hill Shelf, the vegetation was originally Jarrah and Marri. Large areas have been cleared for agriculture, however some Marri has been retained as open grassed woodland. Wandoo occurs on the clay fields, Swamp Sheoak on the more poorly drained saline soils and Flooded Gum along the watercourse (Taylor and Burrell, 1985).

Salim (1985 in Klemm et al, 1987) estimates that the majority of the coastal plain and approximately 20% of the plateau forests have been cleared for agriculture.

2.6 HYDROLOGY AND BATHYMETRY

Water depth in the estuary varies from 0.3 metres on the shallow sand flats on the eastern edge to 2.0 metres in the central channel. Due to the shallow nature of the estuary, water temperature is dictated by air temperature resulting in a diurnal and seasonal change. Summer water temperature is about 25°C and winter 14°C.

The salinity of the estuary changes seasonally and according to distance from the Cut. The salinity of the river waters varies seasonally, depending on whether the runoff is from cleared land or from the forested coastal plain. During heavy winter rainfalls fresh water flows from the rivers into the estuary forming a fresh layer over the salt water. In summer when freshwater flow is minimal the salt water from the estuary penetrates upstream sliding in underneath the fresher river water. As summer progresses mixing of fresh and salt water occurs. In winter fresh water also flows from the Parkfield Drain into the northern estuary. In contrast this area tends to become hypersaline in the summer due to tidal influence and evaporation.

In the inlet water depths are generally in excess of 1.5 metres, however sandbanks are exposed during low tide along the northern and eastern boundaries. The deepest area of the inlet occurs midway along the inlet towards the south foreshore. The maximum depth recorded is 3.2 metres.

The tide regime within both the estuary and inlet is similar to that of the ocean indicating good water exchange with the ocean.

2.7 FAUNA

The estuary and rivers are used in three ways by fish and crustaceans: permanent breeding, nursery habitat for juveniles, and occasional feeding area for maturing and mature adults. Factors influencing utilisation and distribution of fish are salinity, temperature, dissolved oxygen, turbidity and available food and shelter.

For most species making up the commercial and amateur catch the estuary is a nursery habitat for juveniles. Species include mullet, whiting, silver bream, tailor, mulloway and the blue manna crab. Abundant food and shelter from both predators and the less protected marine environment influence the utilisation of the waterways by these species. It should be noted that in years of reduced winter flushing some species may remain in the estuary all year. Conversely in years of prolonged freshwater flow some species may be forced out of the system for long periods during the year.

Species which visit the estuary as a feeding area for maturing and mature adults include herring, skipjack, scaly mackerel, blue mackerel and most sharks and rays. This group forms only a minor part of the commercial and amateur catch from the estuary, only venturing into the estuary when salinities are similar to sea water.

Freshwater fish species are few in the upper reaches of the river. Redfin perch is the most common. Limited marron can be caught in the Collie River area although the season has been closed in past years due to insufficient numbers. The freshwater mussel *Hyridella carteri* is also found along the river system.

A recent study of Leschenault Estuary by Ninox (1989) indicates that 62 species of waterbirds use the estuary and that the tidal saltmarshes are an integral and necessary part of the estuarine system providing rich intertidal and freshwater feeding areas for a large proportion of these species. These tidal marshes are the only areas where breeding takes place and which can provide refuge for young waterbirds.

The estuary is also used by a large number of birds, particularly migratory wading birds many of which are protected by international conservation agreements.

The estuary is considered important for the Little Egret, Grey Plover, Bar-tailed Godwit and Great Knot. These birds have been counted in higher numbers at very few wetlands besides Leschenault.

Ninox (1989) comments that the Leschenault Estuary is less significant than other estuaries of the lower west coast in terms of the number of species recorded, number of individuals in one survey and number of species for which it may be judged important. The estuary nevertheless has an important role to play as a feeding ground for a wide and diverse range of waterbirds. It is a crucial feeding area for the Great Egrets which breed at Morangeral Swamp. As a permanent wetland, it is a significant drought refuge for ducks, swans and other groups of waterbirds.

Ninox (1989) listed as areas of conservation significance all fringing wetlands along the extreme northern and western shoreline, the Preston River mouth, Morangeral Swamp, Marriot Road Swamp, Anglesea Island and associated mud flats.

Much of the terrestrial fauna of the foreshore around the estuary has vanished as a result of clearing of these areas, loss of habitat and people pressure. The Leschenault Peninsula still supports quite a large population of kangaroos and unfortunately abundant numbers of rabbits. Lizards and snakes still find refuge in fringing vegetation.

Invertebrate fauna still occurs in abundant numbers in the estuary providing an important link in the food chains of the estuarine fish and birds. Van de Wiele (1987) reported that invertebrate numbers were greatest in the northern estuary.

2.8 HISTORY OF DEVELOPMENT

2.8.1 Aboriginal Use

It is generally thought that the southwest of Western Australia was occupied by thirteen groups or 'tribes'. Three main groups were associated with the Bunbury region these being the Pinjarup and the Wardani (Tindale, 1974) and the Ganeang (Berndt, 1979). It is thought that the Leschenault Inlet may have formed the boundary between the first two of these groups.

The Pinjarup ranged from the Murray River to Harvey, Collie and Bunbury. The Wardani's territory was concentrated on Geographe Bay and the southern boundary was probably the Blackwood River. Bordering on these groups was the Wilmen whose territory extended east from the Collie, and incorporated Pingelly.

Tindale (1974) also suggests that the Ganeang may have moved to the Bunbury area only after colonisation. Overall, it is difficult to establish clear cut boundaries at any time in history, especially since the impact of European culture was so devastating to Aboriginal life.

In the face of cultural destruction, southwest Aboriginal people have formed a collective identity known as the Nyungars.

There are a number of archaeological and ethnographic sites in the region. These tend to be associated with water courses and wetlands, particularly around the Collie and Brunswick Rivers.

Like the Swan River much of the freshwater sources of the region. is associated with the Waugal. The Waugal is a mythical serpent associated with creation, fertility, healing, avoidance area (at night mostly), water courses and wetlands, magic and harm. It is sometimes referred to as the 'mother' or 'grandmother' in creation myths and is equivalent to primal waters and earth (Mc Donald and Locke , 1991).

The district was well watered and had a plentiful supply of their food. The sea and the rivers provided many varieties of fish, the inlet was the breeding place of swans, ducks and other varieties of waterfowl, while on the higher land several species of kangaroos grazed. Gilgies, water rats, snakes and lizards and possums lived around the wetland areas. In the late autumn, many Aborigines returned to the hills and in early summer came back to the coastal regions (Sanders, 1975).

2.8.2 European Settlement

In November 1829 expedition leaders, Dr Collie and Lt Preston, left Fremantle in the HMS 'Sulphur' in search of land south of the Murray River suitable for sheep and cattle grazing, weighing anchor off Port Leschenault one week later. On return they indicated that the soils of the Leschenault region were suitable for farming. Farmers and military personnel proceeded to 'settle' the district as a result. However, it was not until December 1836 that the decision to establish Bunbury town was made.

Since its formal declaration as a town in 1841 many changes have occurred to the waterways and vegetation of the region. By 1890 a timber jetty and breakwater had been established in Koombana Bay. However, the breakwater caused silting along Koombana Bay, necessitating its continual extension.

Silting was such a problem that in the 1930s, a new groyne was constructed on the western side of Koombana Bay, the jetty was removed and replaced with a more stable structure and the breakwater was extended and its newly created beach areas formed into wharfs.

In 1951, the estuary's natural outlet to the ocean at Point MacLeod was closed to eliminate the deposition of river silts in the port area (George, 1981). At the same time, in order to compensate for the loss of this outlet to the ocean, the Cut was constructed through the sand dunes opposite the mouth of the Collie River. This outlet is more efficient than the natural channel in the discharge of floodwaters. Further to this modification, in 1968-69, the Preston River downstream of the Australind Road Bridge was realigned to allow for the construction of the new Inner Harbour. In 1971, work on the Inner Harbour commenced, cutting off the southernmost part of the estuary. On completion of the Inner Harbour, a channel was cut at Point MacLeod to allow water circulation to this small body of water and to allow the passage of boats out to Koombana Bay.

These modifications have resulted in the renaming of the waterbodies; the smaller waterbody at Point MacLeod is now known as Leschenault Inlet and the main waterbody to the north is termed the Leschenault Estuary.

In addition to the physical modifications to the waterways agriculture has also resulted in changes to the catchment of the estuary. Agricultural growth was restricted in the early days due to the poor quality of soils and lack of 'fertilisers'. The advent of superphosphate revolutionised farming in the area, increasing productivity and demand for land in the area. Irrigation and drainage have enhanced its growth, development of the Wellington and the Glen Merven Dams providing water for irrigation purposes.

2.8.3 Land Uses

The most prominent industries in the region at present are agriculture and manufacturing, though bauxite/alumina production is expected to assume considerable importance by 1990. Barrack Silicon and SCM Chemicals are two of the main industries in close proximity to the estuary. Tourism, forestry and wood processing, coal, manufacturing, power generation and heavy mineral sands are expected to rank in that order of importance by 1990 (SPC, 1987).

It is intended that Bunbury will become the focus of major secondary processing industries for the South West Region due to its size, range of services and particularly its deep water harbour.

Approximately 51% and 73% of the coastal plain for the Brunswick-Collie and Preston-Ferguson catchments respectively has been cleared (Davis, 1989). The majority of this land has been cleared for cattle grazing.

The irrigation districts of the Collie River and Preston River fall within the coastal plain catchments. On the Collie most irrigation is associated with pasture growing for dairy and livestock production. On the Preston a combination of dairy production and horticulture occurs. Fruit growing is the major form of horticulture with some potato and vegetable production.

Job opportunities created by these land uses have resulted in urban development on the foreshores of the estuary and small farming communities within the catchment.

The Bunbury City Centre and Port of Bunbury surround the Leschenault Inlet. The communities of Eaton, Clifton Park and Australind are nestled on the eastern foreshore of the estuary and Collie River.

2.8.4 Population Growth

Over the last 40 years the Greater Bunbury area has consistently grown at rates higher than the rest of the South West Region (excepting Mandurah and Districts). Since 1966, rapid urban development has occurred at Australind and Eaton resulting in isolated suburbs within 5 km of the Bunbury Central Area.

The population of the Bunbury Region is approximately 35,000 and may reach 50,000 by the year 2001, and 100,000 by the year 2034 (SPC, 1987). By then, the residential and employment distribution will have spread beyond the present city limits into the Shires of Harvey, Dardanup and Capel. The satellite townsites of Australind and Eaton have shown considerably greater growth than Bunbury itself.

Population growth will create demands for urban growth in the area. These areas have been identified in the Bunbury Region Plan (SPC, 1987). It is anticipated that those areas with a focus on the estuary, rivers and ocean will be in greatest demand for development.

2.8.5 Recreational Use

As with most waterbodies the Leschenault system experiences its greatest recreational use when air and water temperatures are suitable for water contact sports.

Use of the Leschenault Estuary by power and sail craft is restricted by water depth and the height of the pipeline. Crabbing and fishing in this area is particularly popular over the summer months. Exposure to the south-westerly breeze determines the time and distribution of boats on the estuary. A number of powerboats cruise up the Collie River, the depth of the Preston River restricting this activity. No water skiing is permitted on any of the waterways, this activity being restricted to Koombana Bay. A number of boats are launched at the Cut, Shoalhaven or Apex Park before proceeding out to Koombana Bay for fishing. Navigating the Cut can be hazardous depending on tides and winds.

The Leschenault Inlet is used for launching by the Bunbury Power Boat Club before proceeding through the 'Plug' to Koombana Bay. The Bunbury Rowing Club is also located on the Inlet, a new rowing course was completed in the 1980s.

The Collie River Gorge is a popular camping and picnic spot and is located below Wellington Dam. The release of irrigation water from this dam during summer months provides year-round water flow through the Gorge. Previous studies have identified that summer use is dominated by metropolitan residents and winter use by Bunbury Region residents. The Ministry of Sport and Recreation provides a canoe guide of the area. It also conducts school camps in the region, visiting the Gorge on a number of occasions.

A small commercial boat and sailboard hire facility operates from Ridley Place (Parris Road) boat ramp. Collie River cruises operate from the Shoalhaven boat ramp.

Commercial fishing is permitted on the Leschenault Estuary on a very limited basis. Its operation is controlled and monitored by the Department of Fisheries.

2.9 LAND OWNERSHIP

The majority of the foreshores of the estuary and rivers are identified in the Bunbury Region Plan as 'Areas under consideration for conservation, scenic protection and reservation' or for the purpose of 'Parks and Recreation and Drainage'. Within these reservations, land can be of different status. It includes Crown land reserved under the Land Act 1933, Amended, foreshore areas still in private ownership and areas leased by or vested in various authorities or organisations.

Around the Leschenault Inlet, the majority of land is in public ownership. Some areas abutting the port are leased by companies under the Mining Act.

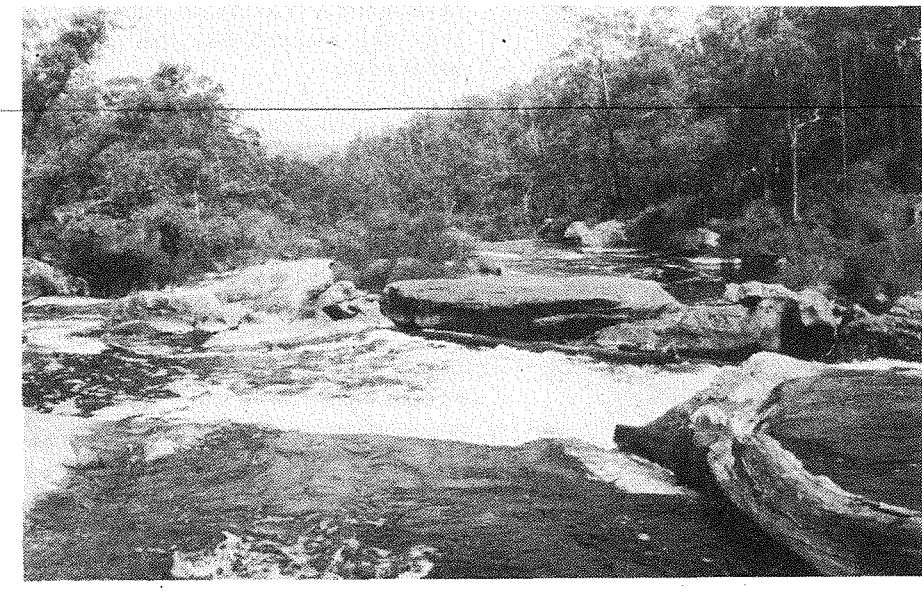
The southern foreshore of the estuary is generally affected by zoning for the Port of Bunbury, land near Turkey Point is leased to SECWA for fly ash disposal.

On the eastern and northern foreshore, the majority of the foreshore is in public ownership and is vested with the local authority or is unvested Crown land. Much of this land has been given up as a condition of subdivision.

The western foreshore (Leschenault Peninsula) is to be vested with the Department of Conservation and Land Management and will become a 'Conservation Park' when the Conservation and Land Management Act is amended.

The majority of land along the rivers is in private ownership with pockets of reserves occurring where subdivision has occurred.

The forest area in the Collie River Gorge is managed by CALM and will also become a 'Conservation Park' when the Conservation and Land Management Act is amended.



The Collie River Gorge provides a unique opportunity for white water canoeing.

2.10 ISSUES

The physical characteristics of the catchments and estuary and population growth and development of the region raise issues that must be addressed in the management of the waterways and catchments. These issues cover a wide range of topics. Management of waterways involves not only water quality but also conservation of flora and fauna, landscape protection, aesthetics and recreational experience. The issues have been identified after consultation with local government and government agencies, and a survey of recreational use of the waterways. They have been grouped under eight broad headings which relate to the primary objectives, and are listed below. The same broad headings are used in Chapters 3 and 4 where further discussion of the issues occurs.

Only those issues requiring action have been addressed in the Management Programme. New problems may arise in the future and cannot always be foreseen. This is where monitoring and evaluation is so important and this aspect is addressed in Chapter 6.

LAND USE AND WATERWAY PLANNING

Regional and local planning

It is important that regional and local planning consider possible impacts on the waterways. Similarly the Management Programme must reflect, where appropriate, current land use plans for the area.

Channels to drain wetland areas have reduced mosquito breeding in some areas.

Foreshore reserves

Reservation and acquisition of many foreshore areas is required for recreation (public access) and conservation purposes, some commercial purposes and the natural functioning of the waterway environment.

Commercial development

Opportunities should be provided for commercial facilities which enhance community use of the waterway without affecting its living systems or public access and amenity.

Climatic change - the Greenhouse Effect

Planning for the region should take into account possible climatic changes resulting from global warming of the atmosphere.

Canal developments

Proposals for artificial waterways adjoining the estuary and rivers require special consideration to ensure that they are environmentally acceptable.

Water resources

Proposals for the development of water supply resources require thorough assessment to ensure that established uses and environmental needs can be met by proposed new flow rates.

Transport network and utility services

Road and rail networks and utility services are essential infrastructure for the growth and development of the region.

Industry

Industrial development will be the focus of growth in the Bunbury Region in years to come. Such developments require assessment to ensure that they are compatible with protection of the waterways.

Flooding and flood plain management

Areas of the floodplain should be protected from developments to reduce the risk of flooding and preserve flora and fauna habitats.

Urban development

Urban development abutting the waterways and foreshore reserves should not affect the integrity and functioning of the system.

CONSERVATION AND ENVIRONMENTAL PROTECTION

Conservation areas

Areas should be set aside to protect the flora and fauna of the region and ensure the natural balance of the waterway environment.

Water quality

Management plans must include measures to ensure on-going satisfactory water quality in the catchment and the waterways.

Erosion control

It is undesirable to allow uncontrolled erosion because of the threat it poses to property and to conservation areas.

Dredging

Shallow banks are important to aquatic flora and fauna and can be degraded as a result of dredging and spoil disposal.

Mosquitoes

Introduction of mosquito eradication measures often results in degradation or loss of important wetland environments.

Landscape protection

Maintenance and enhancement of special and significant views to and from the waterway is important.

Scientific research and education

Co-ordinated scientific research on the waterway environment can aid the future management of the system.

Fire management

Fire management practices should protect the natural environment as well as private property.

Heritage and cultural sites

Aboriginal heritage sites are protected by legislation and the programme should reflect this. Similarly European sites should be conserved and protected.

RECREATION AND TOURISM

Recreation

The waterways provide a recreational focus for the Bunbury Region and planning and management requires that a broad range of opportunities best suited to the local area be provided.

Tourism

Growth of tourism requires that further facilities be developed; however, elements which initially attracted tourists to the waterway should be maintained.

Boating activities and facilities

Safe and environmentally suitable areas for boating activities and facilities are required.

Public access

The waterways are an important recreational resource and the public should have access to the foreshore for community use and enjoyment.

NAVIGATION AND BOATING SAFETY

Boating control

Public safety, environmental impact and use of adjacent areas need to be considered when determining control of boating.

Special events

Approval of aquatic events should consider environmental impact.

LIAISON AND CO-ORDINATION

Community involvement

Interested and affected members of the community should be involved in management and planning of the waterways.

State and local representation

Membership of the Management Authority should include State government and local government representatives.

Administrative procedures

A system is required to ensure that planning and development applications are referred to the appropriate agencies for comment.

FISHERY MANAGEMENT

Fishing

Competition amongst waterway users for a share of the fish resource places fish stocks and habitats under stress.

PUBLIC EDUCATION

Education programmes

Public information programmes should be developed.

MANAGEMENT

Management area boundaries

Effective management of the waterways requires that the management area includes associated land and major tributaries of the estuary.

Management and maintenance of foreshore reserves

Management and maintenance of foreshore areas is required to ensure their protection and enhancement.

Staff and finance

Adequate staffing and funding levels are required to ensure implementation of the management programme and maintain a public profile for the Management Authority.

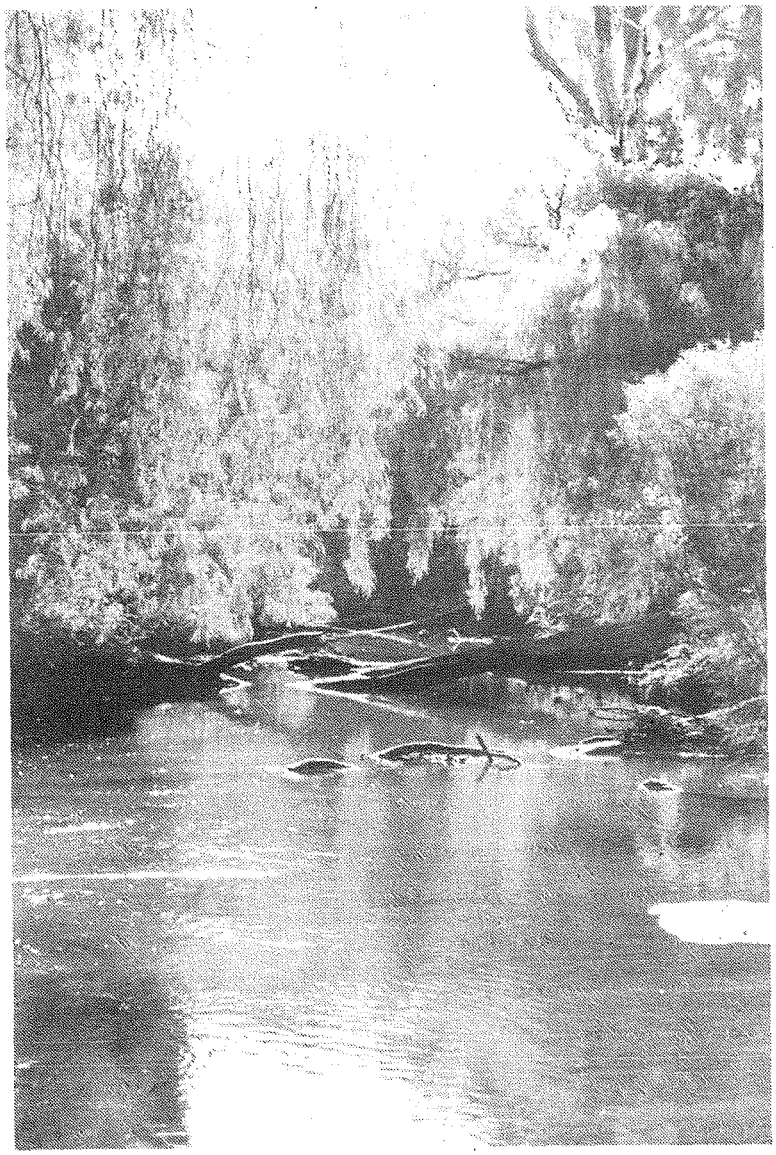
Development approval implementation

A mechanism is required to ensure that development approval conditions (DPUD or EPA) designed to protect the environment are implemented by the proponent.

Review and amendment of the management programme

A clear procedure for review and amendment of the management programme is required.

The following chapter outlines the aims and objectives of the management programme in order to address the previously listed issues.



The upper reaches of the Collie River are well vegetated providing attractive picnic and camping areas.

CHAPTER 3
MANAGEMENT AIMS AND OBJECTIVES

3.1 PHILOSOPHY OF APPROACH

The Leschenault Waterways Management Programme is only one of many plans, programmes and strategies addressing particular issues in the Bunbury Region; it is important that it should be integrated with these other plans and vice versa. To ensure the health of the waterways planning and management must extend beyond the waterways and the immediate foreshore, and include strategies for catchment management. The programme must provide for long term water quality management. Only through close liaison with the various planning and management authorities in the Region can integration of policies and ideas occur and the following aim and objectives be achieved.

3.2 AIM

> "To fulfil the demands for use and development in so far as they are consistent with the conservation and enhancement of a functional healthy estuarine environment for the enjoyment of present and future generations".

The waterways are a living system and their integrity should be maintained and sustained to the greatest extent possible. This means that a wide range of biological and physical functions should be retained and all proposed uses should be evaluated in terms of their capacity to adversely affect the system.

3.3 OBJECTIVES

To achieve the above aim and to address the previously discussed issues a series of primary and specific objectives have been developed. The order in which they appear below should not be construed as an order of priority; all are necessary to achieve the aim in Section 3.2.

3.3.1 Land Use and Waterway Planning

PRIMARY OBJECTIVE 1

Ensure that land use and development on and adjacent to the waterways maintain or enhance the quality and amenity of the waterway environment.

SPECIFIC OBJECTIVES

- Provide a planning framework which promotes and guides the understanding by local government, planning authorities, developers and the public that the waterways and foreshores are an important regional resource.
- Establish a framework for a comprehensive and integrated system of Parks and Recreation Reservation along the foreshore of the waterways, and maximise public ownership of foreshore land.
- Maintain the waterways as a major ocean outlet for surface and groundwater drainage.
- Identify areas where water-dependent commercial, industrial and recreational development is appropriate.
- Develop guidelines which assist planning authorities in determining developments compatible with the waterways.

3.3.2 Conservation and Environmental Protection

PRIMARY OBJECTIVE 2

Conserve, protect and rehabilitate the waterways and foreshores.

SPECIFIC OBJECTIVES

- Identify and conserve natural landforms and ecosystems, and areas of landscape value or scientific and cultural importance.
- Ensure that the waterways and foreshores are managed as an integrated ecological unit.
- Maintain and monitor water quality so that the waterways remain healthy and continue to support a diverse biota and provide recreational opportunities.
- Retain and enhance the existing fringing vegetation along the foreshore.
- Require that use and development proposals undergo appropriate environmental impact assessment before proceeding and that conditions of approval are complied with.
- Identify conservation areas and ensure that they are afforded a high level of protection

given their importance as wetland habitats, waterbird habitats and fish nursery habitats.

3.3.3 Recreation and Tourism

PRIMARY OBJECTIVE 3

Encourage a range of recreation and tourism opportunities and facilities that reflect and complement local heritage, life style and the natural environment.

SPECIFIC OBJECTIVES

- Ensure diversity in providing opportunities and facilities so that users can seek a variety of appropriate recreational experiences from the waterways.
- Promote the Bunbury Region as an important tourism destination within the aim of the Management Programme.
- Ensure that a range of commercial and non-commercial opportunities and facilities is available for the benefit of the community and tourists.
- Ensure that recreational and tourist developments undergo appropriate environmental assessment.
- Manage overcrowding in order to protect the waterways and the recreational experience sought by visitors to the area.
- Preserve and enhance the public's right of access to and use of the waterways and foreshores.

3.3.4 Public Education

PRIMARY OBJECTIVE 4

Promote awareness and appreciation of the waterways and foreshores.

SPECIFIC OBJECTIVES

- Develop education programmes to minimise current management problems.
- Develop pamphlets which lead to more effective use of recreation areas.
- Educate the public on the value of the waterways and the need for sound management.
- Advise government agencies, local government, groups and individuals on up-to-date environmental understanding.

3.3.5 Navigation and Boating Safety

PRIMARY OBJECTIVE 5

Regulate, control and promote measures to ensure the safety of life in connection with all boating activities and to construct, maintain and manage facilities and equipment necessary for that purpose.

SPECIFIC OBJECTIVES

- Ensure that all navigable waters are kept safe for navigation.
- Maintain high standards of safety by reducing user conflict whilst recognising the rights of all waterway users.

3.3.6 Fishery Management

PRIMARY OBJECTIVE 6

Manage the fish resources of the waterways for the benefit of the community.

SPECIFIC OBJECTIVES

- Manage and utilise fish stocks on a sustainable basis for the commercial and recreational fishery.
- Conserve fish species and fish habitats, particularly juvenile and nursery habitats.
- Minimise conflict between professional and recreational fishermen.

3.3.7 Liaison and Co-ordination

PRIMARY OBJECTIVE 7

Ensure local government and public participation in planning and management of waterways and foreshores.

SPECIFIC OBJECTIVES

- Ensure that the local community and local government are adequately represented on LIMA.
- Incorporate community attitudes, needs and perceptions into planning, management and decision making.
- Liaise with other government agencies and local government authorities to promote integration of environmental considerations within other statutory procedures.
- Develop administrative arrangements with government agencies and local government to ensure referral of developments for consideration by LIMA.

- Ensure that all proposals to prepare management programmes and management plans are advertised and the public given opportunity to make representation.

3.3.8 Management

PRIMARY OBJECTIVE 8

Ensure that a legislative base and appropriately funded body exist to achieve the primary objectives of the Management Programme.

SPECIFIC OBJECTIVES

- Enhance knowledge of the waterways and foreshores to aid future management.
- Ensure management of the estuary in accordance with the Management Programme.
- Provide a mechanism for review and amendment of the programme.

3.3.9 A Vision for the Future

The implementation of the aim and objectives together with other integrated land use and development plans for the Region will result in a variety of recreation opportunities on the waterway.

The Leschenault Inlet will become a gateway to Bunbury City Centre. The southern shore will link to the civic square providing opportunity for walking and cycling. The northern shore with its important mangrove community will provide opportunities for recreation and conservation.

In the estuary a large network of foreshore reserves will give easy access to the southern end and the lower Collie River. People will be able to reach the area by boat, cycle, foot and car. Nodes will be clearly identified for recreation, commercial use and conservation. A co-ordinated landscape plan will visually link activity nodes and linear parks. Development abutting the waterway and foreshore will be limited to certain sites and designed to enhance vistas to and from the waterway. Provision of access to the waterways and foreshores consistent with their protection will remain a high priority.

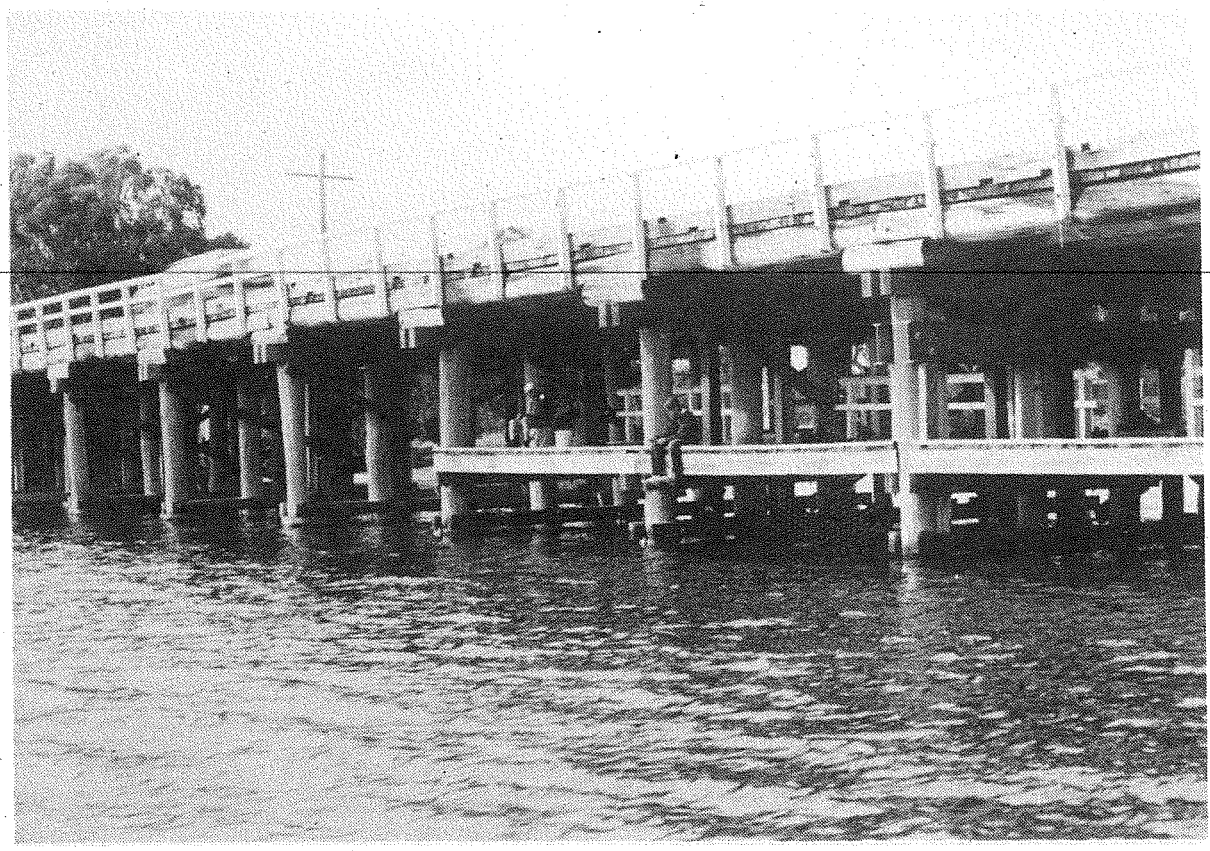
The northern estuary together with the Leschenault Peninsula will be a major conservation area. Cathedral Avenue will provide a scenic outlook over the area.

The upper reaches of the tributaries will essentially remain in private ownership. However, rehabilitation of foreshore areas by landowners will be encouraged.

The Collie Gorge area and abutting State Forest will provide an ideal opportunity for camping and canoeing.

The following two chapters outline the recommendations that are required to achieve the above plan for the future. Chapter 6 details implementation of the various recommendations, responsible agencies and priorities for implementation.

The platform under the Collie River bridge is popular for crabbing and fishing.



The White Egret can be seen in marsh areas abutting the estuary.

CHAPTER 4
GENERAL RECOMMENDATIONS

This chapter details the various issues affecting the Leschenault waterways and catchment and recommendations for dealing with them. The issues have been classified into eight categories according to the objectives detailed in Chapter 3.

Where a particular recommendation calls for the development of a policy or administrative procedure these will appear in Appendix 1 and 2 respectively.

Agencies responsible for implementation of a recommendation are identified in brackets. The lead agency is shown in italics. Abbreviations for agencies are listed at the back of the document.

4.1 LAND USE AND WATERWAY PLANNING

4.1.1 Regional and Local Planning

Need for Action

Regional and local planning is dictated by the Bunbury Region Plan and the various local government authority town planning schemes.

The Bunbury Region Plan - Policy Statement, although not a statutory plan, seeks to guide overall planning for the Bunbury Region. The Policy Statement has recommended that local authority town planning schemes be consistent with the Plan in broad concept and intent. It is also recommended that where local government town planning schemes are inconsistent with the Region Plan either the local authority scheme should be reviewed and amended, or a submission put to the Bunbury and Districts Planning Committee with a view to updating the Region Plan. The Plan needs amending to reflect current industrial zoning in the Kemerton area.

The Waterways Commission and LIMA had considerable involvement with the preparation of the Region Plan with particular regard to the foreshores and waterways. The Policy Statement identifies the foreshores and waterways as either 'Parks Recreation and Drainage' or 'Areas under consideration for Conservation, Scenic Protection and Reservation'.

Three local authorities, Bunbury, Dardanup and Harvey, fall within LIMA's management area. Local authorities in country areas are encouraged to prepare town planning schemes, however, there is no legal requirement to do so. In local authorities where there is pressure for development town planning schemes are generally prepared as this gives the local authority considerable control over development. Such plans are generally reviewed after five years or longer. The local authorities of Bunbury, Dardanup and Harvey all have town planning schemes.

Local government have the opportunity to incorporate policies into town planning schemes. Such a system to protect the waterways has been adopted for coastal planning in the Broome region.

RECOMMENDATIONS

1) Ensure that the Leschenault Waterways Management Programme be complementary to the Bunbury Region Plan (*LIMA*, DPUD).

2) Identify required nodes and linear parks along the foreshores which could ultimately be incorporated into the Region Plan (*LIMA*, DPUD, LGAs).

3) Support DPUD in its desire to provide a statutory and financial framework for ongoing implementation of the Bunbury Region Plan (*DPUD*, LIMA, LGAs).

4) Liaise with local government and DPUD to develop a Regional Open Space plan for the waterway. LIMA should use the Bunbury Region Plan as a means of identifying required recreation areas to accommodate future population growth (*DPUD*, LGAs, LIMA).

5) Develop a system to ensure that LIMA is consulted by DPUD on proposed amendments to the Bunbury Region Plan affecting the waterways (*LIMA*, DPUD).

6) Liaise with local government authorities to promote integration of environmental considerations within the various town planning schemes affecting the management area (*LIMA*, LGAs).

7) Provide comment when town planning schemes and rural strategies become available for review (*LIMA*, LGAs).

8) Encourage the incorporation of policies for foreshores or waterways into local authority town planning schemes, thus giving them a statutory basis (*LGAs*, LIMA, DPUD).

4.1.2 Foreshore Reserves

Need for Action

The foreshore of the waterways is an integral part of the estuarine system providing a recreation and conservation resource of regional importance.

Land uses on the foreshore include recreation, residential, commercial, agriculture and, in parts of the catchment, State Forest and conservation reserve.

The foreshore area contains land of different status such as Crown land, land owned by local authorities, land in private ownership, leased land and State Forests.

It is an objective of LIMA and other government agencies to enable all members of the public to enjoy the right of access to and along the foreshore, and to protect the integrity of the waterways from incompatible development. Unlike in the metropolitan area, no funding exists to purchase land. Obtaining foreshore land depends upon subdivided land being ceded free of cost to the Crown under Section 20A of the Town Planning Act. Developers may also agree to give up foreshore areas as a 'Condition of Development'.

The strategy for foreshore recreation areas is for the creation of 'nodes', or centres of activity, where a clustering of activities will occur. These nodes will be connected by relatively narrow reserves along the rivers, wide enough to permit the passage of pedestrians/cyclists and encompassing where necessary valuable wetlands, topographic features and places of interest. This will enable often limited management resources to be concentrated in these nodes rather than spread over a large area.

There is a strong case for the establishment of foreshore reserves for conservation, preservation of the waterway environment, vegetation protection, species diversity and sanctuary areas for fauna. This has been discussed in Section 4.2.1.

The Waterways Commission in association with LIMA has recently developed a Foreshore Management Policy (see Appendix 1). This Policy is designed to provide a uniform approach to the establishment, planning and development of foreshore reserves by setting guidelines for development and management. The Policy covers such aspects as the acquisition of appropriate foreshore reserves around waterways; the preparation of management plans for foreshore reserves within and adjoining the management area; protection, conservation and enhancement of the foreshore; public access to waterways; funding of foreshore reserves within the management area. This Policy has been adopted by the Waterways Commission.

Where it is unlikely that land will be subdivided and foreshore land ceded to the Crown alternatives to acquisition need to be identified. This will reduce public expenditure and enable public access to more of the waterways system. Affected landowners should be consulted over such aspects as loss of privacy, effect on livelihood, increased fire risk.

It is extremely important that, in determining the alignment of a foreshore reserve, the area be pegged and inspected to ensure that the land is a suitable width and size for the long term plans of LIMA and local government.

RECOMMENDATIONS

9) Implement the Waterways Commission Foreshore Management Policy (*LIMA*).

10) Determine the need and priorities for establishment of foreshore reserves (*LIMA*, DPUD, LGA).

11) Ensure that land taken as a condition of subdivision serves a useful function. Criteria for determining width and shape of foreshore reserves should include (*LIMA*):

- future land use
- conservation of natural ecosystems
- educational value
- recreation links including linear parks
- the flood plains
- heritage values
- landscape conservation
- management access
- public access
- local and regional significance
- erosion and accretion processes
- climate change
- wildlife corridors
- fire management

12) Require that all proposed foreshore reserves are pegged and inspected before approval is given (*DPUD*, LIMA).

13) Examine alternatives to acquisition for land adjacent to the waterway within rural areas (*LIMA*, DPUD, LGAs).

14) Investigate the feasibility of entering into agreements with private landowners to ensure the right of public access, while protecting the rights of landowners, and achieving satisfactory public liability arrangements (*LIMA*, DPUD, LGAs).

4.1.3 Commercial Development

Need for Action

Commercial development can enhance the community's use of the waterway. However it should not affect its living systems or public access and amenity. For this reason it should not be assumed that commercial development would be permitted on the waterways.

Commercial development includes the construction of facilities and provision of services for the purpose of generating income for profit. Generally commercial developments on the waterway should be associated with recreation and tourist facilities. Marine service industries

have been accommodated on a number of other waterways around the State. However, the shallow nature and limited navigable water of the Leschenault system make such facilities not feasible and undesirable.

A wide range of facilities that may be considered include a limited amount of tourist accommodation and high standard restaurants, tearooms and kiosks with associated small boat and bicycle hire outlets. Such developments should be confined to already modified areas of the waterway and foreshores.

Managing and maintaining the waterways and foreshores can be very expensive, particularly in areas of heavy recreational use. Proposals for commercial developments should be considered on the basis that they are capable of returning economic rents and paying rates and taxes appropriate to their activity. Such revenue may then be used to assist LIMA, DMH and/or local government in managing the waterways and foreshores. It is important that all those that benefit financially from the waterways should contribute directly to the cost of their care and maintenance.

Advertising is regarded as development by planning authorities and requires development approval. Advertising on the foreshore requires the approval of the relevant local authority. Advertising over the water requires the approval of LIMA, DMH and/or the Bunbury Port Authority.

Where land is foreshore reserve, it is largely because of its attractiveness, and therefore outdoor advertising is unlikely to be acceptable. Similarly advertising on vessels moored in strategic locations or floating hoardings may be regarded as unacceptable. Temporary advertising for special events may be acceptable in some circumstances. DOLA is currently reviewing the Land Act 1933, Amended, to determine the need for amendments to control advertising on Land Act reserves.

RECOMMENDATIONS

15) Identify areas on the foreshore suitable for commercial developments based on the following social, environmental and physical planning criteria (*LIMA*, DPUD, LGA, SWDA):

- Availability of the essential services required by the development including water, sewerage, electricity and telephone.
- Likelihood of the development having an adverse impact on neighbouring residential areas because of noise, traffic and parking.
- Intent of the LGA town planning scheme as it relates to adjacent areas.
- Impact of the development on the amenity of the existing landscape and natural environment.
- Effect the development may have on the hydrology of the floodway and flood plain, and risk of flooding to the development.
- Every proposal for commercial development should be considered on its individual merits. It should also be considered in context to take into account cumulative impacts.
- Impact of the development on public access to the foreshore.

16) Refer major proposals which involve over-water structures, developmental dredging, filling of the waterway or those which abut or include System 6 recommendations, to the EPA for environmental impact assessment (*LIMA*, EPA).

17) Identify areas suitable for hire and house boat activities (*LIMA*, LGA, DMH, EPA).

18) Assess developments to ensure that they are set back from the waterway where appropriate to allow space for public amenity, and to protect features of natural, scientific, visual and cultural significance (*DPUD*, LGA, LIMA).

19) Ensure that advertising development proposals are assessed by the appropriate agency or agencies (*LGA*, LIMA).

20) Ensure that advertising associated with commercial developments is assessed as part of the approval process (*LIMA*, LGA, DPUD).

4.1.4 Climatic Change - The Greenhouse Effect

Need for Action

Scientific research indicates that significant changes in the global climate can be expected in the next 20 to 30 years as a result of increasing carbon dioxide, methane, chlorofluorocarbons, freons and nitrous oxide levels in the atmosphere. Indications are that atmospheric temperatures in Australia could rise between 1.5 and 4.5°C. Sea levels could also rise, rainfall and weather patterns may change and extreme events, like storms, could increase. Preliminary work indicates that sea levels could rise between 0.3 metres and 1.6 metres. These predictions are based on work presented at an international conference at Belagio, Italy, in 1987 (WAWRC).

The State Government has developed a policy statement in response to the predicted Greenhouse Effect. The Policy Statement aims to increase

people's knowledge of the situation and provide incentives for change; when advising on developments around the waterway LIMA can incorporate the Policy Statement into its decision making.

RECOMMENDATIONS

21) Support the Government's Policy Statement on "Greenhouse-Meeting the Challenge" (*LIMA*).

22) Ensure that Water Authority advice on flooding takes into account the Greenhouse Effect (*WAWA*, LIMA).

23) Ensure that the width and shape of foreshore reserves are based on topographical features and will be sufficient if water levels rise (*LIMA*, DPUD, LGA, WAWA).

24) Ensure that facilities and structures are of suitable design or can be easily modified to accommodate rises in water level (*LIMA*).

4.1.5 Canal Developments

Need for Action

It is considered that there is very limited opportunity for canal developments on the Leschenault waterway. LIMA has developed a policy to reflect this (see Appendix 1 - Residential Development Policy).

Artificial channels, lakes, harbours or embayments have been proposed on the estuary and Collie River in the past for navigational, ornamental, recreational or residential purposes. Often proposals involve substantial modification of low-lying foreshore areas. These low-lying areas are often important wetland areas and wildlife refuges and areas also generally affected by flooding. Water quality can be a problem if the waterways are not adequately flushed or if the surrounding waters are not of sufficient standard.

Guidelines for the development of canal estates have previously been endorsed by Cabinet. These guidelines are currently being reviewed to address the problem of ongoing management of canal estate waterways.

RECOMMENDATIONS

25) Ensure that proposals for canal developments which comply with "Recommendations for the Development of Canal Estates", endorsed by Cabinet, undergo adequate environmental assessment (*LIMA*).

26) Advise developers that LIMA considers that there are limited opportunities for appropriate canal developments and such developments are unlikely to be approved unless they conform rigidly with LIMA's Policy (*LIMA*, DPUD).

4.1.6 Water Resources

Need for Action

Rivers and streams feeding into Leschenault Estuary provide important water supply resources for the Bunbury and Katanning regions. A number of these tributaries are already dammed for water supply or irrigation purposes, others such as the Harris and Brunswick Rivers have been identified as future water resources. Responsibility for water supply lies with the Water Authority of Western Australia.

The impoundment of waters can have an impact on the waterways and foreshores and this must be taken into consideration when planning and managing dams. Changes in river flow can affect flora and fauna, water quality and established uses of the waterways. Clearing in the Wellington catchment has resulted in increasing salinity levels in the Wellington Dam and Collie River. The Water Authority has imposed restrictions on land clearing within the catchment and is currently revegetating parts of the catchment. It is important that proposals which have the potential to alter river flow undergo adequate environmental assessment. Proposals should aim to provide a flow equal to what would have been available to meet established uses and the environment, had the river flow not been altered.

Use of dams and rivers for irrigation purposes can have advantages by providing water flow in rivers during summer. The Collie Gorge for example provides canoeing opportunities during summer and it is expected that the Wellington Dam will be used for recreational purposes once the Harris Dam is completed.

The WA Water Resources Council has recently looked at the issue of Transferrable Water Entitlements. A preliminary report indicated that the Brunswick/Collie and Preston irrigation systems could operate on such a system (WAWRC, 1988). Before such a system is implemented, it is important that the impact on instream uses is clearly assessed and monitoring of the system occurs to assess any problems.

RECOMMENDATIONS

27) Ensure that proposals to upgrade or build dams, weirs or other constructions partially or totally obstructing a water course are referred to the EPA for environmental assessment. Proposals should be reviewed from a local and regional perspective. The assessment should also determine requirements for maintenance of instream flora and fauna (*EPA*, LIMA).

28) Support the Water Authority in efforts to rehabilitate water catchments and reduce salinity levels (*WAWA*, LIMA).

4.1.7 Transport Network and Utility Services

Need for Action

The regional road and rail network is identified in the Bunbury Region Plan. Regional roads and railways cross the rivers at several points while a large number of local roads are located adjacent to the foreshores. They may provide an attractive vista for motorists and access to the foreshore. But roads carrying high volumes of traffic reduce the foreshore amenity if they are too close to the waterway or provide a barrier to access. Use of local roads by commercial vehicles can reduce the scenic qualities of the road and increase the potential for accidental spillage. A by-pass road has recently been constructed east of Australind and Eaton diverting heavy traffic away from the Old Coast Road and the estuary foreshore.

Accidental spillage of goods being transported can have serious consequences if contaminants enter the waterway directly or via stormwater outlets. Similarly oil and petrol can enter the waterway via drains from roadways and carparks (See Section 4.2.2.7).

Under the Waterways Conservation Regulations 1981, a bridge in, over or contiguous with the waterway shall not be constructed unless a current licence has been issued by LIMA.

In suitable locations fishing platforms, walk and cycleways and swimming jetties can be provided as part of bridge construction enhancing recreational use of the area.

Foreshore reserves are often regarded as ideal locations for utility services. At times this is inevitable, as services such as water supply, sewerage, electricity, gas and telecommunications must cross the river. Careful site design and selection of crossing points can minimise disturbance of the foreshore reserve (See Section 4.2.2.5 regarding stormwater disposal from roadways).

RECOMMENDATIONS

29) Ensure that major road developments within the management area undergo adequate environmental assessment (*DPUD*, LGA, LIMA, EPA).

30) Review proposals for minor roads taking account of their proximity to the estuary, the nature of the area, type of construction methods, impact on the hydrology of the foreshore area, stormwater discharge from the roadway, use and maintenance of catchtraps and the possibility of accidental spillage (*LGA*, DPUD, LIMA).

31) Review the feasibility of incorporating recreational facilities into bridge design when issuing licences for bridge construction (*MRD*, LIMA).

32) Plan service corridors to provide for the combined needs of utilities so that all services cross the river at fewer locations, where the impact can be minimised (*DPUD*, SECWA, MRD, WESTRAIL, WAWA, LIMA).

4.1.8 Industry

Need for Action

Areas zoned for industrial development are identified in the Bunbury Region Plan. One exception is Kemerton Industrial Park. An amendment to the Region Plan will be required to reflect this current land use. Other major industrial areas are the Port of Bunbury and Picton. The latter is dissected by the Preston and Ferguson Rivers. The Preston River is within the management area, however the Ferguson is not.

A number of industries are licensed to discharge to the Leschenault Estuary and/or its tributaries or drainage network. Criteria for discharge are based on the capacity of receiving waters to be affected by the discharge. LIMA will work towards phasing out industrial discharges to the waterways.

The Environmental Protection Act 1986 gives the EPA Statewide pollution control powers, including water pollution. The Water Authority controls industrial discharge to the drainage system under powers delegated by the EPA. LIMA operated until June 1989 under the Waterways Conservation Act but has now also been delegated powers by the EPA. An administrative arrangement is required between these three agencies to co-ordinate the licensing, monitoring and review of licence conditions for effluent likely to affect the Leschenault waterways.

RECOMMENDATIONS

33) Extend the Leschenault Inlet Management Area to include that part of the Ferguson River abutting proposed industrial areas (*EPA*, LIMA).

34) Establish an administrative procedure between LIMA, WAWA and EPA to deal with licensing of industrial discharges, sampling of discharge, monitoring of conditions and review of licences (See Section 4.2.2.9) (*LIMA*, EPA, WAWA).

35) Ensure that major industries proposed in the catchment area that are likely to have an impact on the waterways undergo adequate environmental assessment (*LIMA*, EPA).

4.1.9 Flooding and Flood Plain Management

Need for Action

Historically, low-lying areas surrounding the Leschenault Estuary and parts of East Bunbury including the Glen Iris area have been inundated either by floods in the Collie and Preston Rivers or by extreme tidal events.

In 1981 the then Public Works Department (George, 1981) undertook a regional flood study of the Collie River, the lower reaches of the Preston River and Leschenault Estuary together with the ocean outlet at the Cut. All these bodies of water together with the adjoining ocean form one large interactive hydraulic system.

The purpose of the study was to enable management strategies to be formulated by government and local authorities for the protection of existing developments and guidance for development of flood prone lands. Without such a strategy increasing urban development and land filling along the river foreshore would result in intrusions into the flood plain increasing the effects of flooding on other areas of the river as well as adjacent developments.

Subsequent to the PWD 1981 study, the Water Authority of WA designed relief floodways for the Collie and Preston Rivers. On the Collie River the floodway option provides a development strategy at the river mouth that optimises land available for development while ensuring that the flood hazard is reduced or at least maintained at an acceptable level. The plan directs and concentrates bank overflow safely into a developed floodway on Location 26 (Pelican Point). This permits extensive development on all land outside the 250 m floodway without transferred flood disability for others. The floodway should be suitable for recreational use or temporary occupation but permanent structures that obstruct flow should not be permitted.

Similarly, to minimise the opportunity for flooding of the Preston River and surrounding areas to occur a relief floodway has been designed through Glen Iris to connect to the Preston River at a point lower down.

Both floodway options are depicted on Map 3.

The primary agency responsible for river flood plain management is the Water Authority. Under current arrangements, it acts as a consultant and advises planning authorities on matters affecting the passage of floods along rivers and flood plains. The final decisions on land planning and development proposals are made by the planning authorities.

While this informal arrangement between the Water Authority, DPUD and local government authorities has worked well, it is proposed to include a modified version of the river management provisions in the Bill to consolidate all Water Authority legislation and hence formalise this arrangement.

As well as exacerbating flooding, filling of the flood plain can also result in loss of wildlife habitats which provide food and nesting grounds for fauna. It is important that proposals for filling of the flood plain consider the ecological importance of the area.

RECOMMENDATIONS

36) Liaise with WAWA and local government on developments within the flood plain (*LIMA*, WAWA) LGAs).

37) Identify key areas where filling of the flood plain may result in loss of important flora and fauna, ensuring that planning authorities are aware of the significance of these areas when assessing development proposals (*LIMA*).

38) Encourage the Water Authority to prepare and update flood plain management plans for the river system. These should consider factors such as flood behaviour, including risk and effects of future developments, conservation of the natural environment, social factors and planning issues (*WAWA*, LIMA).

39) Support an investigation of the need for legislative change, in conjunction with the consolidation of Water Authority Acts and amendments to other planning Acts, to ensure that suitable co-ordination exists between planning authorities and the Water Authority for sound flood plain management (*WAWA*, LIMA).

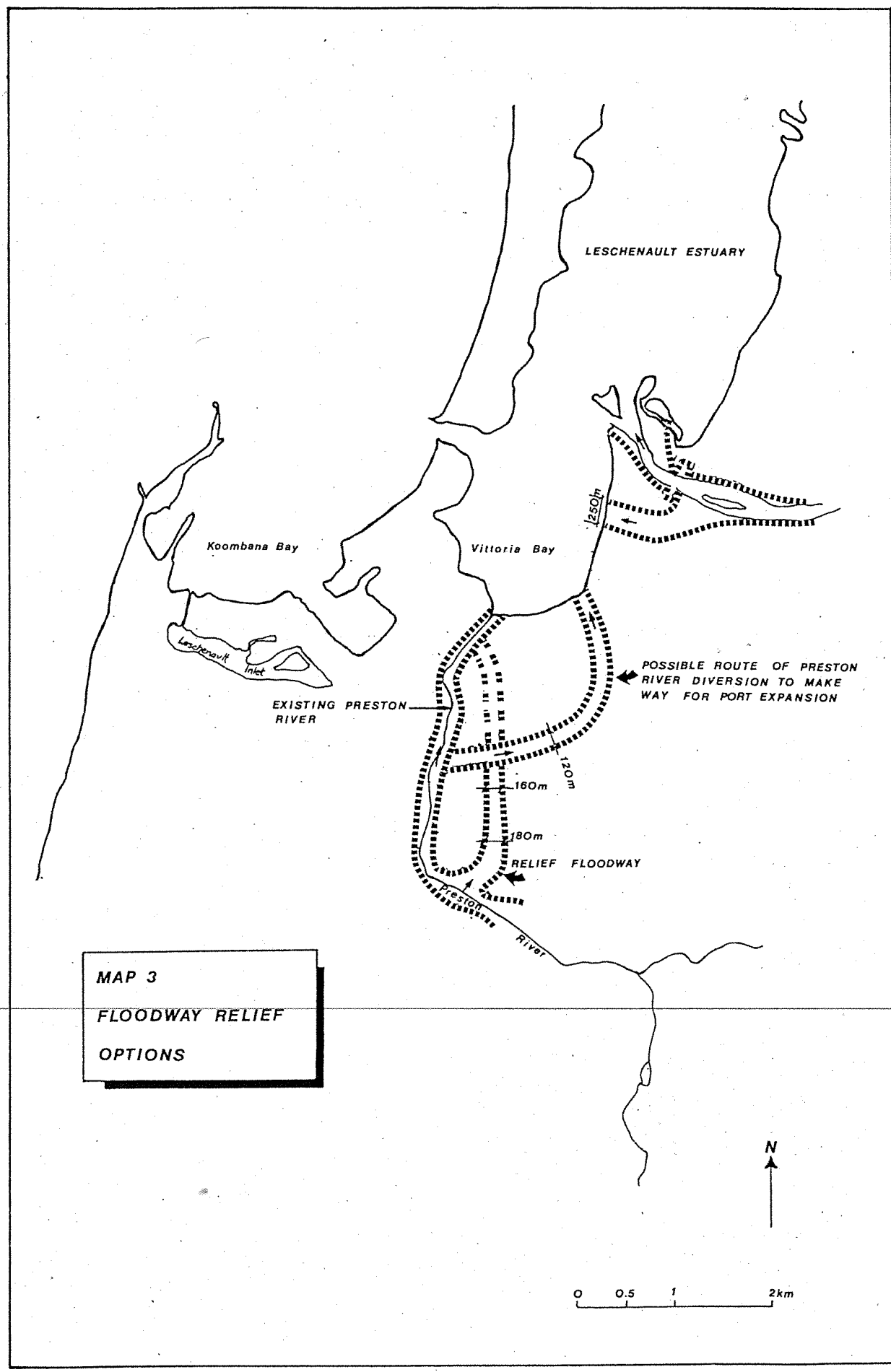
4.1.10 Urban Development

Need for Action

Special consideration should be given to urban development of foreshore areas and land abutting foreshore reserves to ensure that developments do not affect the integrity of the waterway and foreshore.

Continuity of development around the river to avoid a clash of contrasting styles should be achieved wherever possible. Particular attention should be paid to residential density codes selected for land abutting foreshore reserves.

Where foreshore reserves include environmentally sensitive areas such as wetlands and wildlife habitats moves toward higher densities could be detrimental to the integrity of the foreshore reserve. Problems may occur as a direct result of


LESCHENAULT ESTUARY
Koombana Bay
Vittoria Bay
Leschenault Inlet
250m
EXISTING PRESTON RIVER
POSSIBLE ROUTE OF PRESTON RIVER DIVERSION TO MAKE WAY FOR PORT EXPANSION
120m
160m
180m
RELIEF FLOODWAY
Preston River
MAP 3
FLOODWAY RELIEF OPTIONS
N
0 0.5 1 2km

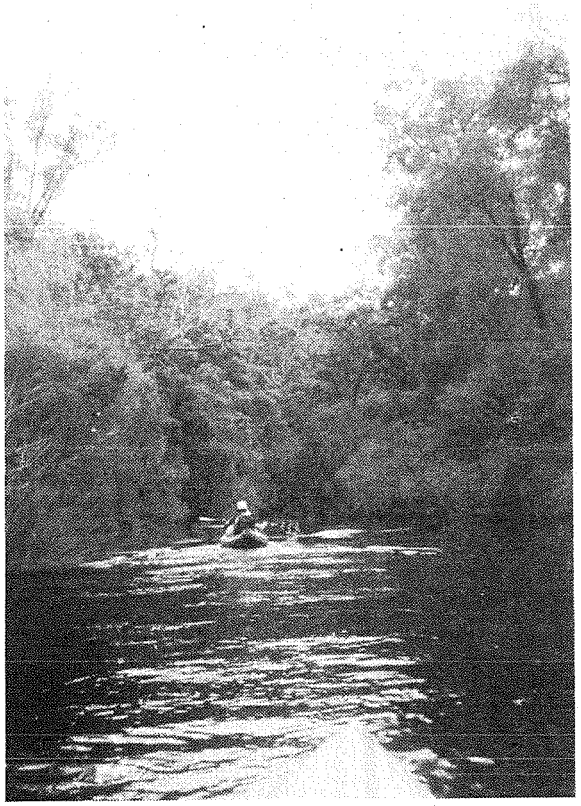
Increased people pressure (for example lighting and noise, trampling and intrusion, rubbish dumping and litter, dogs and other pets, introduction of exotic species of vegetation, insecticides and other pollutants).

Where foreshore reserves are predominantly recreation areas, and are extensive in area, increased densities in adjoining residential areas may be compatible and desirable, enabling many more residents to enjoy an enhanced level of access to the foreshore. A further benefit is that pressure is directed away from sensitive areas.

In considering the appropriateness of residential densities in town planning schemes and in proposed amendments to schemes, local government authorities should be aware of the implications of high density developments on adjoining environmentally sensitive river foreshores.

Early consultation by local government with LIMA and other relevant agencies during the preparation of a town planning scheme can achieve these fundamental requirements.

The examination of development proposals should focus on their compatibility with the river environment, and include an assessment of the extent to which the development will be maintained and properly managed by the proponent without unnecessary cost to the public or detriment to the landscape.



The Collie River Gorge.

RECOMMENDATIONS

40) Ensure that any residential development in newly developed or undeveloped river locations has regard for (*LGA*, LIMA, DPUD):

- the nature of the foreshore, whether conservation or recreation based;
- the degree of modification to the foreshore;
- the ability of the foreshore to sustain added usage;
- the predominant characteristics of adjoining residential areas; and
- the degree of protection afforded to the foreshore, particularly to conservation areas.

41) Assess proposed residential developments in riverside locations with due regard for the foreshore. Aspects to be considered include siting of buildings, scale and the shape and form of the development (height, bulk, colour and choice of materials, landscaping, earthworks, etc.) (*LIMA*, LGA, DPUD).

4.2 CONSERVATION AND ENVIRONMENTAL PROTECTION

4.2.1 Conservation Areas

Need for Action

Since settlement much of the waterway system has been modified and relocated resulting in considerable loss of foreshore vegetation and fringing wetlands (see Chapter 2 for specific details).

Fringing vegetation, particularly in wetlands, provides food and shelter for bird life and traps nutrients and pollutants in land drainage, slowing their passage to the estuary. Fringing vegetation also stabilises the banks and foreshores of the waterway. In areas where this vegetation cover has been removed, erosion of the banks is accelerated producing the need for revegetation or structures such as retaining walls.

The retention and rehabilitation of the remaining fringing vegetation provides wildlife habitats that are at a premium, reservoirs of plant material and genetic diversity and a natural means of erosion control while maintaining the variation in river landscapes. Controlled eradication programmes of declared plants and animals are carried out in foreshore areas and should continue. Rehabilitation of foreshore vegetation is often financially prohibitive and time consuming. There is opportunity to encourage community groups to become involved with such projects.

The System 6 Report (DCE, 1983a) identified much of the Leschenault waterways and tributaries as being of regional significance and worthy of preservation. The report's recommendations embraced the concepts of conservation and recreation reserves and linear parks that could be designated as regional parks.

Four broad areas are identified in the report:

- C66 Leschenault Inlet (correct name Estuary) encompassing the Leschenault Estuary and Peninsula north of Pelican Point and the Cut.

- C67 Brunswick, Collie and Wellesley Rivers comprising the Brunswick River downstream from Brunswick Junction, the Wellesley River downstream from about 1 km north of its intersection with Wellesley Road, and the Collie River from its mouth in the Leschenault Estuary to approximately 4 km upstream.

- C68 Anglesea Island - comprising the white mangrove and bird feeding and roosting areas of Leschenault Inlet and Anglesea Island.

- C87 Lennard Management Priority Area.

In addition the area of Vittoria Bay has been identified in a report to the Bunbury Region Plan Technical Committee by the Technical Sub-Committee Vittoria Bay (1985) as being an important bird feeding and roosting habitat. More recently a report by Ninox Wildlife Consulting (1989) reported that 72% of all shorebirds recorded throughout the estuary were observed in the Preston River mouth area.

Ninox (1989) also reported that the Leschenault Estuary is important to waterbirds and that its fringing wetlands, where mosquito breeding takes place, are an integral and necessary part of the system. It is stated that further loss or degradation of fringing wetlands will adversely affect waterbird populations on the estuary. Tidal saltmarshes stand out as productive waterbird locations with their wetland samphire areas, small pools and associated shorelines contributing most to maintaining waterbird populations.

Eighteen birds protected by the Japan/Australia, China/Australia Migratory Bird Agreements (JAMBA and CAMBA) occur on the Leschenault Estuary (Ninox 1989). Australia is bound by these agreements to protect these migratory birds and their habitats.

The large white egret can be seen feeding on the estuary. Morangerel Swamp and the Rosamel Road area are also breeding areas for the egret. It is important that both the breeding and feeding areas of the white egret are protected.

The majority of the Leschenault waterways are less than 1 metre deep. These tidal flats are fish nursery areas and as such are important to the viability of the recreational and commercial fishery.

Shallow banks are areas of high productivity. Seagrass meadows are found on these banks while other parts remain bare of vegetation, save for occasional drifts of algae. A rich invertebrate fauna (worms, molluscs and crustacea) live in the sediments on these shallow banks (Van de Wiele, 1987).

All of the important exploited fish and shellfish taken from the estuary depend on the shallow banks for essential food and shelter. The degradation or loss of these habitats reduces the waterways' ability to support the abundant fauna including fish and birds which attract people to the waterways. It is difficult to nominate a particular priority amongst banks because:

i) The relative productivity of different banks varies seasonally and annually.

ii) The relative abundance of different species of fish and shellfish in the estuary varies annually and the distribution of the various life history stages throughout the estuary varies seasonally.

It is, therefore, essential to retain shallow banks in the waterways to ensure continued use by the present diverse fish and shellfish fauna, which contributes significantly to the continued viability of the commercial and recreational fisheries.

Recognising this, it is possible to nominate some broad areas which can be regarded as priority areas for fish communities.

Van de Wiele (1987) identifies the area immediately adjacent to Waterloo Head as the most productive in terms of both plant biomass and invertebrate numbers. Invertebrate fauna numbers decrease further south from this point. Productivity was highest on submarginal mud flats and sandy platforms. As a result of this study LIMA has promoted a 'no boating zone' north of Waterloo Head on a trial basis. Observations indicate that this measure has been relatively successful in discouraging powerboat usage in this area. This 'no boating zone' currently has no legal status nor can a Land Act reserve be created below low water mark. There are a number of problems associated with protection of this area under current legislation.

Currently land above low water mark can be reserved for the conservation of flora and fauna and vested with conditions in an agency specified by the Minister for Lands under the Land Act. Land both above and below low water mark (i.e. adjacent to or in the water) can be reserved as a Marine Nature Reserve or Marine Park for the protection of marine and freshwater flora and fauna and vested in CALM under the Conservation and Land Management Act. CALM are obliged to manage reserves created under the CALM Act,

whereas the Minister for Lands determines the appropriate management body for Land Act reserves.

In a multi-purpose waterway there should be a range of options for managing conservation areas, depending on traditional uses and the sensitivity of the area, by CALM and other agencies, for example the Waterways Commission/LIMA or an LGA. To achieve this, it will be necessary to amend the Land Act to enable Land Act reserves to be created below low water mark. These changes would then allow for the choice of a suitable management agency for conservation areas to be widened and for a wider variety of conservation areas, especially below low water mark, to be created.

Given the System 6 recommendations and the results of other studies, these areas should be identified for the purpose of conservation.

Permitted uses that do not detract from the conservation values of these proposed reserves while substantially enabling a continuation of traditional uses must be identified and, where appropriate, provided for in the declaration of the reserves (e.g. commercial and recreational fishing, boating, swimming). Management of conservation reserves, including permitted uses, will be guided by management plans. Management may include classifying sections of the proposed reserves for a variety of uses ranging from highly sensitive prohibited areas to recreational areas for specified activities. In all of these areas liaison and co-operation with the relevant local government authority is essential.

RECOMMENDATIONS

42) Evaluate fringing wetlands for establishment and vesting as reserves for the conservation of flora and fauna or the protection of the environment. The evaluation should include detailed assessment of the flora and fauna, permitted uses, definition of boundaries and adjacent land uses (*LIMA*, CALM, DOLA, LGAs).

43) Reserve the following areas for the conservation of flora and fauna and protection of the environment (*DOLA*, LIMA, CALM, LGAs):

- The northern estuary above Waterloo Head.
- Vittoria Bay (Turkey Point to Pelican Point, including the Preston River mouth).
- The Leschenault Inlet affected by System 6 Recommendation C68.

Amend the Land Act 1933 to allow for the reservation of land below low water mark for the conservation of flora and fauna and protection of the environment and identify the appropriate management agencies for vesting.

44) Prepare and release for public comment management plans for all areas reserved for the purpose of conservation of flora and fauna and protection of the environment, giving particular consideration to the following aspects where appropriate (*CALM*, LGA, LIMA):

- Commercial and amateur fishing and crabbing.
- Boating activities.
- Other recreational activities adjacent to and in various parts of the reserve.

45) Develop management agreements with private landowners for the protection of wetlands and fringing vegetation on private property (*LIMA*, LGAs).

46) Ensure that development and activities on the foreshore involve the maintenance and restoration of native vegetation and natural landforms (*LIMA*, DPUD, LGA).

47) Prepare a strategy for rehabilitation of the foreshore and waterways margins covering issues such as: (*LIMA*, CALM, LGAs)

- identification of fringing vegetation;
- controlled eradication of declared plants and animals;
- current ownership and management;
- work to protect and rehabilitate areas of vegetation;.and
- research to determine effective techniques for rehabilitating degraded fringing vegetation, weed control, use of biological filters on proposed drainage systems and encouragement of community groups to become involved with rehabilitation of foreshore areas.

4.2.2 Water Quality

Water quality is a complex major issue; ten important aspects are identified and discussed below.

4.2.2.1 Water Quality Monitoring

Need for Action

Nutrient enrichment of estuaries in the South West of Western Australia is an increasing problem. Nutrients from years of fertiliser application to farm land, urban stormwater runoff and discharge from industry are entering many of these estuaries via rivers and streams, enriching them and causing a decline in the natural seagrasses and an increase in algal growth. The growth of algae can reach nuisance proportions, fouling fishing nets and beaches where decomposition of dead algae causes unpleasant odours. Blooms of microscopic algae colour the water giving it a slimy feel and can cause fish deaths on decomposition. The most notable example of this problem today is the Peel-Harvey Estuary at Mandurah.

The coastal plain catchment consists largely of sand over clay soils, extending from the Darling Scarp to meet deep grey sands midway to the estuary. Brown and yellow sands are located along the Brunswick, Collie and Preston river valleys. Nutrient release from these soil complexes varies, with deep grey sands releasing relatively more nutrients than sand over clay, which in turn release more nutrients than brown and yellow sands (DCE, 1983b). Hence the coastal plain catchment consists largely of soils that may readily lose their nutrient components to drainage.

Continuous water quality monitoring of the Leschenault waterways commenced in 1976. Modifications to the hydrology of the estuary resulting from the Preston River diversion, construction of the Cut and Inner Harbour, and the separation of the Leschenault Inlet from the Leschenault Estuary make comparison of water quality conditions difficult prior to 1976.

Due to the location of river discharges it can be assumed that a large proportion of the annual riverine nutrient load is directly exported to the ocean via the Cut' However, this depends on tidal forcing and circulation within the estuary.

An assessment of water quality in Leschenault Estuary by Klemm (1984) indicated that:

- Based on phosphorus ranges only the Estuary was eu-polytrophic.
- Based on total inorganic nitrogen levels the Estuary was oligo-mesotrophic.
- Based on chlorophyll 'a' levels the Estuary was mesotrophic with a high possibility of becoming eutrophic.

Further to this a five year monitoring programme was undertaken from winter 1984 to winter 1988 inclusive.

The study aimed to estimate the nutrient loading of the Leschenault Estuary during the high river flow periods and measure changes in water quality and sediment nutrient conditions during this period. A review of three years data by Klemm et al (1987) indicated that at present the Leschenault Estuary is a healthy environment. The areal phosphorus loss from the Leschenault catchment and the areal loading to the estuary are similar to those of the Peel-Harvey system. It was concluded from the data that the Leschenault system has the potential to develop a nuisance algal problem and that the proximity of the Cut as the river discharge point in the Leschenault Estuary is probably a major reason why such problems have not occurred to date. Notwithstanding this the high areal macroalgae biomass recorded in the estuary suggests that it is vulnerable to further nutrient enrichment.

RECOMMENDATIONS

48) Assess the data from the five year monitoring programme with the view to developing a management plan to reduce nutrient inputs if necessary (*WWC*, LIMA, EPA, LICMG, SWDA).

49) Determine an on-going monitoring programme based on the results of the five year study (*LIMA*, WWC).

4.2.2.2 Integrated Catchment Management

Need for Action

The concept of integrated catchment management has been promoted in recent years on both a National and State level. The State Government adopted the policy of an integrated approach to catchment management in November 1987. In adopting this policy the Government established an Integrated Catchment Management Policy Group (ICMPG) to advise Cabinet and to ensure co-ordination and integration of plans and policies as they relate to resource allocation, use and management, on a surface water and groundwater catchment basis. This group has been superseded by the Office of Catchment Management under the Waterways Commission. Fundamental to this approach is that emphasis is placed on co-ordinating and strengthening existing institutional and legal arrangements, rather than establishing new institutions.

In the past there was an urgent need for new rubbish disposal facilities to serve the three local authorities in the Leschenault area. Site options included areas in the vicinity of the Preston, Collie and Brunswick Rivers. Sandy soils such as Bassendean Sands are common in such areas and are well known for their nutrient leaching capacity. A site has now been found for this facility.

However, because of concerns about the establishment of regional rubbish disposal sites, occurrence of algal blooms and agricultural and industrial sources of nutrients entering the estuary LIMA sought the assistance of SWDA in establishing a steering committee to oversee the development of a regional waste disposal and catchment management strategy.

The terms of reference for the committee are:

- To identify all present sources of pollutants including industrial, domestic and agricultural wastes.
- To identify current local and State government authorities' responsibilities and practices in the management of water and wastes in the catchment area.
- To develop strategies for effectively disposing of industrial, domestic and agricultural wastes in the catchment area.
- To develop an integrated catchment management plan for the Leschenault catchment area, comprising the Preston, Wellesley, Ferguson, Collie and Brunswick river basins.
- To involve the community in the development of the management plan and

to increase awareness of the problem and solutions in the community.

Membership of the Group is designed to cover the issues of industrial and domestic waste and agriculture, particularly fertiliser and soil management practices.

Leschenault Integrated Catchment Management Group.

Industrial and Domestic Waste Subcommittee
SWDA
Bunbury City Council
Harvey Shire Council
Waterways Commission
Health Department
EPA
WAWA

Agricultural Subcommittee
Department of Agriculture
CALM
WA Farmers Federation
Donnybrook Shire Council
Dardanup Shire Council
DPUD
LIMA/Waterways Commission

RECOMMENDATIONS

50) Develop a regional catchment and waste disposal management strategy. The strategy should cover all issues affecting water quality including the development of fertiliser and soil management practices as well as industrial waste disposal both in the catchment and to the waterways (*LICMG*, LIMA, WWC).

4.2.2.3 Algal Growth and Water Quality

Need for Action

Water quality monitoring in the Leschenault Estuary carried out over the previous ten years indicates a nutrient inflow equating to the Peel-Harvey system.

In an effort to quantify the frequency of algal blooms in the waterways LIMA and the Waterways Commission have been monitoring and observing the waterways in greater detail in recent years.

In 1988 for the first time since water quality and sampling began, a bloom of Cladophora (macro algae) occurred in Vittoria Bay in the Leschenault Estuary. This species is the same as that which causes much of the problem in the Peel-Harvey Estuary.

Similarly phytoplankton blooms were recorded in the summers of 1987 to 1989 although it is suspected that many phytoplankton blooms go undetected in the Collie and Preston Rivers.

Observations of such blooms will provide base line data on which to gauge changes in frequency and size of algal blooms in the waterways.

Toxic species of dinoflagellates have formed blooms in other Australian estuaries. Current concern is that ballast water from woodchip carriers may be spreading resting cysts of toxic dinoflagellates from affected areas. Steps should be taken to prevent cysts from being transported into WA ports where they may germinate and affect our estuaries.

RECOMMENDATIONS

51) Monitor sediments in the inner and outer harbour adjacent to woodchip loading areas for toxic dinoflagellate cysts during the summer period (*LIMA*, BPA).

52) Support moves to control the quality of ballast water discharge in all WA ports(*LIMA*, DMH, BPA).

53) Ensure that macrophyte biomass sampling coincides with the appearance of macrophyte blooms (*LIMA*).

54) Monitor macrophyte and phytoplankton blooms in the waterways to provide base line data on their occurrence (*LIMA*).

4.2.2.4 Heavy Metals and Air-Conditioning Bleed Off

Need for Action

In the metropolitan area concern has been raised over the amount of heavy metals entering the Swan River via the stormwater system from air-conditioning bleed off. A study is being undertaken to determine levels and the subsequent impact on river flora and fauna. Stormwater from Bunbury City discharges into the Leschenault Inlet. It is therefore important to assess the potential problem in the Leschenault Inlet given growth of the City and the increase in large air-conditioned buildings in Bunbury City. Results from the Swan River study should be used to determine the situation in Leschenault Inlet.

RECOMMENDATIONS

55) Determine the need for an investigation of heavy metal discharges into the Leschenault Inlet based on the results of the Swan River Study (*LIMA*, WWC, SRT).

4.2.2.5 Stormwater Disposal

Need for Action

The Leschenault system is the major ocean outlet for surface and groundwater drainage of the Collie and Preston catchments. The river system and the many associated brooks, creeks and artificial

waterways form an intricate arterial drainage network which drains large areas of Bunbury, Australind and Eaton.

This drainage network is the primary means by which traces of a variety of substances can reach the waterways. Many of these substances can, in large enough quantities, cause pollution of the waterways. Some upset the balance of the ecosystem, like fertilisers causing excessive plant or algae growth, and silt which makes the water murky and unsuitable for fish, as well as reducing plant growth by cutting down available light. Other substances are toxic and include, as well as chemicals from industry, domestic chemicals such as garden and termite control sprays. Toxic substances can also enter the drainage system as a result of accidental spillage.

However, it must be recognised that it is not practical to eliminate stormwater runoff or groundwater from the waterways as the waterways are the essential natural discharge point for the stormwater system.

The drainage system must be designed and maintained to minimise the impact on the waterways of substances in drainage water. Urban growth in Australind, Eaton and the Glen Iris areas will require drainage to the rivers. Such developments should be adequately assessed for potential drainage to the river system.

Wherever possible stormwater should be disposed of on-site. Use of fertilisers on gardens and parklands should be minimised in order to reduce the amount of nutrients entering the waterways via the stormwater system or groundwater leachate.

Stormwater disposal can result in hydrological changes to peripheral vegetation. Similarly vegetation can trap nutrients before entering the waterways. Stormwater outlets can be unsightly and effort should be made to reduce the visual impact of such facilities by incorporating them into the design of other facilities, locating them away from major recreation areas, and minimising vegetation removal from around the drain. Care should be taken in the location and design of the drainage outlets to reduce problems of erosion and siltation around the mouth of the drain. It is essential that each proposal for stormwater disposal be looked at on its merits in that particular location and that the overall impact on water quality of the waterways be assessed.

RECOMMENDATIONS

56) Develop a co-ordinated policy on stormwater disposal within the management area and encourage local government to reduce stormwater outlets in accordance with this policy (*LIMA*, LGA, DPUD).

57) Ensure that urban development proposals minimise nutrient and stormwater input to the waterways (*LIMA*, LGA, DPUD).

58) Encourage landowners and local authorities to minimise fertiliser use on gardens and parklands (*LIMA*).

4.2.2.6 Pesticides

Need for Action

In recent years concern has focused on use of pesticides, particularly for agriculture and horticulture. The use of pesticides in intensive agriculture may pose a threat to the environment, particularly aquatic ecosystems. As a result of this concern the Waterways Commission and LIMA have conducted two surveys of pesticide levels in the Preston River. The first in 1980-81 concluded that dieldrin levels were amongst the highest in rivers in South West Australia and that organochlorine pesticide criteria for maintenance and preservation of aquatic ecosystems were exceeded from time to time throughout the study. Moreover there was evidence that the application of pesticides throughout irrigation systems had led to contamination of the Preston River (Atkins, 1982).

The follow up survey in 1985-86 concluded that organochlorine pesticide residues in the Preston River had decreased, although dieldrin levels were still amongst the highest recorded in south-west rivers (Klemm, 1989). It was recommended in the study that since organocholorine pesticides were deregistered for agricultural use in July 1987 another survey be conducted during 1992 to assess the success of deregistration.

The high levels of pesticides recorded in the Preston were attributed to agricultural and horticultural practices in the region. Land use practices and use of pesticides in other areas of the catchment should be monitored for change.

RECOMMENDATIONS

59) Endorse the recommendation that a survey of pesticide levels in the Preston River be undertaken in 1992 to assess the success of deregistration of organochlorine pesticides for agricultural use in July 1987 (*LIMA*).

60) Monitor changing land use practices in the catchment for possible increased or decreased sources of pesticides (*LIMA*, DOA).

61) Liaise with the Department of Agriculture on recommended uses of pesticides in agriculture and horticulture (LIMA, DOA).

4.2.2.7 Emergency Procedures

Need for Action

Spillages of petrol, oil and hazardous chemicals into the waterways or the drainage network that lead to the waterways occur from time to time.

The control of petrol, oil and chemical spills involves several agencies. Although little pollution of the waterways has occurred, poor communication and co-ordination can result in unnecessary delays in cleanup operations.

Possible sources of spillage are:

- Fracture or leakage from SCM Chemicals Ltd pipelines into the Collie River and estuary (Peninsula effluent disposal operations ceased in October 1990, but discharge to Collie River continues).
- Spillage from transport vehicles into the waterway or drainage network.
- Industrial sources.
- Spillage from pleasure craft.
- Spillage in Koombana Bay or the Inner Harbour entering the estuary or inlet on an incoming tide.

In association with other concerned agencies LIMA has developed a contingency plan to combat spillage into the waterways (See Appendix 3).

RECOMMENDATIONS

62) Endorse the contingency plan for combating pollution of the waterways. Plans to be updated and modified as required (*LIMA*, DMH, BPA, SES, WAFB, BP OIL, EPA, LGA).

63) Ensure that management agencies have adequate equipment to control chemical and oil spills in the waterway and that staff are adequately trained (*LIMA*, DMH, BPA, SES, WAFB, BP OIL, EPA, LGA).

64) Assess development proposals to ensure that potential problems from accidental spillage are minimised (*LIMA*, DPUD, LGA).

4.2.2.8 Sewage Disposal

Need for Action

The nutrient load to the Leschenault Estuary results from a variety of sources, both urban and agricultural. The subdivisions of Clifton Park and Eaton are serviced by septic tanks and in the long term have the potential to contribute to the nutrient load of the estuary.

Clay soils bind phosphorus but not nitrate. Sandy soils have a limited ability to bind either nitrogen or phosphorus. The estimated discharge per household per year is 3 to 4 kg of phosphorus and 18 kg of nitrogen (Whelan et al, 1979). Some of these nutrients will be bound in the soil, however once the soil becomes saturated the nutrients will rapidly move with water to nearby watercourses.

While it is not feasible or desirable to prevent all nutrients from entering the estuarine system it is important to take reasonable and responsible steps to ensure that the pollution load is minimised from specific areas such as septic systems. This will ensure that the total pollution load is kept within the assimilative capacity of the estuary.

Larger hobby farm subdivisions are also occurring within the catchment. While connection to sewer for such developments is impractical and cost prohibitive, it is important that their cumulative impact on nutrient loading to the estuary be monitored. A change in land use on these properties can result in greater nutrient loading to the waterways.

New technologies are currently being developed which reduce phosphorus leachate from septic systems. However nitrogen can still leach to the estuary. No methods exist which can reduce this. The impact of long term loading of nitrogen to the system has not been determined.

A number of waste water treatment plants are located in proximity to the waterways. It is considered that assessment of proposals for new treatment plants is the responsibility of the EPA, including examination of alternative methods of disposal. LIMA will ensure it provides advice to the EPA on such issues.

RECOMMENDATIONS

65) Encourage the Water Authority to provide infill sewerage to unsewered areas likely to be contributing to nutrient loading to the estuary (*WAWA*, LIMA).

66) Ensure that all new subdivisions smaller than 1 hectare are sewered, or incorporate the technologies to reduce nutrient leachate entering the groundwater. The latter should only be endorsed when sewering is not economically feasible (*WAWA*, LIMA, DPUD).

67) Assess proposals for new sewage treatment plants and monitor existing sewage treatment plants in the catchment area to minimise leaching to waterways (*EPA*, LIMA, WAWA).

68) Review the impact of hobby farm subdivisions as part of the catchment management programme proposed in Recommendation 50 and the review of local government rural strategies (Recommendation 7) (*LIMA*).

4.2.2.9 Industrial Discharge

Need for Action

The Environmental Protection Act 1986 gives the EPA Statewide pollution control powers including water pollution. The Water Authority controls industrial discharge to the drainage system under powers delegated by the EPA. Industrial discharges to the drainage system are strictly controlled, and are only allowed if no sewerage is available and the discharge will not threaten the stormwater system or the waterway. New industries should be located so that they can be connected to sewerage. LIMA also controls pollution and industrial discharge to the waterways under powers delegated by the EPA. These organisations are developing a three way system to ensure consistency in the setting of industrial licence conditions and monitoring of these conditions.

RECOMMENDATIONS

69) Develop an administrative arrangement between EPA, WAWA and LIMA regarding the issuing of industrial licences and monitoring of conditions. The arrangement should address (*LIMA*, WAWA, EPA, LGAs):

- review of existing licences;
- monitoring of conditions and referral of data;
- policy on establishment of new licences; and
- issuing of Pollution Abatement Notices and Pollution Abatement Directions.

4.2.2.10 Underground Storage Tanks

Need for Action

In the United States the issue of leakage of polluting and dangerous liquids from underground storage tanks has resulted in the introduction of federal regulations controlling design, age, leak detection systems and installation of tanks.

The Water Authority of WA has by-laws controlling the installation of tanks within groundwater aquifer areas (Metropolitan Water Supply, Sewerage and Drainage By-Laws). In addition, the EPA is currently reviewing the problem with the view to introducing guidelines or an Environmental Protection Policy to control installation of underground storage tanks. The Department of Mines is responsible for controlling the installation of underground storage facilities.

Data from the US indicates that more than 60% of all release incidents are associated with retail petrol stations; the typical quantity released during an incident is in the range of 2275 to 9100 litres; the problem is growing with time due to a greater awareness of the problem and aging of tanks (Cassana et al 1987).

The Leschenault Inlet currently has 11 drains flowing into it from Bunbury City Centre. Each drain has the potential to transport materials leaked from underground storage tanks into the Inlet. Similarly leakage from storage tank facilities in industrial areas and along Old Coast Road have the potential to find their way into the waterways.

RECOMMENDATIONS

70) Liaise with the EPA and Department of Mines on the development of an Environmental Protection Policy addressing the issue of underground storage facilities (*EPA*, LIMA, DOM).

71) Monitor areas where leakage from underground storage facilities is possible (*LIMA*).

4.2.3 Erosion Control

Need for Action

Erosion is a natural and continuous process in any waterway. With increased urbanisation, it is not always desirable to allow uncontrolled erosion because of the threat it poses both to property and to the limited conservation and recreation areas.

The major agents of erosion include stream and tidal flow, tidal flow and wave action, both natural (i.e. wind-induced waves) and artificial (i.e. boat wash).

The geography of the estuary means that wind-induced waves are a major source of erosion on the eastern foreshore of the estuary. It is important that foreshore rushes and trees are maintained in these areas. The Cut area is also subject to strong tidal action. Groynes and rock walling have had to be established in order to stabilise this area.

Upstream in rural areas, access to the river bank by livestock causes damage to the vegetation which destabilises the bank. Some LGAs in the metropolitan area prevent the keeping of stock on land less than 15 metres from a water course.

Erosion occurs in three areas:

a) Erosion at the Water Line

This is generally more apparent in tidal areas, where water levels vary diurnally and are less affected by variations in stream flow. Erosion at the water line generally raises the most comment.

b) Erosion Below the Water Line

Considerable erosion occurs below the water line, generally on the outside of bends. As it is out of sight, it does not draw public comment until it causes a major collapse of the bank above. This is generally the most damaging area of erosion and the most expensive to deal with.

c) Erosion Above the Water Line

This is the area where infrequent but dramatic erosion can occur during flood events. Again, it is not seen by the public as a major problem primarily because there has not been a large flood in the river for many years.

It is the minor erosion at the water line which attracts the most attention. Wave action and boat wash can increase bank erosion, especially if the foreshore vegetation has been damaged.

As stated in Section 4.2.1 the intertidal zone of the estuary is an important fauna habitat. Erosion control techniques should preserve and enhance as much of these areas as possible. Wherever feasible foreshore stabilisation should be with endemic vegetation.

RECOMMENDATIONS

72) Develop a long term tree planting programme integrating with management plans for foreshore areas (*LIMA*, LGA).

73) Identify and monitor areas of the river at risk from erosion and implement a long term erosion control programme. Control measures should include (*LIMA*):

- Foreshore stabilisation with native vegetation, particularly species endemic to the area.
- Tree planting adjacent to the waterway.
- Encouragement to provide access at nodes and discouragement of access to erosion prone areas.
- Beach renourishment, walling, groynes, flow redirection, use of baffle boards to dissipate wave action.
- Modification to recreational activities in very serious erosion areas.

74) Provide information to private landowners to encourage appropriate methods of erosion control (*LIMA*).

75) Encourage landowners to fence foreshore areas to restrict stock access and damage to foreshore bed and banks. Provision should still be made for access to the waterway for stock watering (*LIMA*, Landowners, LGAs).

4.2.4 Dredging

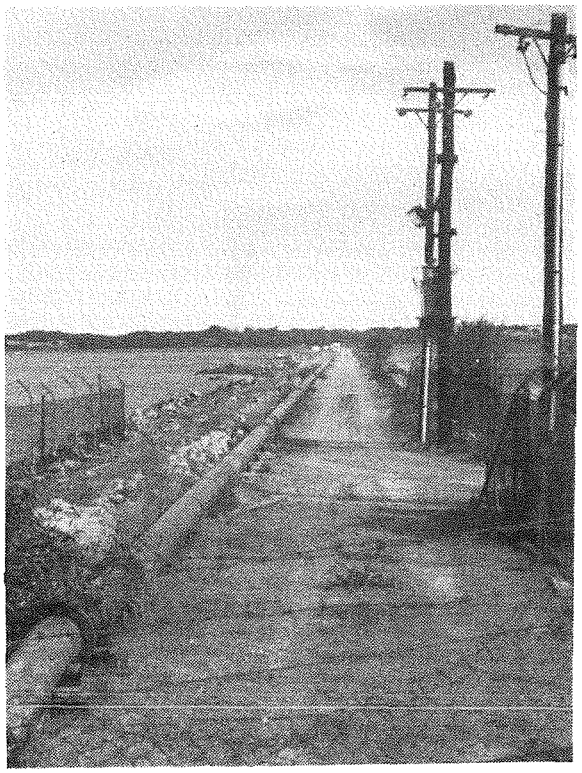
Need for Action

The removal of sediments in the waterway by dredging has disruptive effects on both the physical environment and the flora and fauna inhabiting the sediments and waters.

LIMA has an existing policy on dredging which recognises the importance of shallow areas and the need for adequate environmental assessment of development proposals involving dredging (see Appendix 1).

Dredging guidelines for the Swan River have been prepared by a consultative committee for the EPA. It is proposed in the Swan River Management Strategy that an Environmental Protection Policy be prepared using the guidelines.

The guidelines for the Swan River are more broadly based than the existing LIMA policy. Moreover the issue of dredging in estuaries, rivers and shallow waters requires a Statewide policy that can be applied to all waterways. It is therefore recommended that the Swan River guidelines be modified and implemented on a Statewide basis.



The decommissioning of the SCM titanium dioxide plant at Australind will provide the opportunity to remove the pipeline and improve water circulation to this part of the estuary.

The guidelines provide for maintenance of existing channels and basins and developmental dredging for new proposals. All dredging proposals are to be judged on their merits in the context of the guidelines.

Maintenance dredging is dredging required to maintain existing navigation channels and boat harbours and to resurrect, where desirable, former water conditions. Development dredging is dredging necessary for construction of new facilities including extension of existing facilities. All proposals for dredging are to include the cost of removing the dredge spoil from the river.

Development dredging and any dredging which involves the disposal of dredge material within the river system shall be subject to the appropriate level of environmental assessment determined by the EPA and a relevant waterway management body. The assessment should include impact on river hydrology, impact on the biota resulting from dredging and deposition of dredge spoil, need for the proposal, stability of final river profile, future silting and need for on-going maintenance.

Although some broad priority areas for the protection of shallow banks have been identified in Section 4.2.1, the waterway should not be classified into areas where dredging could not be permitted and areas where dredging would be permitted. Each development proposal should be judged on its merits.

In order to reduce mosquito breeding areas, careful installation of channels is required to ensure the integrity of samphire marshes.

Obviously some parts of the waterway system will be more sensitive to degradation as a result of dredging than others. Therefore decisions regarding these impacts should be made after a full environmental assessment.

RECOMMENDATIONS

76) Modify the Dredging Guidelines prepared by the EPA for the Swan River so they address the issue of dredging of waterways on a Statewide basis. Implement the guidelines as an Environmental Protection Policy under the Environmental Protection Act 1986 (*EPA*, LIMA, SRT).

77) Use the LIMA policy on dredging in the interim until the EPA policy has been developed (*LIMA*).

4.2.5 Mosquitoes

Need for Action

In 1985 a detailed study was undertaken of larval breeding and adult biting activities of mosquitoes in the Bunbury Region. Wright (1986) concluded that the most significant mosquito breeding sites in the Bunbury Region were located on tidal saltmarsh habitats around the margins of Leschenault Estuary and Inlet.

An outbreak of Ross River fever (spread by mosquitoes) in late 1988 led to Government approval in late January 1989 of a special funding grant to control mosquito nuisance in the Peel Inlet and Leschenault Estuary Regions.

The Interim Strategy for Mosquito Control in the Peel Inlet and Leschenault Estuary Regions (Government of Western Australia, 1989) developed as a result of the Government grant relies on commitment from both local and State governments. The Strategy has been operating since January 1989. The Strategy details monitoring of breeding sites, physical control of breeding sites, larvicide control and aerial application.

Further to this Strategy the Mosquito Control Advisory Committee has completed studies on bird breeding and feeding on the Estuary (Ninox Wildlife Consulting, 1989). This information is being used to develop more effective and environmentally sensitive mosquito control techniques.

RECOMMENDATIONS

78) Support the Mosquito Control Advisory Committee in its effort to develop a regional mosquito strategy which improves control methods and reduces environmental impact. This should include a review of mosquito control methods used Australia-wide and overseas (*MCAC*, LIMA).

79) Develop a policy detailing State and local government responsibilities for mosquito control (*MCAC*, LIMA).

80) Provide advice to LGAs and DPUD on rezoning and development applications ensuring that such proposals are not in close proximity to mosquito breeding areas (*LIMA*).

4.2.6 Landscape Protection

Need for Action

Foreshore environments contain a large variety of landscapes, both natural and modified, which need protection as they often provide a visually attractive backdrop to the water, contain places of scientific or historic interest, or contain unique or unusual wetland ecosystems. LIMA is responsible under Section 24 (4) (a) of the Waterways Conservation Act to have regard for the natural beauty and amenity of the management area. Local government also has a key role in landscape protection through its town planning scheme.

The SWDA (1988) recommends the development of a South West Landscape Restoration Masterplan to protect the landscape value of the region as an attractive backdrop for all its activities - from its forests and farmlands to its river and coasts. The scheme aims to restore rivers to optimum health, return salinity-affected soils to prime agricultural land and rehabilitate degraded areas of forest and natural vegetation. A key aspect of the plan is to encourage the planting of trees on private and public lands throughout the South West. It is considered appropriate that plans for rehabilitation of the estuary and its tributaries be incorporated into the proposed South West Landscape Restoration Masterplan. It is further recommended that landscaping plans of local government, private enterprise and developers should be integrated into an overall concept, taking into account the unifying elements of the landscape.

Special and significant views to and from the waterways should be maintained and enhanced. Important landscapes in the management area are:

- The avenue of trees in Cathedral Avenue Scenic Drive.
- The Leschenault Peninsula.
- The Collie Gorge.
- The saltmarshes of Point Douro and Pelican Point.
- Alexander Island and the lower Collie River foreshore.
- The northern foreshore of Leschenault Inlet and views across the Inlet to the City of Bunbury.

Many other stretches of the rivers also provide outstanding landscapes which require protection. In many cases such areas are in private ownership. A means of providing protection to such areas while avoiding the need for acquisition from public funds is required. In the metropolitan area the incorporation of 'landscape protection zones' into local government town planning schemes is being contemplated.

Control of inappropriate land uses is warranted in order to protect the foreshore, retain its aesthetic attractiveness, and prevent undesirable developments which may detract from the amenity of the foreshore and flood plain. Inappropriate development (such as advertising) and illegal development (including filling) mar the landscape. Any high rise developments sited too close to the waterway also have the potential to adversely affect it. Developments should be appropriately scaled and positioned.

The formulation of a policy or set of guidelines depicting acceptable standards and site design criteria is one means of preventing incompatible development from occurring.

The groyne and pipeline traversing the estuary has reduced viewscapes across and down the estuary. It was decommissioned in 1990 and LIMA, the Department of State Development and CALM have assessed public attitudes regarding its complete or partial removal.

It is important that any proposals for landscaping within the floodway do not interfere with flood waters. The Water Authority recommends that only trees be planted in the floodway. These trees should have no boughs below 2 metres and should be planted no closer than 10 metres apart. No shrubs or bushes should be planted in the floodway. No restrictions apply to planting in the flood fringe.

RECOMMENDATIONS

81) Determine a suitable means of land use control which enables the character of rural areas to be maintained while avoiding the necessity for public authorities to purchase land (*LIMA*, DPUD, LGA, DOLA).

82) Encourage local government authorities to protect high valued landscapes through town planning schemes, particularly in rural areas where much of the foreshore remains in private ownership (*LGA*, LIMA).

83) Prepare an overall landscape plan in consultation with local government and the SWDA for incorporation into the proposed South West Landscape Restoration Masterplan. Encourage individual landowners to participate in the scheme (*LIMA*, LGA, SWDA).

84) Develop site design criteria and development guidelines for recreation nodes (*LIMA*, LGA).

85) Ensure landscape proposals within the floodway comply with WAWA's guidelines (*LIMA*, WAWA).

4.2.7 Scientific Research and Education

Need for Action

It is a role of LIMA to conduct or promote relevant research or to enter into projects for research (Section 25 (2) (g) Waterways Conservation Act).

A number of institutional and private research programmes have been carried out on the Leschenault waterways and associated foreshores. LIMA has had little involvement in the direction of research undertaken. This, combined with LIMA's and the Waterways Commission's limited research budget, has meant that required scientific research has not always been possible. It is proposed that a system be implemented whereby LIMA has the opportunity to approve and co-ordinate research programmes carried out on the waterways and associated foreshores.

RECOMMENDATIONS

86) Establish a sub-committee of LIMA to oversee approval and co-ordination of research programmes undertaken on the waterways (*LIMA*).

87) Establish research programmes in consultation with the Waterways Commission to meet the management requirements of LIMA (*LIMA*, WWC).

88) Identify areas for scientific research (*LIMA*).

4.2.8 Fire Management

Need for Action

The foreshore rushes and vegetation provide an important habitat for fauna as well as bank stabilisation, a filtering system for nutrients and pollutants, and protection against erosion. A programme is required to reduce the risk of widespread fire damage to such areas, and to inform the public of the need for fire control.

Problems experienced include indiscriminate lighting of reed areas, open fires getting out of control, fires on farming properties spreading to foreshore areas and vice versa.

LIMA currently has an agreement with the Shire of Harvey regarding controlled burns on the foreshore. This should be extended to include the two other local government authorities.

RECOMMENDATIONS

89) Prohibit lighting of fires on the foreshore except in properly constructed fire places in accordance with Section 25 (1a) (1b) and (1c) of the Bush Fires Act (*LGA*, LIMA).

90) Develop a public education programme informing people about the danger of fire in the area, and the responsibilities of people in relation to the lighting of fires (*LIMA*).

91) Develop roads, tracks, carparks and dual-use paths as fire breaks and determine the appropriate location of fire breaks when locating such facilities (*LIMA*, LGA).

92) Encourage Councils to develop their fire fighting capacity by obtaining and upgrading equipment (*LIMA*, LGA).

93) Develop a fire management plan for the Leschenault Estuary, Inlet and tributaries in co-operation with the Bush Fires Board, local government and landowners. This should address the issue of controlled burns and loss of landscape quality (*LIMA*, LGA, BFB).

4.2.9 Heritage and Cultural Sites

Need for Action

In the past the waterways have provided a valuable environmental resource to the Aboriginal people which ensured a permanent supply of fish and water, and supported a wide range of edible plants and animals. To date some Aboriginal sites have been found in upstream areas, however many more are presumed to be present.

All Aboriginal sites are protected by the Aboriginal Heritage Act 1972-80. Under this legislation the onus is on the developer to determine if the proposed development site is protected under the Act. Any proposal involving physical disturbance of the ground on the foreshore should be referred to the WA Museum for advice.

Since the early 1800s the waterways have provided a focus for European settlement. Disturbance to cultural and historic sites can be minimised by referring all developments and management actions to the Heritage Council of Western Australia and recommending further sites of high value for listing on the Register of Heritage Places or the National Estate Register.

RECOMMENDATIONS

94) Consult with the Department of Aboriginal Sites, WA Museum, and other community groups and individuals, on management and development plans to ensure Aboriginal sites are not inadvertently disturbed (*LIMA*, WAM).

95) Incorporate historic sites into management plans to provide a recreation and tourism attraction (*LIMA*, WAM, HCWA, NT).

4.3 RECREATION AND TOURISM

4.3.1 Recreation

Need for Action

In providing recreational opportunities and facilities on or adjacent to the waterways it is important to recognise that people have a variety of expectations about the waterways' capability to provide for their recreation. Planning must consider these desires and expectations, and then determine priorities and suggest areas capable of sustaining agreed uses.

A recent survey of recreational use (Thurlow, 1989a) indicated that the '10 Most Important Activities' to respondents were:

Relaxing
Crabbing/prawning from boats
Line fishing from boats
Swimming/paddling
Line fishing from shore
Socialising
Barbecuing/picnicking
Enjoying view/scenic driving
Powerboating
Walking/hiking

In addition, the '10 Most Appealing Aspects' and '10 Least Appealing Aspects' of a visit to the waterway were:

Appealing	Least Appealing
Quiet/peaceful	Litter/pollution
Fishing	Toilets
Crabbing	Other people's behaviour
Natural surroundings	Access roads
View/picturesque	Lack of fish or crabs
Close to home	Lack of shade
Flat water	Insects
Foreshore	Low water level
Clean/well kept	Crowding
Toilet facilities	Drinking water
	Lack of parking

It is important that recreation planning and management address these issues, particularly the intrinsic values of 'quiet/peaceful' and 'crowding' rather than just the physical issues.

As the waterways are a limited resource, consideration should be given to providing alternative sites outside the estuary for some activities to reduce the impact of human use on the river. Maintaining Koombana Bay for yachting, powerboating, water-skiing and fishing is particularly important.

Other techniques can be employed such as encouraging the best use of existing facilities and opportunities by appropriate site design, dual use of facilities and time-sharing a gazetted water area. For example, boat ramp facilities on the foreshore of the estuary and inlet should not be 'tied-up' by boat users who then proceed out to the waters of Koombana Bay. Ocean launching facilities should be provided as an alternative.

The physical nature of the waterways is also a determining factor in the provision of recreational opportunities. The shallow upper reaches of the Collie River are more suited to manually powered boats whereas the southern estuary and lower Collie can accommodate small powerboat traffic. Sailing in the area is limited not only by water depth but by height of the pipeline. The northern estuary and other shallow sand and mud banks are unsuitable for most activities which result in excessive disturbance of the bed, banks and fauna in these areas. However, it is not only the impact of the activities on the environment but the impact of one user on the experience of another user which needs to be considered.

Trends in recreational participation and new activities are also important in determining provision of opportunities and facilities. Windsurfing, surfcatting and jetskiing are three activities which fall into this category (See Section 4.3.3 for more detail on these activities). Trends in use and participation should be monitored in an effort to provide for new recreational activities as well as determine possible environmental effects and conflict with other users.

Recreation activities should generally be directed into recreation nodes where appropriate facilities and site modification can be developed. Effective management can also be implemented in these locations rather than spreading often limited resources over a wider area. Nodes should supply a range of recreational opportunities appropriate to the local environments.

Recreation nodes should be connected by linear parks along the foreshores and canoeing trails in the upper reaches. These areas should provide facilities and activities for both the local and regional community. Opportunities on the waterways must be integrated with other recreational areas such as Wellington Dam, Conservation Parks, the outer harbour redevelopment and plans for the Leschenault Peninsula.

RECOMMENDATIONS

96) Monitor trends in recreational use and participation through survey, observation and public consultation to determine requirements for future recreation facilities and opportunities, and environmental and user conflict (*LIMA*).

97) Liaise with managers of other recreational areas regarding proposed developments, undertaking joint management and development plans where appropriate (*LIMA*, LGA, CALM).

98) Develop management plans for recreation nodes in consultation with local government and other affected parties. Incorporate a works development programme into the plan outlining implementation and funding of facilities on a five year basis (*LIMA*, LGA).

99) Encourage activities compatible with the protection and conservation of the Leschenault waterways (*LIMA*).

100) Encourage developers in accordance with the 'Foreshore Management Policy' to contribute towards the cost of development and maintenance of adjacent foreshore areas (*LIMA*).

101) Assess subdivision developments to ensure that adequate public open space is provided as well as foreshore reserves (*DPUD*, LIMA, LGA).

4.3.2 Tourism

Need for Action

Tourism in the South West has changed considerably in the last five years. It is anticipated that by 1990 tourism will rank with the traditional industries of agriculture, forestry and the mineral industry to become a major employer in the Region (SWDA, 1988).

It is essential that those elements which are attractive to tourists be maintained. Sensitive use of the waterways is one of the key challenges for tourism development. This has been recognised in the South West Strategy, a commitment being made to develop programmes to protect the natural features which attract tourist traffic (SWDA, 1988).

Often tourist facilities and activities are perceived by locals as reducing their use of the resource. For this reason wherever possible tourist facilities and activities should be designed to service both the tourist and the day visitor. Recreation data on summertime users of the waterways indicated that 69% of respondents came from the Bunbury Region compared with 31% from outside the area who could be classified as 'tourists' (Thurlow, 1989a).

Both the Tourism Commission and South West Development Authority have a strong commitment to the development of tourism in the Region. It is intended that Bunbury be promoted as a tourist destination and as a holiday headquarters of the South West. Key projects designed to achieve this that abut or impinge on the waterways are: (SWDA, 1988)

- Development of the Bunbury Harbour City concept on the north shore of Leschenault Inlet and outer harbour areas of the City. This project will enhance the north shore area protecting the valuable mangrove and bird feeding areas of Anglesea Island. Moreover, outer harbour developments will provide alternative activities and facilities to alleviate pressure on the Leschenault system. It will also provide family recreation and low-cost tourism facilities on the north shore.

- Development of the Leschenault Coastal Park once effluent disposal ceases on Leschenault Peninsula. Recreation nodes are planned for Belvedere (Waterloo Head) and the southern tip of the Peninsula. Beach access at the northern end of the Peninsula has already been developed, providing a readily accessible fishing area outside the estuary.

- Development of the Wellington Dam and Collie Gorge for recreational and tourism use on completion of the Harris River Dam. Facilities proposed include rowing, picnicking, camping, fishing, swimming and canoeing. This will enhance the Collie Gorge area and provide new opportunities at the dam site.

RECOMMENDATIONS

102) Encourage tourist promoters and marketers to include information on 'How to Care for Our Waterways' as part of promotional brochures (*LIMA*, WATC).

103) Develop a close working relationship with the WA Tourism Commission and South West Development Authority to ensure that possible environmental and use conflict problems associated with tourist developments are addressed during the early stages of a project (*LIMA*, WATC, SWDA).

104) Identify areas suitable for tourist development and develop environmental guidelines for such developments addressing issues of scale, height, density, pollution etc. (*LIMA*, DPUD, SWDA, LGA).

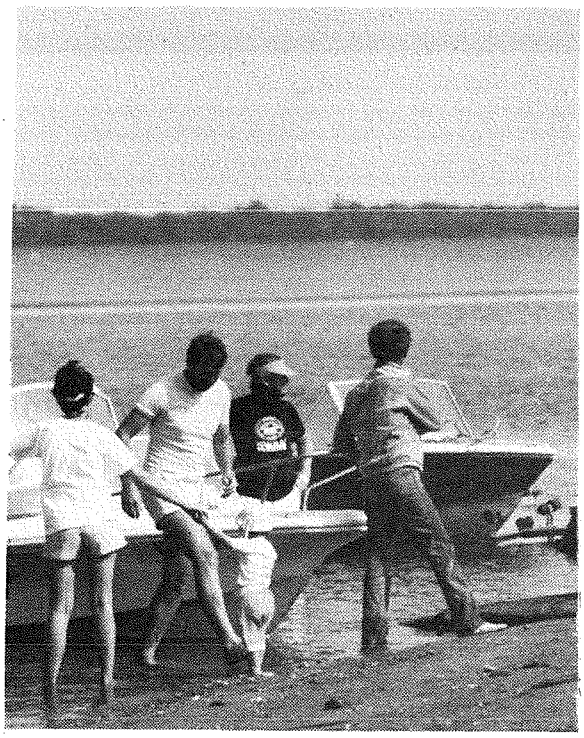
105) Ensure that tourist developers and operators contribute to on-going management of the waterways and foreshores and that maintenance will not become a financial burden to government or local government bodies (*LIMA*, Proponent).

4.3.3 Boating Activities and Facilities

Need for Action

A variety of boating activities dominate recreational use of the waterways including rowing, powerboating for pleasure cruising and fishing, and canoeing. These activities are not always compatible with each other, the environment and other users. However, the waterways provide a sheltered waterway for these activities giving rise to the need for management and a broad education programme. DMH currently conducts Statewide voluntary education programmes. The Yachting Association of WA also plays an important role in boating education. A recent survey of recreational use (Thurlow, 1989a) indicated that 6% of respondents were concerned about some aspect of boating safety such as better policing of regulations or lack of knowledge of boating regulations (particularly speed limits).

A recently completed course on Leschenault Inlet is available for rowing. If proposals for Wellington Dam come to fruition, an international rowing course will also be available in the Region. The development of a facility at Wellington Dam may result in increased interest and participation in the sport with a possible increase in demand for training and club facilities in Bunbury itself. This situation should be monitored.



Boating is a popular recreation activity on the estuary.

No organised sailing/yachting activities occur on the waterways, depth of water and height of the pipeline restricting this activity. Alternatively Koombana Bay is suitable for this activity providing a base for the Bunbury Yacht Club. Implementation of the Bunbury Harbour City concept will further enhance use of the bay for this activity. Removal of the pipeline on completion of effluent disposal operations in 1990 may increase the popularity of this activity although water depth will still limit the type of sail craft able to use the estuary.

Powerboats are used for pleasure cruising and fishing and crabbing. Pleasure cruising is generally restricted to the lower reaches of the Collie. Fishing and crabbing are the most common reasons for powerboating. The most common craft are small aluminium dinghies which can be used in the shallow areas of the estuary. Disturbance of the estuary bottom can result from use in too shallow areas. The Authority has introduced a restriction on powerboating in the northern estuary for this reason.

Distribution of craft depends on weather conditions and wind directions. Indiscriminate launching of boats from the bank sometimes occurs along the northern section of Cathedral Avenue and during peak usage period in summer. A new channel has been completed to provide for small boat launching in this area.

The condition of boat ramps and navigation channels were the most common complaints about boating facilities particularly the Shoalhaven and Cut ramps (this latter was an informal ramp at the time) and the navigation channel in and around the Collie River mouth. Redevelopment plans should address these issues.

Canoeing and rafting are popular activities in the Collie Gorge area, the release of irrigation waters during summer providing year-round flow. The Ministry for Sport and Recreation provides a canoeing guide to the area. No formalised launching facilities are provided on the river banks resulting in some areas becoming denuded of vegetation and eroding.

Water-skiing is not permitted within the estuary or inlet because of the shallow nature of the estuary and its popularity for other activities. Provision is made for this activity in Koombana Bay. Plans for the Bunbury Harbour City concept and use of Koombana Bay should recognise use of the area for water-skiing.

Jetskiing occurs infrequently on the estuary but has, however, resulted in a number of complaints. The shallow nature of the estuary restricts this activity as does the boating regulation prohibiting boats from travelling above 8 knots in waters less than 3 metres. Use of jetskis should be regulated to ensure that the waterways are protected and use of the estuary by other people is not impinged upon.

Windsurfing is a minor activity on the estuary at present with a small hire facility operating from the Paris Road ramp area. Observations indicate indiscriminate launching and retrieval of craft through reed areas. Craft are presently launched from the Paris Road area and this may result in conflict with powerboat users in the future. The popularity of windsurfing should be monitored and consideration given to setting specific areas aside for launching of these craft.

The popularity of any waterway during summer leads to over use of facilities during this period and under use during the winter period. Limited carparking and queuing at boat ramps are the most common complaints. Development of areas for boat launching should address this problem examining the desirability of temporary parking areas during summer and education on how to use boat ramps efficiently. Observation of boat ramp areas in Perth (Thurlow, 1989b) indicates that some boat owners occupy ramps unnecessarily while they load, unload, remove lights and wait for other passengers. Temporary jetties to allow people to launch their boat and then tie up the boat while they get organised, have been built in a number of locations on the Swan River to overcome this problem of clogging up ramp areas.

The physical characteristics of the waterways limit the need and demand for marinas and yacht clubs. A small boat haven on the mouth of the Collie River has recently been approved subject to environmental guidelines. It is important that on-going management of these facilities and water quality of artificial waterbodies such as the boat haven do not become a liability for government and local government agencies. Similarly public access around these facilities should be provided. The establishment of such facilities and navigation channels can involve dredging banks and placing structures on the bank of the river. This has the potential to disrupt the waterways and foreshores particularly the bed and shoreline. Consequently such proposals are subject to environmental assessment. The need for ongoing dredging maintenance in particular should be assessed.

The Bunbury Harbour City plan proposed by SWDA involves the construction of ocean marina facilities. The establishment of such facilities is supported as it will reduce the demand in the estuary and inlet.

RECOMMENDATIONS

106) Encourage the development of ocean boating facilities and maintenance of existing boating areas outside the estuary (*DMH*, LIMA).

107) Ensure that public access along the foreshore of marinas/boat haven facilities is provided and that the public is not discouraged from using that access (*DPUD*, LGA, LIMA).

108) Restrict new boat ramps and navigation channels in upstream areas of the Collie River and the northern estuary where boating opportunities are limited (*DMH*, LIMA).

109) Ensure that marina, jetty, boat ramp and boat haven facilities are only located in areas that (*EPA*, LIMA, LGAs):

- Require only minor site modifications so that maintenance works that may generate compounding environmental problems are not required.
- Do not impinge on sensitive environmental areas.
- Do not impinge on other legitimate competing uses.

Refer significant developments to EPA for environmental assessment where necessary.

110) Ensure that boating facilities are designed to blend in with the surrounding environment (*DMH*, LIMA, LGA).

111) Liaise with DMH on issues of boating education (*DMH*, LIMA).

112) Monitor rowing use on the Inlet once the Wellington Dam facility is operational (*LIMA*).

113) Promote the northern estuary as a 'no boating' area monitoring the success of the programme (*LIMA*, DMH).

114) Ensure that provision and condition of boat ramps, navigation channels and carparking are addressed in management plans for recreation areas. Examine the desirability of temporary parking areas during peak periods and jetties to ensure efficient use of ramps (*LIMA*, LGA, DMH).

115) Liaise with SWDA and CALM on the redevelopment of the Collie Gorge area to ensure provision of suitable canoeing and raft launching areas (*CALM*, SWDA, LIMA).

116) Request DMH to regulate the use of jetskis and any fast powerboats on the waterways particularly in relation to noise, speeding, erosion and disturbance of the river bed and conflict with other users (*DMH*, LIMA).

117) Monitor windsurfing use on the waterways with the view to providing a separate launch site for these craft to avoid conflict with other users and protect foreshore vegetation (*LIMA*).

4.3.4 Public Access

Need for Action

It is a major aim of the Authority to provide a high level of community access to the foreshore for its use and enjoyment. Provision of access must also be consistent with protection of the environment. With an increase in population comes a greater demand for access to the waterways.

The ability to enjoy the foreshore is limited by areas of privately owned land with title to high water mark and in some upstream locations into the river, or by leases. Foreshore reserves are generally acquired for public use as a condition of subdivision or as a condition of development approval. Much of the upstream areas are farm land and therefore subdivision is not likely, particularly in the short term. In such situations a private agreement with landowners may achieve the desired result of gaining the right of public access. The issue of liability requires careful consideration in these instances.

It is also important to ensure that physical and visual alienation of the foreshore from the public does not occur. Forms of alienation include where public reserves are developed by adjoining landowners to look like private property (walls, gardens), leased land being made to look like private property, and incorrect siting of facilities preventing movement and views to and along the foreshore.

However, unrestricted public access is not always desirable, particularly where environmentally sensitive wetlands or conservation areas are at risk. Control of access to these areas may be necessary.

Dual-use paths provide linear access to foreshore areas, catering for cyclists and pedestrians. They have been developed along much of the eastern foreshore of the estuary and are planned around the inlet as part of the Bunbury Harbour City concept. It is important that these pathways are designed and constructed to protect the waterways and foreshores while enhancing people's use of the area.

The Waterways Commission, in association with the EPA, SPC (now DPUD) and Bikewest, has developed 'Environmental Guidelines for Dual-Use Paths' (1988). The guidelines discuss issues that should be addressed during the siting and construction of these facilities.

Local government authorities are generally responsible for the planning and development of dual-use paths throughout their municipalities. The Greater Bunbury Bikeplan in 1986 (Bikeplan Study Team, 1986) gave considerable stimulus to bicycle planning and set the scene for the development of an extensive cycle network around Bunbury and the waterways.

The development of heritage trails for walking, cycling, driving and canoeing, which follow a route taking in points of historic interest, can generally improve access to and develop an awareness of the natural and cultural heritage of the waterways.

RECOMMENDATIONS

118) Liaise with DPUD on the feasibility of developing agreements with private landowners to ensure the right of public access, while protecting the rights of landowners, and achieving satisfactory public liability arrangements (See Recommendation 14) (*DPUD*, LIMA).

119) Restrict public access in environmentally sensitive wetlands and other conservation areas according to management plans developed for these areas (*LIMA*, CALM, LGA).

120) Liaise with local government and Bikewest regarding the development of dual-use paths around the waterways (*LIMA*, LGA, Bikewest).

121) Design dual-use paths on the foreshore in accordance with the 'Environmental Guidelines for Dual-Use Paths' ensuring they (*LGA*, Bikewest, LIMA):

- Are set back from the water's edge where possible.
- Avoid environmentally sensitive areas.
- Avoid unsuitable topography where construction costs are high.
- Avoid existing and planned foreshore developments.
- Avoid isolating areas of the foreshore from adjacent parklands.
- Avoid destruction of native vegetation.
- Detour away from the foreshore to other areas of scenic, historic or scientific interest.

122) Ensure that the boundary between private property and the foreshore reserve is clearly defined. Development of private property should not intrude onto the foreshore reserve, or discourage public access or use (*LIMA*, LGA, DPUD).

123) Promote the development of Heritage Trails in scenic and historic areas, so as to develop an awareness of the natural and cultural heritage of the waterways, and improve access to them (*HCWA*, LIMA).

124) Design foreshore areas and facilities to provide access for the disabled (*LIMA*, LGA, DPUD).

125) Monitor problems of public access to the foreshore and develop, in association with local government, strategies to manage problems (*LIMA*, LGA, DPUD).

4.4 NAVIGATION AND BOATING SAFETY

4.4.1 Boating Control

Need for Action

Certain areas of the waterways may be gazetted for specific uses. These areas have defined boundaries and use may be restricted to specific times or days. Alternatively particular activities may be restricted on the waterways such as water-skiing or net fishing in navigation channels.

Controlling legislation is administered by DMH to alleviate navigation safety problems and conflict between different user groups. Aspects such as environmental impact and uses of adjacent areas should be considered. However the legislation does not provide for this.

DMH is responsible for matters relating to navigation which means ensuring that all navigable waters remain open and safe for boating and includes specific activities such as dredging of navigation channels, removal of wrecks and other structures, and the installation, operation and maintenance of navigation aids.

DMH may temporarily close some areas in emergencies or for particular aquatic events, and boating may be restricted in gazetted areas of main navigation channels, but generally DMH will not close off the waterway or restrict the type of craft that may operate in navigable waters. However, in some cases it may be appropriate to provide for the closure of navigable waters for conservation purposes.

RECOMMENDATIONS

126) Liaise with DMH on the gazettal of special use areas having regard for (*DMH*, LIMA):

- Boating safety.
- Recreational use.
- Impact on the foreshore including vegetation bank stability.
- Compatibility with the overall plan for the area.

127) Monitor boating use of the northern estuary and liaise with DMH on closure of these waters to boating if necessary to protect the environment (See Recommendation 43) (*LIMA*, DMH).

128) Liaise with DMH regarding navigation and boating control measures and encourage environmental information to be incorporated into DMH boating guides (*LIMA*, DMH).

129) Incorporate boating regulation information into LIMA public information brochures (*LIMA*).

4.4.2 Special Events

Need for Action

Approval for the scheduling of aquatic events on the waterways is required under Section 51 (C) of the Navigable Waters Regulations. These regulations are administered by DMH. Approval may also be required from the local government authority, LIMA and/or the Port of Bunbury depending on the type and location of the event.

RECOMMENDATIONS

130) Establish an administrative procedure with DMH, Port of Bunbury, local government and LIMA for the assessment of aquatic events on the waterways. Develop guidelines for establishing conditions of approval. Ensure that organisers of events are aware of their responsibility to ensure that events are conducted within conditions of approval, particularly environmental conditions (*LIMA*, DMH, BPA, LGA).

4.5 LIAISON & CO-ORDINATION

4.5.1 Community Involvement

Need for Action

Community involvement in the planning, development and use of major publicly owned waterways like the Leschenault system is an important principle. Public involvement assists in identifying issues and ensuring equitable and appropriate use and management of resources.

The community has the opportunity to be involved in planning and management of the waterways through a number of processes.

1) Membership on the Authority

Under Section 14(3) of the Waterways Conservation Act 1976 membership of the Authority shall be selected from amongst persons resident in the local community.

It is considered desirable that invitations for membership cover a broad spectrum of interest groups such as industry, conservation, recreation, fishing groups, etc.

2) Management Programme Preparation

The Waterways Conservation Act (Section 35) requires LIMA to prepare and periodically review a management programme which details how the waterways will be planned, developed and managed. The public has the opportunity to make submissions during the preparation of a management programme. Invitations to prepare a submission on the draft document are advertised in the general and local press. LIMA has also extended this mechanism to the development of

management plans for recreation and conservation nodes etc.

3) Development Approval

The public has the opportunity to comment on developments on and around the waterways through submissions to the EPA and Waterways Commission. Submissions can also be made to the local government authority on amendments to local government town planning schemes.

Under Section 38 of the Waterways Conservation Act any person or body may refer to LIMA any matter which gives rise to concern as a possible cause of pollution affecting the waterways. LIMA shall consider the matter and may report to the relevant Minister.

RECOMMENDATIONS

131) Retain community representation on LIMA, advertising locally for community representatives from individuals and interest groups (*LIMA*).

132) Consult with the community during preparation of plans and programmes in addition to calling for submissions on the draft documents (*LIMA*).

133) Develop and maintain a list of community groups and individuals who wish to be involved with the preparation and implementation of plans and programmes (*LIMA*).

4.5.2 State and Local Representation

Need for Action

The direct involvement of relevant State and local government authorities is essential if adequate agency co-operation is to occur. Section 14 (3) of the Waterways Conservation Act states that membership of LIMA should include representatives of local government authorities and officers from agencies having responsibility for and knowledge of the waterways.

RECOMMENDATIONS

134) Retain local government representatives on LIMA selected from the authorities within the management area (*WWC*, LIMA).

135) Ensure that government agencies are represented on LIMA or seconded for committees of LIMA (*LIMA*).

4.5.3 Administrative Procedures

Need for Action

Approval of developments may be required by a number of government or local government agencies. It is essential that a system exists for all agencies to refer projects and appropriate documentation to the approving bodies. It is important that licences and/or conditions are not issued by one agency prior to consideration by another. Wherever possible, agencies should consult with each other prior to approvals being issued.

RECOMMENDATIONS

136) Develop a streamlined referral and approval procedure with local and State government bodies. These referral procedures should appear as appendices to the management programme and be updated as required (*LIMA*).

4.6 FISHERY MANAGEMENT

4.6.1 Fishing

Need for Action

Fishing is an important recreational use of the estuary, and professional fishing also occurs on a restricted basis. Fishery management is the responsibility of the Department of Fisheries. Essentially the Department provides specialist advice on the fishery resource to management bodies such as LIMA.

The continuation of the fishery is dependent upon maintenance of suitable water quality and habitats for all stages of fish life. Preservation of 'quiet' areas and the free movement of fish is also important.

It is important that the fish resources of the estuary be managed for the benefit of the community by optimising yields and ensuring that stocks are distributed equitably among different user groups.

Greatest pressure is placed on the estuary during the summer months when the crabs are 'running'. Studies by LIMA indicate that up to 400 boats can be launched into the estuary during the course of a day. Most problems experienced by the Department of Fisheries relate to exceeding crab bag limits and the taking of undersize crabs. The summer of 1988-89 was a particularly bad year with the Department carrying out a blitz on people breaching crabbing regulations. It is important that LIMA assist Fisheries in developing its recreational fishing strategy for the estuary.

Professional fishing on the estuary has operated as a 'Restricted Entry Fishery' since 1970. This means that no new estuarine fishing licences are issued and that individual licences are not transferred if a fisherman chooses to leave the fishery.

Only two professional fishermen operate full-time on the estuary the remaining eight jointly working the beach and estuary fishery. Complaints often surface from recreational fishermen that the

professionals are taking all the fish. Target species are, however, different for both groups with perhaps the exception of King George Whiting. Conflict between these two user groups needs to be monitored.

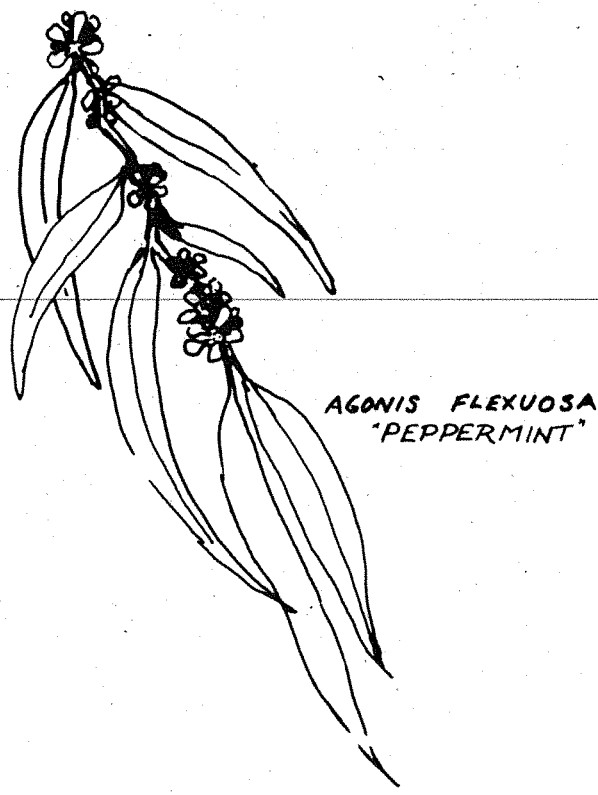
Aquaculture is seen by the Department of Fisheries as desirable to maintain stocks of particular species. Factors determining suitable areas for aquaculture are the availability of fresh water to control salinity fluctuations and a sheltered environment. It is not the policy of Fisheries or LIMA to promote aquaculture at the expense of other recreational uses of the waterways. In the case of the Leschenault system Fisheries would require approval from LIMA prior to considering an aquaculture development proposal.

Marroning also occurs in the upper reaches of the Collie River although marron numbers are limited. Fisheries have recently modified marroning regulations limiting the season to two periods, one covering the New Year period and the other Easter.

RECOMMENDATIONS

137) Liaise with Fisheries on aquaculture proposals to assess the impact on the estuary including the potential impact on other recreational uses (*LIMA*, DOF).

138) Liaise with Fisheries on policy preparation for management of the professional and recreational fishery (*LIMA*, DOF).



139) Provide and encourage where appropriate the development of jetties and other facilities for fishing (*LIMA*, DOF, LGAs).

140) Protect the shallow areas and other fish habitats of the waterways as nursery and breeding grounds for fish (*LIMA*, DOF, CALM).

141) Combine with Fisheries to develop education programmes on conservation of the fishery resource (*DOF*, LIMA).

4.7 PUBLIC EDUCATION

4.7.1 Education Programmes

Need for Action

LIMA produces limited educational material on the waterways. Other organisations also publish brochures on specific issues including:

Department of Marine and Harbours	-	Boating Guide
Department of Fisheries	-	Fishing regulations
Conservation and Land Management	-	Booklets such as: Beating About the Bush, Wild Places, Quiet Places,
Ministry of Sport and Recreation	-	Canoeing guides for the river.
Tourism Commission	-	Promotion of the Bunbury Region as a tourist destination in any promotional material.

The opportunity exists for the implementation of broad public education programmes which would increase public awareness of the waterways, not just particular isolated areas for specific uses. This would create an opportunity for the public to develop a wider appreciation of the waterways as a whole, and increase understanding as to why it is important, for example, to conserve environmentally sensitive areas.

Programmes should focus on all age groups and types of users such as school groups, tourists, adjacent landowners etc.

RECOMMENDATIONS

142) Implement public education and interpretative programmes which promote awareness, appreciation, understanding and active concern for the natural and cultural values of the waterways environment. These programmes should be designed to involve active public participation (*LIMA*).

143) Combine education programmes with other agencies. Incorporate waterway management philosophies into material of other agencies where appropriate (*LIMA*, DMH, DOF, CALM, LGAs).

144) Consider the release of media statements on specific issues which arise on a seasonal or regular basis (*LIMA*).

4.8 MANAGEMENT

4.8.1 Management Area Boundaries

Need for Action

The current LIMA management area is marked on Map 1. It was amended in August 1986 to include most of the coastal plain catchment of the Brunswick, Lunenburgh and Wellesley Rivers. The management area does not include the Ferguson River and only part of the Preston River. The former dissects the proposed Picton industrial area. Also, in the upper reaches subdivision of land for hobby farm developments has occurred. On the Preston River the LIMA boundary extends to the junction of Boyanup and Dardanup Road. Under the Rights in Water and Irrigation Act the Water Authority boundary extends downstream to Argyle Bridge leaving a No-man's-land from Argyle Bridge to Dardanup Road.

It is proposed that the management area be adjusted to include these two rivers. Furthermore, it is suggested that the boundaries be determined to include the Preston River coastal plain catchment. Boundaries should be determined in consultation with the EPA and SWDA Committee, taking into account the issue of catchment management (see Section 4.2.2.2).

The extension of the boundaries will provide LIMA with the opportunity to manage the waterways on a catchment basis. This would be the first such area in the State; it would provide a model for waterways management which should be evaluated for its success and possible problems. It is proposed as is the case now that individual local government authorities will still be responsible for the day-to-day management of specific issues.

RECOMMENDATIONS

145) Extend the LIMA management area to include the Ferguson and Preston Rivers in consultation with EPA and SWDA. All boundaries should be determined on a catchment management basis (*LIMA*, EPA, SWDA, LGAs).

4.8.2 Management and Maintenance of Foreshore Reserves

Need for Action

Historically LIMA has provided funding for local government towards maintenance of foreshore areas. More recently four criteria have been used to determine where and how LIMA should fund foreshore management and maintenance.

- All works should be funded by the local government authority where land is managed as a normal municipal responsibility.

- Where land is vested with a local government authority or government agency, and work is required to protect the waterway, such work should be specified in a management plan and subject to agreement.

- LIMA should only fund the construction of facilities relating to its objectives under the Waterways Conservation Act. Responsibility for maintenance should be the responsibility of the vestee.

- Where land is vested in the Waterways Commission (on behalf of LIMA) and LIMA seeks the assistance of the local government authority such work should be funded by the Waterways Commission/LIMA.

Wherever possible plans for development of foreshore areas should be jointly undertaken by LIMA and the vestee of the land. The plan should identify responsibility for works and a time schedule for implementation.

Foreshore reserves are acquired as a condition of subdivision with the view to creating a linear park around the waterways, providing public access and protecting foreshore areas. In a number of situations these foreshore reserves are not accessible to the public until adjoining areas are subdivided. It may be desirable in some situations for these areas to be leased back to the adjacent landowner until such time as public access is possible. Conditions ensuring protection of the foreshore environment would be required as part of the leaseback arrangement. This would alleviate some of the financial burdens on State and local government authorities for management of these areas.

RECOMMENDATIONS

146) Adopt the criteria detailing funding for management and maintenance of foreshore reserves (*LIMA*).

147) Develop a works programme for new and upgraded foreshore reserves outlining responsibility for works and a time schedule

for implementation (*LIMA*, DPUD, DOLA, LGA).

148) Develop an administrative arrangement between LIMA, DPUD, DOLA and local government for the lease back of foreshore reserves subject to conditions of use (*LIMA*, DPUD, DOLA, LGAs)

4.8.3 Staff and Finance

Need for Action

Resources are required to implement the recommendations of the Leschenault Waterways Management Programme both in terms of staffing levels and funding. It is important that management capability and funding should keep pace with changing community pressures on the waterways.

Unlike the Peel and Swan management authorities, LIMA does not have a field staff to undertake foreshore maintenance works, relying upon contract personnel to undertake these works as required.

Monitoring, evaluation of development proposals, supervision of contract personnel, response to complaints and pollution emergencies are all carried out by the LIMA inspector. Additional support is provided by Perth staff on technical matters relating to planning, environmental quality and engineering. It is necessary that the staff based at LIMA be broadened to accommodate the diversified tasks required for effective waterways management.

RECOMMENDATIONS

149) Develop a more diversified staff structure at LIMA to ensure effective waterways management (*WWC*, LIMA).

4.8.4 Development Approval Implementation

Need for Action

Depending on the type of development, conditions of approval may be set by a number of bodies including the local government authority, DPUD, EPA and LIMA. It is important that these conditions are implemented as soon as is practicable and that any works undertaken on the foreshore are undertaken sensitively. Too often construction and works staff are not aware of environmental conditions placed on developments or the sensitive nature of foreshore areas. This can result in intrusion into foreshore reserves, bulldozing of vegetation, fill or spoil intruding onto the foreshore, and works not being carried out to plan specifications.

It is important that staff inspect work sites to ensure that conditions of approval are implemented satisfactorily.

RECOMMENDATIONS

150) Develop an administrative procedure between local government and government agencies to ensure that conditions of approval are implemented to specifications (*LIMA*, LGA, DPUD).

151) Ensure that construction and works staff carrying out works on or abutting the foreshore are made aware of the sensitive nature of the work. Wherever possible foreshore reserves should be pegged and staff made aware that works should not intrude into this area (*LIMA*, LGA, DPUD).

4.8.5 Review and Amendment of the Management Programme

Need for Action

Under Section 35 (5) of the Waterways Conservation Act the management programme shall be kept under review and may from time to time be amended subject to approval by the Minister. The Minister may direct that a proposed amendment to the programme be referred to persons or parties likely to be affected by the proposal.

RECOMMENDATIONS

152) Consult with affected persons and agencies regarding proposed amendments to the management programme. Wherever possible this should be by personal correspondence as well as advertising in local papers (*LIMA*).

153) Monitor use of the waterways for problems and issues not addressed in the management programme and amend the programme if required (*LIMA*).

154) Review the complete management programme after seven years (*LIMA*).

155) Policies and administrative arrangements to be listed separately from the management programme allowing a more flexible approach to modification and amendment (*LIMA*).

CHAPTER 5
AREA RECOMMENDATIONS

5.1 INTRODUCTION

This chapter deals with recommendations concerning planning, development and use of specific areas of the waterways and foreshores. These areas are shown on Map 4 and have been determined on the basis of features such as natural topography, water depth, foreshore type and vegetation, as well as existing use and development and potential use. This approach assists in viewing the waterways in a regional context.

Opportunities for development, human use and conservation are identified for each area. In addition, constraints or circumstances which place limits or difficulties on conservation or use are identified. For example, areas suitable for the establishment of reserves for conservation purposes or attractive recreation areas are described as opportunities for appropriate reservation. However, freehold titles extending to high water mark which make access difficult, or changes to existing land use expensive, are described as constraints.

System 6 Recommendations are listed as constraints as Cabinet has agreed that specific locality recommendations in the 1983 report (DCE, 1983a) should be implemented as far as possible therefore broadly committing areas to a particular land use. Such a constraint should not be interpreted as a negative approach.

Where practicable, recommendations are stated in broad terms so that maximum flexibility is maintained for implementation. Recommendations which are covered by General Recommendations listed in Chapter 4 and which apply to the entire study area are not repeated in every set of Area Recommendations.

5.2 AREA 1 - LESCHENAULT INLET (SEE MAP 5)

The Leschenault Inlet is approximately two kilometres long and about 200 metres wide. Many alterations have been made to this area of waterway since European settlement (see Section 2.8.2). The inlet is now connected to Koombana Bay via a short narrow entrance channel called 'The Plug'.

Anglesea Island is located at its eastern end. This area is the only area south of Shark Bay where the white mangrove occurs, and is subject to System 6 Recommendation C68. The mangrove is believed to be a relic of an earlier period. Permanent pools of water and low-lying samphire flats on Anglesea Island provide important feeding and resting areas for many waterbirds some of which migrate annually from the northern hemisphere. The System 6 report (DCE, 1983a) suggests that one of the areas greatest values is that it has a complete range of the estuary's major waterbird species, right next to Bunbury City Centre. Therefore it rates highly from a conservation, scientific interest and recreation view point.

The mud-flats of the inlet are important providing large numbers of worms molluscs and crustacea for wading birds and nursery areas for commercial and angling species of fish.

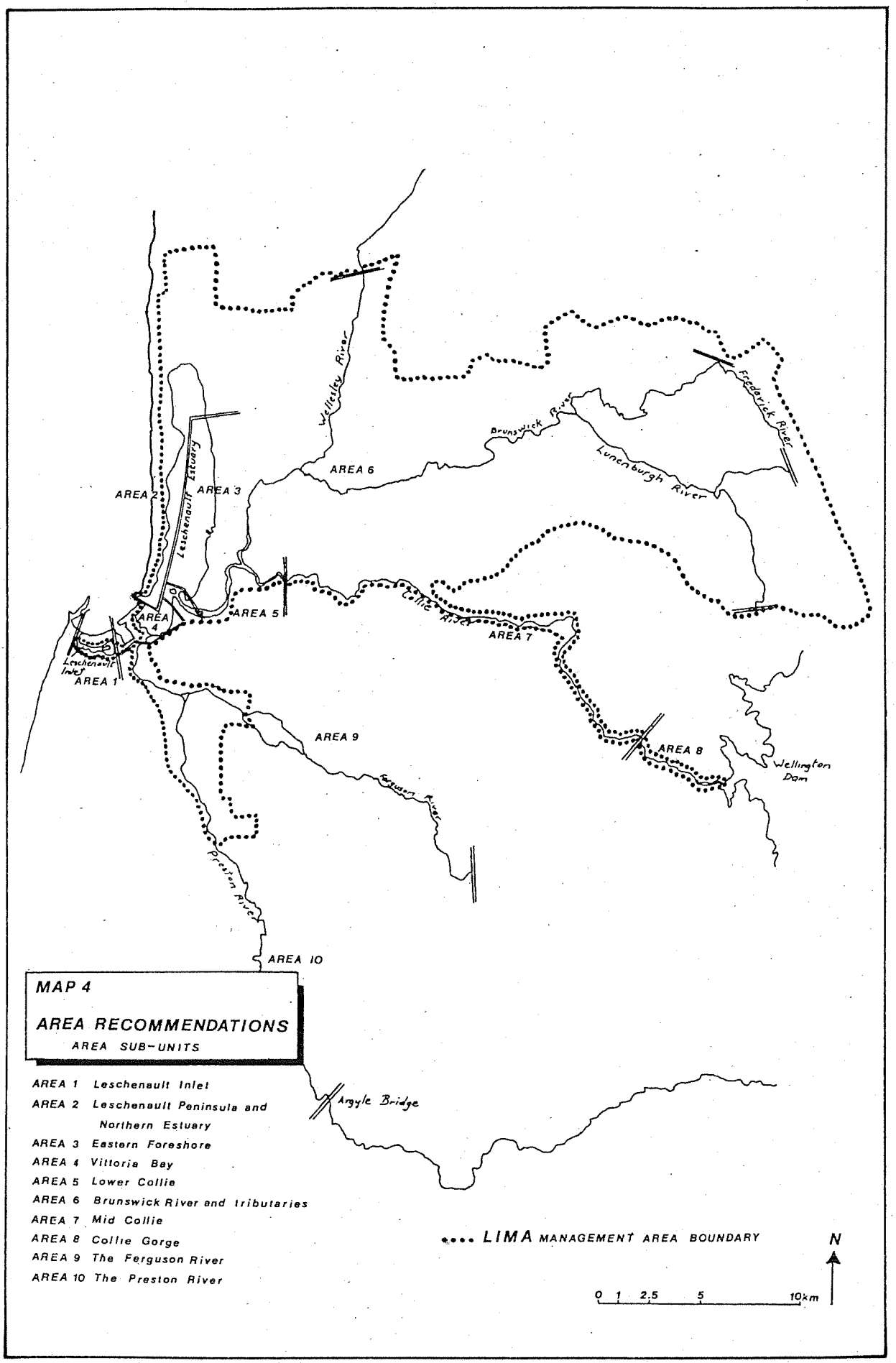
Data collected by Wright (1986) indicated that mosquito breeding in the area could create a serious nuisance to residents in the inner Bunbury area during summer. In December 1987 extensive channelling was undertaken in the Blunders area in an attempt to reduce mosquito breeding. The success of these channels is variable from a mosquito control view point. A comprehensive ground level survey has been conducted and this data will be used to further improve water drainage from the wetland so reducing the mosquito problem. The environmental importance of the areas requires that mosquito control methods must be designed to minimise the environmental impact and ensure that the integrity of the system is maintained. Mosquito control should be undertaken in a co-ordinated way using a combination of physical, chemical and biological control methods.

The inlet area has in recent years been the subject of a number of plans for its redevelopment, the most recent of which is the Bunbury Harbour City plan. The plan provides for the development of the North Shore and adjacent areas. Anglesea Island and the mud-flats will be protected and enhanced under the proposal. On the southern shore a promenade and regional entertainment centre will be developed.

Koombana Drive and Bridge have recently been completed providing a new entrance to the City of Bunbury, focusing on the inlet.

The Bunbury Powerboat Club and Rowing Club have facilities on the foreshore of the inlet. A number of jetties are located on the banks of the waterway most of them private. Barbecue and picnic facilities are located at Queen's Gardens on the southern shore.

Private and public jetties occur around the inlet edge. LIMA and the Bunbury Port Authority have developed separate policies for the renewal of these facilities.


Wellesley River
Brunswick River
Frederick River
Lunenburgh River
AREA 6
AREA 2
AREA 3
Leschenault Estuary
AREA 4
AREA 5
Collie River
AREA 7
Leschenault Inlet
AREA 1
AREA 9
AREA 8
Wellington Dam
Ferguson River
Preston River
AREA 10
Argyle Bridge
MAP 4
AREA RECOMMENDATIONS
AREA SUB-UNITS
AREA 1 Leschenault Inlet
AREA 2 Leschenault Peninsula and Northern Estuary
AREA 3 Eastern Foreshore
AREA 4 Vittoria Bay
AREA 5 Lower Collie
AREA 6 Brunswick River and tributaries
AREA 7 Mid Collie
AREA 8 Collie Gorge
AREA 9 The Ferguson River
AREA 10 The Preston River
LIMA MANAGEMENT AREA BOUNDARY
N
0 1 2.5 5 10km

OPPORTUNITIES
- Primary focus for Bunbury City Centre.
- Conservation area in close proximity to city.
- Co-ordinated development of area through Bunbury Harbour City plan.

CONSTRAINTS
- System 6 Recommendation C68.
- Mosquito control.
- Proximity to harbour and impact of harbour expansion.
- Titles to high water mark restriet public access on southern shore.

RECOMMENDATIONS

A1) Support the implementation of the Bunbury Harbour City plan encouraging early completion of the Anglesea Island and associated waters component of the plan (*SWDA*, LIMA).

A2) Develop a joint policy on transfer, renewal and construction of jetties in the Inlet with Bunbury Port Authority and LIMA (*LIMA*, BPA, DMH).

A3) Encourage the develop of a management plan for Anglesea Island and associated areas focusing on conservation of the waterbird habitat and mud-flats, mosquito control and public access to the area (NB if vesting remains with the City of Bunbury DOLA to require plan as a condition of vesting) (*EPA*, BCC, CALM, DOLA, LIMA).

5.3 AREA 2 - LESCHENAULT PENINSULA AND NORTHERN ESTUARY (SEE MAP 6)

The Leschenault Peninsula is an elongate, finger-like extension of the Swan Coastal Plain, some 12 km long and between 0.8 and 1.5 km wide. The Peninsula encloses the estuary and consists of a series of vegetated and mobile dunes and some small woodland plains. Some of the dunes rise to 40 metres above sea level and mobile dunes currently cover some 30% of the Peninsula (Semeniuk and Meagher, 1981, as cited by Trudgen, 1984).

The Peninsula is largely surrounded by water giving an island-like atmosphere to the area.

The vegetation of the Peninsula is of high interest, its value being the good development of vegetation types represented, its aesthetically pleasing nature, its potential as a resource, its role in stabilising the sand dunes of the Quindalup Dune System and the presence of the Tuart woodlands, white mangrove closed scrub and the extensive halophytic areas. The stabilising role of the dune vegetation is highly significant in protecting the estuary and edge communities from invasion by sand dune blowouts (Trudgen, 1984).

The area is subject to System 6 Recommendation C66.

Public access to the Peninsula has been restricted since the early 1960s when it became the site for effluent disposal from the SCM Chemicals (then Laporte) titanium dioxide plant at Australind. Use of the Peninsula for this purpose ceased in 1990. Extensive rehabilitation works are occurring in lagoon areas. On completion of effluent dumping and rehabilitation works the area will be developed for recreation and public access permitted. When the Conservation and Land Management Act has been amended the area will become a Conservation Park managed by CALM. LIMA is represented on the Technical Committee and Community Committee overseeing the development of a plan for the area.

To date the Shire of Harvey has improved road access to the northern end of the Peninsula to the ocean beach. This area is proving a popular ocean fishing site. SWDA and CALM have constructed an overnight camping and day picnic area accessible by boat at the southern tip of the Peninsula. Potential recreation nodes are planned for Belvedere (Waterloo Head) and the pipeline crossing point.

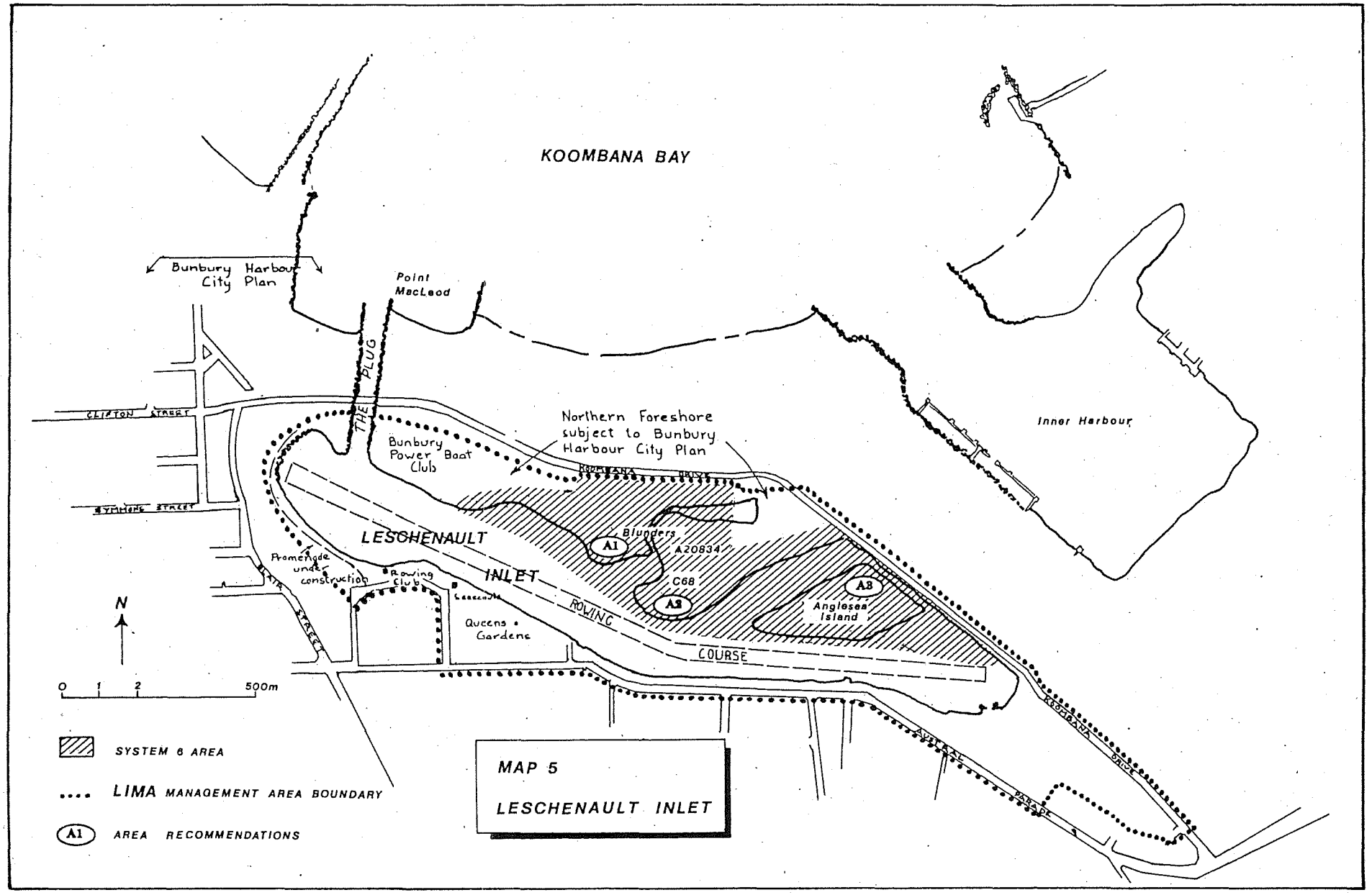
Illegal public vehicle access to the Peninsula contributes to problems of dune destabilisation and in samphire areas leads to rutting of the ground creating pond areas for mosquito breeding.

The northern estuary and Peninsula edges are highly productive providing important bird roosting and feeding areas (see Section 4.2.1) and significant mosquito breeding areas (see Section 4.2.5). LIMA promotes the northern estuary as a 'no boating area' due to the disturbance this activity causes to aquatic vegetation and benthic fauna.

Parkfield Drain enters the estuary in this area. This drain drains agricultural land to the north of the estuary. This is being looked at by the LICMG (See Recommendation 50).

OPPORTUNITIES
- Development of conservation park.
- Development of major new recreation area for Bunbury Region.

CONSTRAINTS
- System 6 Recommendation C66.
- Public access restricted until effluent disposal ceases.
- Dune destabilisation.
- Mosquito breeding.


KOOMBANA BAY
Bunbury Harbour City Plan
Point MacLeod
THE PLUG
CLIFTON STREET
SYMMONS STREET
Bunbury Power Boat Club
Northern Foreshore subject to Bunbury Harbour City Plan
KOOMBANA DRIVE
Inner Harbour
LESCHENAULT INLET
Blunders
A20834
C68
A1
A2
A3
Anglesea Island
Promenade under construction
Rowing Club
Queens Gardens
ROWING COURSE
N
0 1 2 500m
SYSTEM 6 AREA
LIMA MANAGEMENT AREA BOUNDARY
A1 AREA RECOMMENDATIONS
MAP 5
LESCHENAULT INLET

RECOMMENDATIONS

A4) Liaise with CALM on the development of a management plan for the Peninsula ensuring it is complementary to the Leschenault Waterways Management Programme (*CALM*, LIMA).

A5) Amend System 6 Recommendation C66 to include the southern part of the estuary and implement the general recommendations (*EPA*, LIMA).

A6) Ensure mosquito control is in accordance with the Mosquito Control Advisory Committee recommendations (*MCAC*, LIMA, LGAs).

A7) Monitor nutrient levels in Parkfield Drain. Encourage changes in land use and land use practices in order to reduce nutrient levels in the drain (*LIMA*, LICMG).

5.4 AREA 3 - EASTERN FORESHORE (SEE MAP 6)

The eastern foreshore is the main focus for recreational use of the estuary. A thin foreshore reserve runs almost the entire length of the area although some properties extend to high water mark. Many of these areas are low lying and become inundated during winter.

Indigenous vegetation along the shoreline has been removed in a number of locations. Rehabilitation work is being carried out by LIMA and Council.

The sedge communities around the estuary edges serve an important function in protecting the shoreline from wind generated waves. Indiscriminate boat launching and fires in the area can destroy the fringing vegetation.

The townsite of Australind abuts Old Coast Road and subdivision is spreading northwards into the vicinity of Cathedral Avenue. This area is identified as 'Special Rural' and 'Future Special Rural' in the Bunbury Region Plan. The Shire of Harvey and LIMA are currently preparing a management plan for the area addressing issues including nutrient input and landscape protection.

The main boat ramp for the estuary is located at Parris Road, Australind. A dredged channel provides access to the deeper waters of the estuary. Other smaller ramps and channels are located along the foreshore. A number of these channels are only used spasmodically by adjacent residents. Consolidation of the channels is required to reduce the burden of maintenance on LIMA.

Due to strong south-westerly winds weed accumulates along this foreshore. Access difficulties make it impossible to collect this weed without damaging foreshore vegetation. To date weed accumulation has not been a severe problem, however, if eutrophication of the estuary becomes a problem, weed collection and removal will present a problem for LIMA.

As well as a Parris Road boat ramp a recreation area is located at Christina Place. The Shire of Harvey and LIMA undertook joint development works at this location in the 1989-90 financial year.

Cathedral Avenue provides an aesthetically pleasing scenic drive along the estuary foreshore. Trees on either side overhang the road resulting in an attractive canopy.

The effluent pipeline crosses the estuary opposite the SCM Chemicals plant. The first section of the pipeline is supported on a rock groyne. This restricts the through flow of water and results in weed accumulating in the embayment. The remainder of the pipeline is on a trestle structure with a passage provided for boating traffic. The height of the pipeline does however restrict the size and type of boat able to pass under the structure. On completion of effluent disposal operations, it is proposed to remove most of the trestle structure with the rock groyne to remain but with increased circulation through the structure.

The area is subject to System 6 Recommendation C66.

OPPORTUNITIES

- Development of a continuous walkway along the eastern foreshore.
- Development of Christina Place Reserve.

CONSTRAINTS

- Titles to high water mark.
- Width of the foreshore reserve.
- Tidal inundation.
- Traffic on Old Coast Road.

RECOMMENDATIONS

A8) Maintain the policy of reducing boat channels to a maximum of eight (*LIMA*).

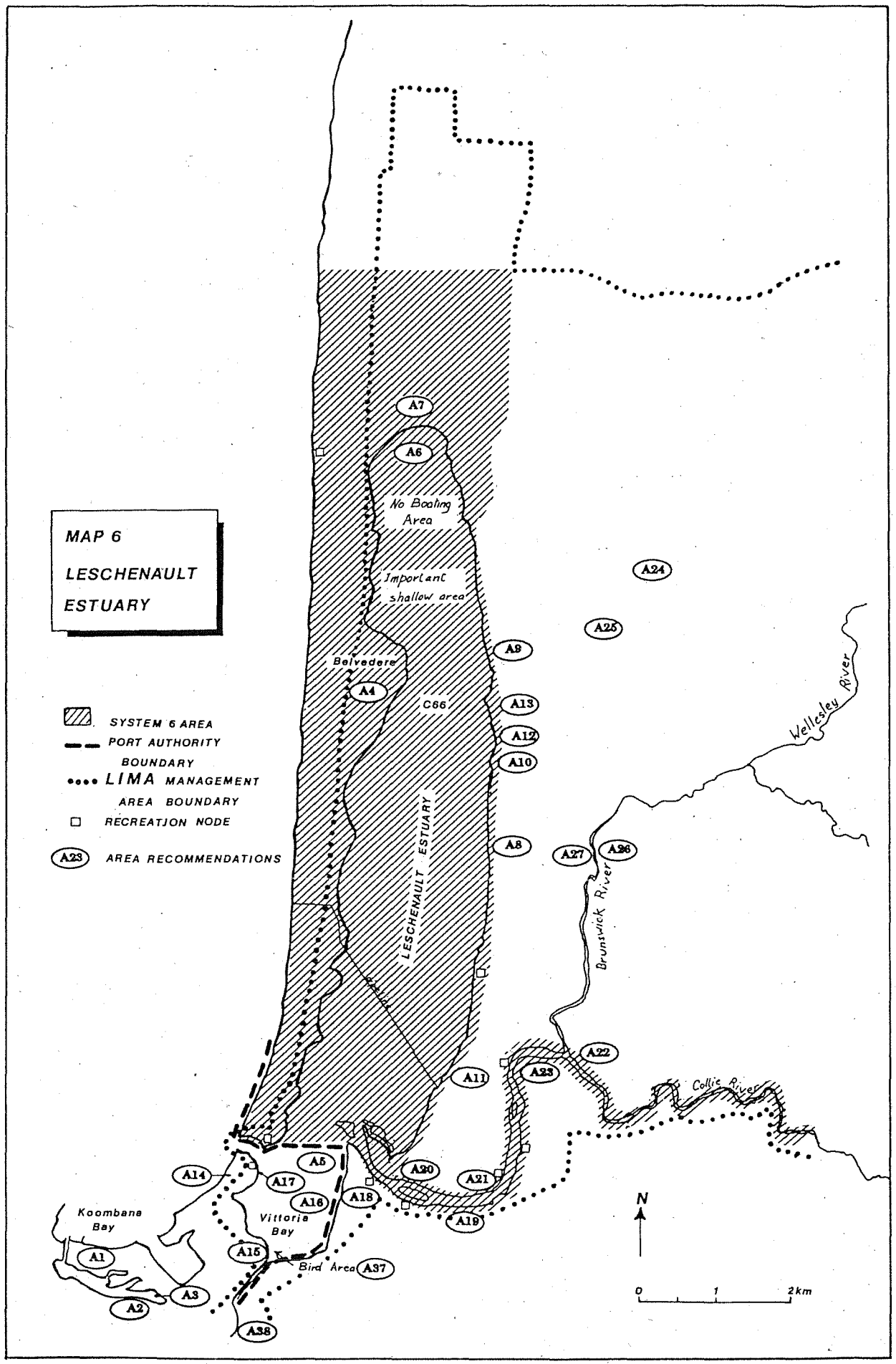
A9) Restrict unauthorised boat launching (*LIMA*).

A10) Develop a co-ordinated landscape plan for the area to: (*LIMA*, LGAs)

- Stabilise foreshore erosion;
- Provide scenic views across the estuary;
- Minimise bush fires; and
- Restrict public access and boat launching.

A11) Upgrade Christina Place Reserve (*LIMA*, HSC).

A12) Ensure that Cathedral Avenue does not become a major road as a result of subdivision in the vicinity (*DPUD*, HSC, LIMA).


MAP 6
LESCHENAULT
ESTUARY
SYSTEM 6 AREA
PORT AUTHORITY BOUNDARY
LIMA MANAGEMENT AREA BOUNDARY
RECREATION NODE
AREA RECOMMENDATIONS
No Boating Area
Important shallow area
Belvedere
C66
LESCHENAULT ESTUARY
Wellesley River
Brunswick River
Collie River
Koombana Bay
Vittoria Bay
Bird Area
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
A20
A21
A22
A23
A24
A25
A26
A27
A37
A38
N
0
1
2km

A13) Develop a management plan for the Cathedral Avenue area and eastern escarpment addressing issues including nutrient input and landscape protection (LIMA, HSC).

5.5 AREA 4 - VITTORIA BAY (SEE MAP 6)

This area covers the southern foreshore of the estuary around to Pelican Point on the eastern foreshore. It is a highly modified environment due to alterations to the waterways resulting from the Inner Harbour development.

The Vittoria Bay area falls within the Bunbury Port Authority boundary. It is not a System 6 area, however Ninox (1989) have recently quantified its importance as an important bird feeding and roosting area, particularly the Preston River delta which provides important shallow wading areas for birds. Much of the low lying land abutting the estuary is flooded during winter.

The majority of the foreshore is in public ownership although its use is limited by Port Authority expansion plans. EPA has recently given approval for expansion of the Port under certain conditions. If Port activities continue to grow further expansion may be necessary. This may involve the relocation of the Preston River again.

Two recreation areas are available, one at the Cut the other south of Pelican Point on Estuary Drive. The Cut area has been recently upgraded by SECWA as a result of rehabilitation of one of the fly ash ponds. A launch ramp and parking area are now available. Previous to this LIMA and the City of Bunbury undertook some sand dune stabilisation works. The Cut is a popular fishing spot. A co-ordinated development plan is required for the area. An area has been set aside for future fly ash ponds. However expansion beyond this is not seen as desirable.

The reserve on Estuary Drive has barbecue facilities and is used by people crabbing. The area is also used by the racing fraternity as a horse exercise area.

LIMA and the BPA plan to develop a management plan for the Vittoria Bay area including the Preston River mouth as a condition of the Port expansion plans. A previous study by the Technical Sub-Committee Vittoria Bay (1985) will provide the basis for the plan.

OPPORTUNITIES

- Important bird feeding and roosting area.
- Development of a continuous walkway system.
- Development of bird watching facilities.

CONSTRAINTS

- Bunbury Port Authority expansion plans.
- SECWA fly ash disposal.
- Weather conditions can make boat launching difficult.

RECOMMENDATIONS

A14) Develop a recreation plan for 'The Cut' area taking into account the Proposed facility on the southern tip of the Peninsula (*LIMA*, SEC, BCC, HSC).

A15) Develop a foreshore plan for Vittoria Bay covering the area from Preston River mouth to Pelican Point (*LIMA*, BCC, BPA).

A16) Amend the System 6 boundary in the area to include the waters of Vittoria Bay (*LIMA*, EPA).

A17) Restrict the expansion of existing fly ash pond areas adjacent to the foreshore (*LIMA*, EPA).

5.6 AREA 5 - LOWER COLLIE (SEE MAP 6)

This area extends from the Collie River mouth upstream on the Collie River for approximately four kilometres. The area is subject to System 6 Recommendation C67. It is recognised that demand for use of this sector of the river is likely to increase as the population of Bunbury grows.

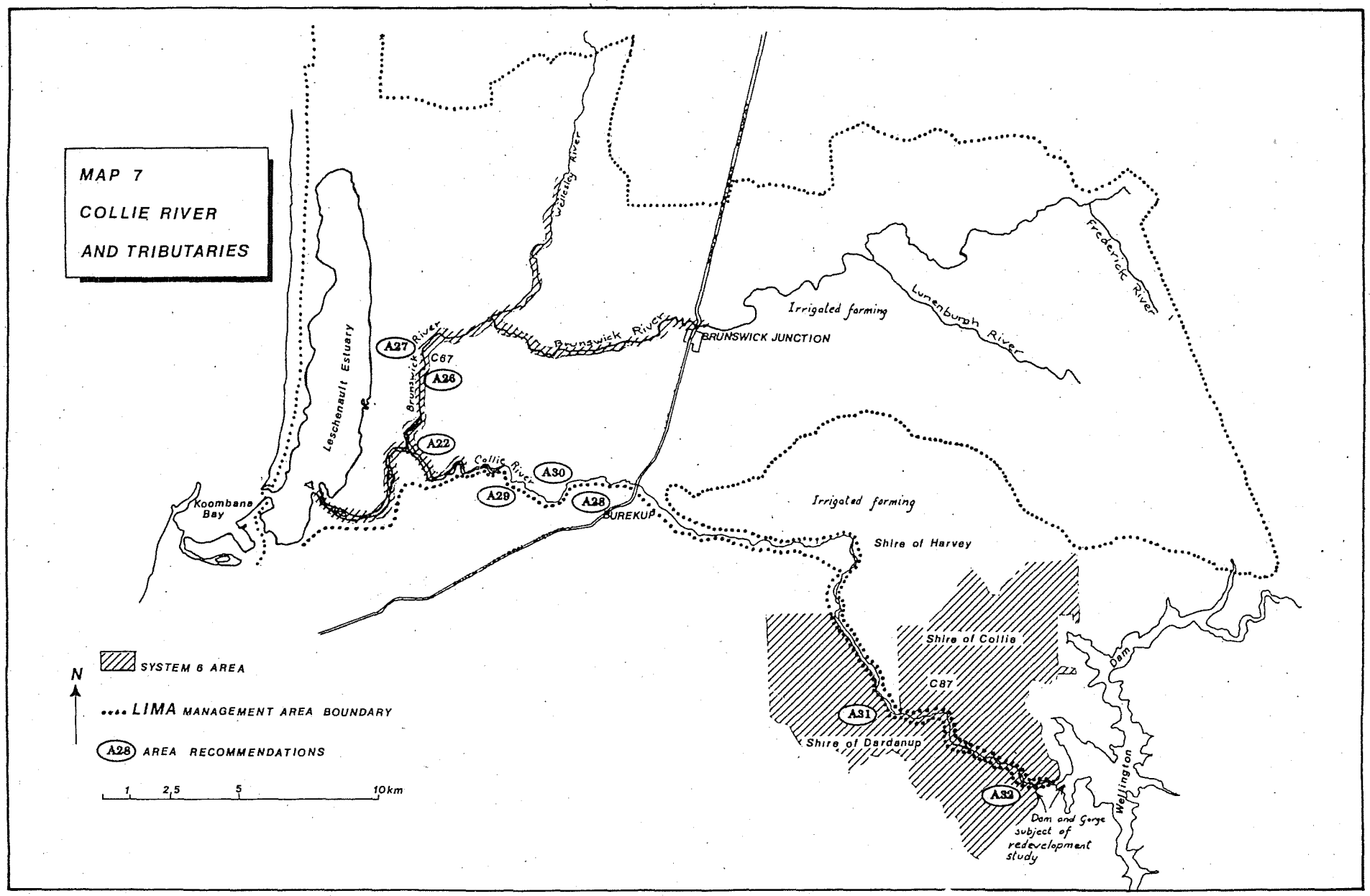
Point Douro and Pelican Point are the subject of tourist development plans. The former received approval in 1989 and the latter is still the subject of negotiation. The Point Douro development is for a caravan/chalet development. The southern tip of land is to be managed as a conservation reserve as a condition of development.

This lower stretch of the Collie is affected by flooding with floodways extending into Point Douro and Pelican Point (see Section 4.1.9).

The communities of Eaton (on the southern shore) and Clifton Park (on the northern shore) abut the Collie River. Foreshore reserves abut these subdivisions. Further upstream no foreshore reserves exist.

LIMA and Shire of Harvey completed a management plan for the Clifton Park Foreshore Reserve in 1989. It identifies works required in the area and conservation areas. Implementation of the plan is being carried out jointly by Shire of Harvey and LIMA.

Recreation nodes are located at Shoalhaven and Apex Park on the southern bank and Clifton Park and The Elbow on the northern shore. Facilities have also been developed adjacent to the Eaton Scout Hall. The facilities at Shoalhaven require upgrading.


MAP 7
COLLIE RIVER
AND TRIBUTARIES
Wellesley River
Leschenault Estuary
Brunswick River
A27
C67
A26
A22
Collie River
A30
A29
A28
Brunswick River
BRUNSWICK JUNCTION
Irrigated farming
Lunenburgh River
Frederick River
Koombana Bay
BUREKUP
Irrigated farming
Shire of Harvey
Shire of Collie
C87
A31
Shire of Dardanup
A32
Dam and Gorge subject of redevelopment study
Dam
Wellington
N
SYSTEM 6 AREA
LIMA MANAGEMENT AREA BOUNDARY
A28 AREA RECOMMENDATIONS
1 2,5 5 10km

The area is identified for future residential development in the Bunbury Region Plan. A structural plan for expansion of the Eaton area has recently been completed.

OPPORTUNITIES
- Establish foreshore reserves as subdivision occurs.
- Upgrade Shoalhaven recreation area.
- Enhance fishing facilities in the area.
- Public access to foreshore.

CONSTRAINTS
- Floodway requirements.
- Water depth restricts boating activities.
- Foreshore erosion in some locations.
- Titles to high water mark in upstream locations.
- System 6 Recommendation C67.

RECOMMENDATIONS

A18) Develop guidelines for the redevelopment of the Shoalhaven boat ramp area ensuring that there is adequate provision for boat ramps, parking and a public recreation area (*LIMA*, BCC).

A19) Develop a continuous foreshore walkway (*LIMA*, BCC).

A20) Undertake foreshore erosion works (*LIMA*, LGAs).

A21) Establish fishing facilities to discourage indiscriminate access to the foreshore (*LIMA*, LGAs).

A22) Establish foreshore reserves as subdivision occurs in upstream areas (*DPUD*, LGA, LIMA).

A23) Implement System 6 Recommendation C67 (*LIMA*, EPA, LGAs).

5.7 AREA 6 - BRUNSWICK RIVER & TRIBUTARIES (SEE MAP 7)

This area includes the Brunswick, Wellesley, Lunenburgh and Frederick Rivers to the edge of the management area. Some of these rivers experience intermittent flow only.

The Brunswick River downstream from Brunswick Junction and Wellesley River from about 1 km downstream of the intersection with Wellesley Road are subject to System 6 Recommendation C67.

The Bunbury Region Plan identifies areas on the lower reaches of the Brunswick River as suitable for urban expansion. Similarly land abutting the river at Brunswick Junction has been identified for the same purpose. The river and foreshores have been identified as 'Parks and Recreation' areas or 'Areas under consideration for conservation, scenic protection and reservation'.

The proposed Kemerton Industrial Park abuts the Wellesley River in the northern perimeter of the management area. Surface and groundwater flow from the site has the potential to enter the Wellesley River system. It is important that individual developments on the site are subject to environmental assessment and a vegetation buffer is maintained between the industrial park and the river.

A number of hobby farm subdivisions have previously occurred between the estuary and Brunswick and Wellesley Rivers. Such subdivisions are unsewered and have the potential to contribute to the nutrient load to the system.

Irrigated farming is the main land use on the coastal plain catchment of these rivers. Davis (1989) in a preliminary assessment of nutrient loading to the estuary indicated that significant levels of nutrients were entering the Brunswick-Collie system from the sand over clay soils. Changes in land use or practices need to be monitored as these have the potential to alter nutrient loadings from these areas. Foreshore vegetation should be maintained and enhanced as a buffer zone. Stock access should be restricted.

The Brunswick River is also the subject of plans for a new dam in order to meet future water supply demand for the region, particularly in the Harvey/Brunswick area.

OPPORTUNITIES
- Creation of foreshore reserves along the foreshore as subdivision occurs.
- Focus of township of Brunswick Junction.

CONSTRAINTS
- Water depth of river.
- Titles to high water mark.
- System 6 Recommendation C67.

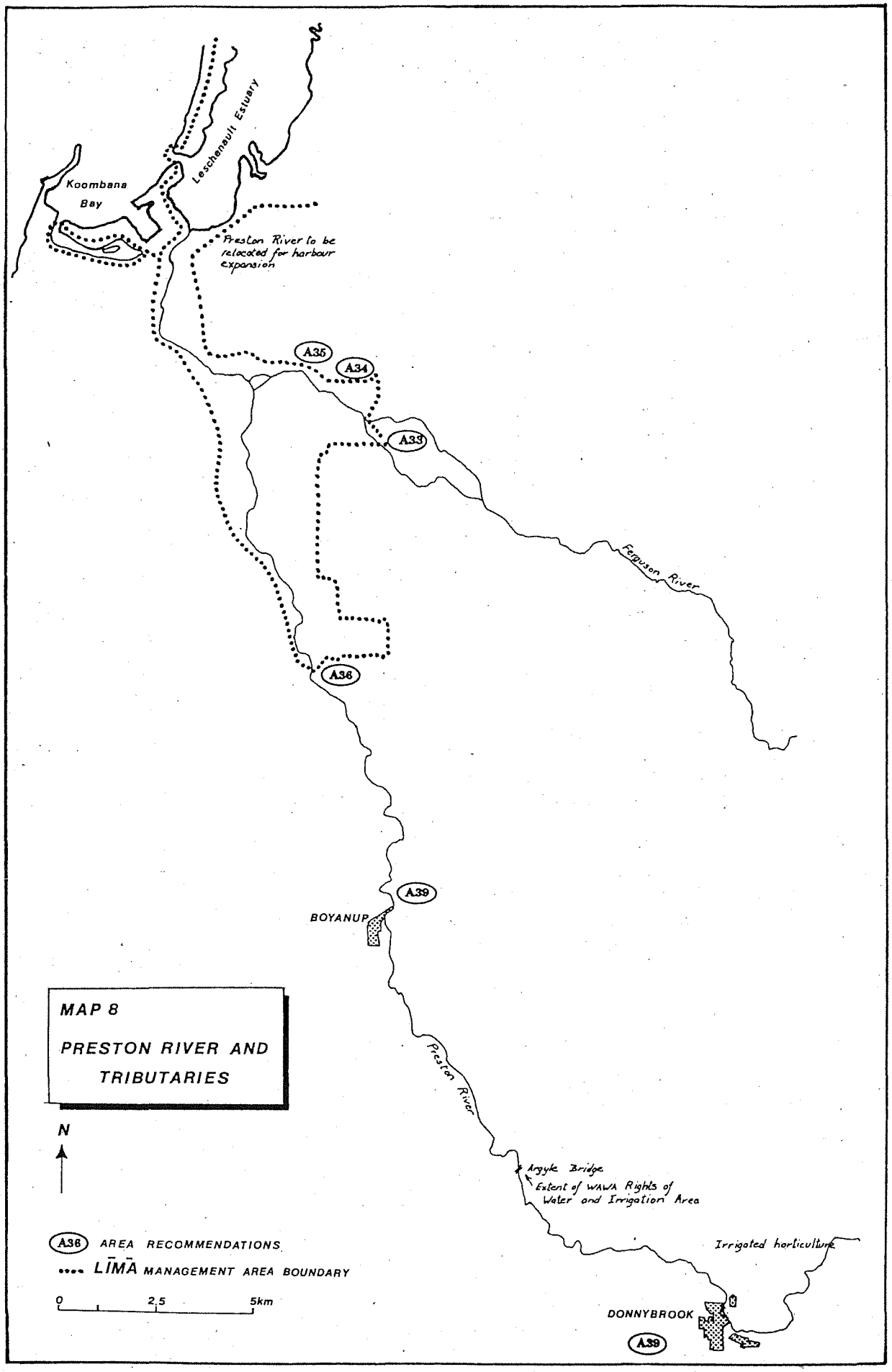
RECOMMENDATIONS

A24) Ensure developments at Kemerton Industrial Park are environmentally acceptable to the health of the estuary (*EPA*, LIMA).

A25) Monitor land uses to determine potential nutrient loading changes to the waterways (*LIMA*, LICMG, DOA).

A26) Develop foreshore reserves along the Brunswick River as a condition of subdivision including the townsite of Brunswick Junction (*LIMA*, LGA).

A27) Implement System 6 Recommendation C67 (*LIMA*, EPA, LGAs).


Koombana Bay
Leschenault Estuary
Preston River to be relocated for harbour expansion
A35
A34
A33
Ferguson River
A36
A39
BOYANUP
Preston River
Argyle Bridge
Extent of WAWA Rights of Water and Irrigation Area
Irrigated horticulture
DONNYBROOK
A38
MAP 8
PRESTON RIVER AND TRIBUTARIES
N
A36 AREA RECOMMENDATIONS
LIMA MANAGEMENT AREA BOUNDARY
0 2.5 5km

5.8 AREA 7 - MID COLLIE (SEE MAP 7)

The area includes the Collie River 4 km upstream to the boundary of the Lennard Management Priority Area. The main land use in this area is irrigated farming.

A number of linear foreshore reserves exist along this stretch of the river as a result of past subdivision. Vegetation along the banks is quite sparse in most locations and accessible by stock.

Public access to this section of the river is limited due to private ownership to high water mark. Unrestricted public access could result in problems of vandalism and bushfires to adjacent landowners.

OPPORTUNITIES
- Revegetation of foreshore areas.

CONSTRAINTS
- Titles to high water mark.

RECOMMENDATIONS

A28) Restrict stock access to the river to reduce erosion, localised eutrophication and loss of vegetation (*LIMA*, HSC, DSC).

A29) Develop a joint fire management plan with local government, LIMA and landowners (*LIMA*, HSC, DSC, Eaton and Australind Fire Brigades).

A30) Enter into agreement with landowners to provide public or statutory access where appropriate (*LIMA*, DOLA, HSC).

5.9 AREA 8 - COLLIE GORGE (SEE MAP 7)

This area includes the Lennard Management Priority Area and is subject to System 6 Recommendation C87 for its conservation and recreation value and its proximity to the Bunbury and Collie regions.

This area provides a valuable recreation resource for the people of the Collie/Bunbury areas providing opportunities for canoeing, limited marroning, camping and bushwalking. The area through the gorge up to Wellington Dam is a particularly attractive scenic drive. Condition of the road however limits use and enjoyment of the area.

It is aniticpated that the completion of the Harris River Dam in 1990 will release the Wellington Dam for recreational and tourism use. A preliminary development and management plan has been completed by SWDA in association with government and local government agencies.

Additional recreational facilities are proposed for the Wellington Dam and Collie Gorge area. SWDA has established a committee on which LIMA is represented to oversee the development of the Gorge area.

Current recreational facilities in the Gorge are limited, however it is important that over development does not occur destroying the solitude people are seeking from the area.

OPPORTUNITIES
- Large conservation area with good public access and constant water supply.
- Use of Wellington Dam for recreation.
- Scenic Drive.
- Provision for a range of camping opportunities and experience in the gorge area.

CONSTRAINTS
- System 6 Recommendation C87.
- Water quality and effluent disposal.

RECOMMENDATIONS

A31) Implement System 6 Recommendation C87 (*CALM*, LIMA).

A32) Liaise with the Wellington Dam Planning Committee on the development of the gorge area and Wellington Dam. Ensure that the plan for the gorge addresses issues of: (*CALM*, SWDA, LIMA)

- camping;
- rehabilitation;
- public access to the foreshore;
- a safe and attractive scenic road;
- recreation nodes; and
- suitable effluent disposal facilities.

5.10 AREA 9 - THE FERGUSON (SEE MAP 8)

This area includes the Ferguson River from its headwaters to its confluence with the Preston River. Currently the LIMA management area extends only a limited way along the river.

Land abutting the Ferguson in its lower reaches is identified for industrial purposes and further upstream as irrigated farming. The foreshore reserves are identified for 'Parks and Recreation and Drainage Purposes' or 'Areas under consideration for conservation, scenic protection and reservation'.

To date very few Land Act reserves exist along the river foreshore.

Public access to the foreshore needs to address the issues of vandalism and fire management.

OPPORTUNITIES
- Extension of management areas.
- Development of foreshore reserves as a condition of subdivision.

CONSTRAINTS
- Industrial land use zoning and potential problems of leaching to river.
- Titles to high water mark.

RECOMMENDATIONS

A33) Extend the LIMA management area to include Ferguson River in accordance with Recommendation 145 (*EPA*, LIMA).

A34) Monitor industrial land use in the area (*LIMA*, EPA).

A35) Revegetate foreshore areas adjacent to industrial areas (*LIMA*, DSC).

5.11 AREA 10 - THE PRESTON RIVER (SEE MAP 8)

The Preston River enters the estuary at Vittoria Bay. The river mouth was relocated in the 1970s to allow for the development of the Bunbury Inner Harbour. Siltation of the river mouth since its relocation has resulted in the development of a delta which provides a significant waterbird feeding habitat.

The artificial banks created when the river was relocated have not been revegetated and are quite steeply sloping. This area of the river is unattractive having a canal-like appearance.

EPA has recently approved plans for the partial expansion of the Inner Harbour.The Bunbury Port Authority has further long term plans for extension of the Inner Harbour and land has been set aside in the Bunbury Region Plan for these works. If the extension goes ahead then the mouth of the Preston River will have to be relocated again, further to the east.

The Preston River is also subject to flooding and a floodway has been provided through the Glen Iris area.

The foreshore of the river is identified in the Region Plan for 'Parks and Recreation and Drainage' or 'Areas under consideration for conservation, scenic protection and recreation'. Along the lower Preston River a small area is set aside for the future suburb of Glen Iris. Rural land use occurs in the upstream sections. The communities of Boyanup and Donnybrook are located on the banks of the Preston River.

Most rural land uses are agriculture with irrigated horticulture, particularly in upstream areas. Pesticide use in these areas has been of concern to LIMA in the past (see Section 4.2.2.6).

The Water Authority manages the waters of the Preston River downstream to Argyle Bridge as a 'Water Rights and Irrigation' area.

Water depth and the nature of the river limit recreational opportunities.

Public access to the river is restricted due to private ownership. A number of foreshore reserves have been created as a result of subdivisions, however these are not always accessible due to abutting private property and limited road access.

OPPORTUNITIES
- Focus for communities of Donnybrook and Boyanup.
- Extension of management area.
- Rehabilitation and landscaping of Preston River.

CONSTRAINTS
- Titles to high water mark.
- Protection of delta as bird feeding habitat.
- Floodway.
- Extension of the Bunbury Inner Harbour.

RECOMMENDATIONS

A36) Extend the LIMA management area to include the Preston River in accordance with Recommendation 145 (*EPA*, LIMA).

A37) Protect the delta as a bird feeding habitat (*LIMA*, BPA).

A38) Rehabilitate and landscape lower Preston River. Liaise with Water Authority and Port Authority on flooding and relocation of the river mouth. Encourage community groups to assist with rehabilitation works (See Recommendation 133) (*LIMA*, WAWA, BPA, BCC).

A39) Encourage landscaping of the river to provide a focus for the communities of Donnybrook and Boyanup (*LIMA*, LGAs).

CHAPTER 6

IMPLEMENTATION AND MONITORING

6.1 INTRODUCTION

The implementation of the various recommendations in this Management Programme is the responsibility of LIMA although many require liaison and co-ordination with government and local government agencies.

The large number of recommendations and the involved nature of some of them mean that implementation will take a number of years. For example, biological investigations may take several years to complete or legislative changes required may be quite complex.

Similarly staff, financial resources and Government budgetary restraint in the face of the current economic situation will also limit implementation of some recommendations.

6.2 IMPLEMENTATION

It is proposed that a yearly works programme for the Leschenault Management Area will be developed by LIMA in association with the Waterways Commission, based on this Management Programme.

The recommendations have been divided into two categories: on-going activities and one-off projects. The recommendations for on-going activities will be implemented as soon as possible. These are listed in Table 2. For one-off projects a time schedule has been applied to indicate priority. These are listed in Table 3.

It is proposed that LIMA and the Waterways Commission maintain records of all management activities in relation to the programme and report on these in the annual report of the Waterways Commission.

6.3 REVIEW

It is proposed in Recommendation 154 that the programme be reviewed in seven years time. The review will identify which objectives and recommendations have been achieved and any reasons for facets of the programme not being implemented. Any information such as changing roles of agencies, population growth in the region and increasing recreational use will be assessed and a new updated programme prepared as a result.

TABLE 2 IMPLEMENTATION OF ON-GOING RECOMMENDATIONS

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Priority
1	LIMA	Liaise with DPUD	High
3	DPUD	Liaise with DPUD	Medium
6	LIMA LGA to implement	Develop guidelines	Low
7	LIMA	Liaise with LGA	Medium
8	LGA	LIMA assist in preparation. Can be done as part of Rec. 7	Medium
9	LIMA	Incorporate into advice on development proposals	High
11	LIMA	Incorporate into advice on development proposals	High
12	Developer DPUD	LIMA liaise with DPUD to have as condition of approval	High
16	LIMA	Refer to EPA	High
18	DPUD LGA	Liaise with DPUD and LGA on requirements	High
19	LGA LIMA	Require development proposals to identify advertising requirements	Low
20	LIMA	Advise LGA and DPUD on development proposals	Low
21	LIMA	Consider during assessment of development proposals	High
22	WAWA	Request WAWA for advice	High
23	LIMA DPUD LGA	Consider during assessment of development proposals	High
24	LIMA	Consider during assessment of development proposals	High
25	LIMA	Refer canal proposals to appropriate agency for assessment	High
26	LIMA	Advise developers of policy	High
27	EPA	Refer to EPA	High
28	WAWA	Liaise with WAWA	Medium

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Priority
29	DPUD EPA	Refer to appropriate body for assessment	Medium
30	LGA DPUD	Liaise with LGA, DPUD on possible impact	High
31	MRD	Liaise with MRD on design	Medium
32	DPUD SECWA MRD Westrail WAWA	Liaise with agency on design	Medium
35	LIMA	Refer to EPA	High
36	LIMA	Liaise with WAWA	Medium
38	WAWA	Liaise with WAWA	Medium
40	LGA	Advise LGA and DPUD on development proposals	High
41	LIMA	Advise LGA and DPUD on development proposals	Medium
45	LIMA Landowner	Determine suitable areas; set up a few trial areas	Low
46	LIMA Proponent	Determine as part of DPUD assessment. Require as condition of approval	Medium
51	LIMA	Incorporate into monitoring programme. Assess the problem	High
52	LIMA	Liaise with DMH	Medium
53	LIMA	Incorporate into monitoring programme	High
54	LIMA	Incorporate into monitoring programme	Low
57	LIMA	Liaise with LGA, DPUD	High
58	LIMA	Liaise with landowners and developers	High
60	LIMA	Liaise with Department of Agriculture	Low
61	LIMA	Liaise with Department of Agriculture	Medium

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
63	LIMA	LIMA to budget for equipment and staff with Waterways Commission	Medium
64	LIMA	Advise DPUD, LGA on potential problem. Assess as part of development proposals	High
65	WAWA	Liaise with WAWA	Low
66	WAWA	Require as condition of approval	High
67	LIMA	Assess and advise WAWA on impact on waterway	Low
70	EPA	Liaise with EPA	Low
71	LIMA	Incorporate into monitoring programme	Medium
74	LIMA	Determine problem and provide information as required	Low
75	LIMA	Liaise with landowners. Set up trial demonstration areas	Medium
77	LIMA	Assess development proposals under existing policy	High
78	MCAC	Liaise with MCAC	Medium
80	LIMA	Liaise with MCAC on mosquito problem. Provide advice to LGA and DPUD	High
82	LGA	Liaise with LGA	Low
85	WAWA	Refer plans to WAWA for comment	High
89	LGA	Liaise with Council rangers on problems of fire lighting	High
91	LIMA LGA	Assess development proposals and management plans to include such features	Medium
92	LGA	Liaise with LGA	Medium
94	LIMA WAM	Refer plans to WAM for comment	Medium
95	LIMA	Contact WAM, HCWA and National Trust for information	Medium

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Priority
96	LIMA	Undertake surveys at regular intervals	Low
97	LIMA	Liaise with CALM, LGA on facilities	Medium
99	LIMA	Determine suitable activities	Low
100	LIMA	Liaise with developer on maintenance of foreshore	High
101	DPUD	Assess proposals and advise DPUD and/or LGA	High
102	Tourist Operators WATC	Liaise with tourist operators and promoters	Medium
103	LIMA SWDA	Liaise with WATC	Medium
105	LIMA	Liaise with developer on maintenance of foreshores	High
106	DMH	Lobby responsible agencies to support alternative facilities	Low
107	DPUD LGA	Advise approving agency on LIMA's requirements	High
108	DMH	Liaise with DMH on appropriate facilities	Medium
109	EPA	Refer proposals to EPA	High
110	Approving agency (DPUD, DMH, EPA)	Advise approving agency on requirements	Low
111	DMH	Liaise with DMH	High
112	LIMA	Monitor use and demand for facilities	Low
113	LIMA	Sign post area, promote in brochures, monitor use.	High
114	LIMA	Address issue in development of management plans for recreation nodes	Medium
115	SWDA CALM	Liaise with SWDA and CALM	High
116	LIMA	Monitor use, record complaints, refer to DMH	Low

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Priority
117	LIMA	Monitor use, plan and develop new facilities if required	Medium
118	DPUD	Liaise with DPUD	Low
120	LGA Bikewest LIMA	Liaise with LGA and Bikewest	Medium
121	LGA Bikewest LIMA	Observe guidelines. Liaise with LGA and Bikewest. Assess proposals	High
122	LIMA LGA DPUD	Monitor problem. Assess issue in development proposals	Medium
123	HCWA	Liaise with HCWA on possible trails	Medium
124	LIMA LGA DPUD	Require as condition of approval	High
125	LIMA LGA DPUD	Monitor problem. Liaise with LGA on solution	High
126	DMH	Liaise with DMH	Medium
127	DMH LIMA	Monitor problem. Liaise with DMH	High
128	LIMA	Liaise with DMH	Medium
129	LIMA	Incorporate into LIMA education material	Medium
131	WWC	Retain in legislation	High
132	LIMA	Advertise documents for public comments	High
134	WWC	Retain in legislation	High
135	LIMA	Establish committees to assess proposals and second technical assistance	Medium
137	LIMA	Liaise with DOF advise on proposals	Low
138	DOF	Liaise with DOF	Low

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Priority
139	LIMA	Incorporate into management plan for recreation nodes	Medium
141	LIMA Fisheries	Joint publications by DOF and LIMA	Low
142	LIMA	Prepare brochures. Encourage other agencies as well	Medium
143	LIMA DMH LGA Fisheries	Joint publications	Medium
144	LIMA	Release as required	As required
151	LIMA LGA Proponent DPUD	Monitor developments	Medium
152	LIMA	Advertise amendments	Low
153	LIMA	Monitor use of waterways	Medium

Area Recommendations

A1	SWDA	Support SWDA in implementing plan	Medium
A2	BPA LIMA	Develop joint policy	Medium
A5	LIMA EPA	Submit management plan to EPA	Medium
A6	LIMA LGA	Refer control problems to MCAC	High
A7	LIMA LICMG EPA	Monitor problem, address as part of catchment management	High
A8	LIMA	Reduce channels as they silt up	Low
A12	DPUD HSC	Advise DPUD, HSC on LIMA's concerns	Medium
A24	EPA	Refer proposals to EPA	Medium
A28	LGA Landowners	Identify problem areas, fence foreshore reserves, encourage landowners to restrict stock	Medium

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Priority
A30	LIMA	Develop agreements as required	Low
A32	SWDA CALM	Liaise with SWDA and CALM	High
A34	LIMA	Monitor problems, liaise with EPA if problems arise	Medium
A39	LGAs	Liaise with LGA on river enhancement programmes	Low

TABLE 3 IMPLEMENTATION OF ONE-OFF RECOMMENDATIONS

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Time Schedule
3	DPUD	Liaise with DPUD	1 year
4	DPUD LGA	Liaise with DPUD, LGA on Region Plan and Town Planning Schemes	1-3 years
5	LIMA	Formalise administrative arrangement and evaluate	1 year
10	LIMA	Liaise with DPUD and LGA	1-3 years
13	LIMA	Liaise with DPUD and LGA	2-4 years
14	LIMA DPUD	Liaise with DPUD and LGA	1-3 years
15	LIMA DPUD LGA	Liaise with DPUD, LGA, SWDA regarding sites	2-3 years
17	LIMA	Liaise with LGA, DMH, EPA	1-2 years
33	EPA LIMA	Liaise with EPA on the determination of boundaries	1-3 years
34	EPA	Liaise with EPA and WAWA	1 year
37	LIMA	Identify areas	1-3 years
39	WAWA	Liaise with WAWA	2-4 years
42	LIMA	Liaise with CALM and DOLA on vesting	1-3 years
43	DOLA	Liaise with DOLA and CALM	2-4 years
44	CALM LGA LIMA	Set priorities for plans and liaise with vesting agency	3-4 years
47	LIMA	Liaise with CALM and LGAs on rehabilitation plans	2-4 years

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Time Schedule
48	WWC LIMA	Determine nutrient status	In progress
49	LIMA	Liaise with WWC	2 years
50	EPA SWDA	Liaise with all agencies on the importance of catchment management	In progress
55	LIMA	Liaise with Waterways Commission and Swan River Trust on results of Swan River Study	1-2 years
56	LGA LIMA	Liaise with agencies to determine policy	2 - 3 years
59	LIMA	Undertake study in 1992	In progress
62	LIMA	Modify after consultation with other agencies as required	In progress
68	LIMA	Determine numbers and size of hobby farms and potential problems	2 years
69	LIMA EPA WAWA	Establish procedure for assessment and monitoring	1 year
72	LIMA	Establish overall plan and undertake yearly plantings	2 years
73	LIMA	Determine problem area and establish a yearly works programme	3 years
76	EPA	Liaise with WWC, EPA amd Swan River Trust	2-3 years
79	MCAC	Liaise with MCAC	In progress
81	LGA DPUD DOLA	Liaise with appropriate authorities	2-4 years
83	LGA SWDA LIMA	Establish plan	4-5 years

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Time Schedule
84	LIMA LGA	Determine guidelines, circulate for comment and encourage LGA to adopt	2 - 3 years
86	LIMA	Establish committee	1-2 years
87	LIMA	Liaise with WWC for technical assistance	In progress
88	LIMA	Identification of research requirements; build into yearly research plans	In progress
90	LIMA	Incorporate into LIMA education brochure	1-3 years
93	LGA BFB LIMA	Liaise with landowners and individuals on plan development	3-4 years
98	LIMA	Determine areas requiring plans. Set priorities into planning and works programmes	In progress
104	DPUD LGA SWDA LIMA	Liaise with responsible agencies	2-4 years
119	LIMA and vested agency	Address access issue in management plans	2-4 years
130	DMH LGA	Liaise with DMH, BPA	1-2 years
133	LIMA	Establish a list of groups	1-3 years
136	LIMA	Establish procedures as required	2-3 years
140	LIMA	Liaise with responsible bodies. Monitor problems	2-4 years
145	LIMA EPA	Liaise with EPA on determination of boundaries	3-4 years

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Time Schedule
146	LIMA	Develop funding criteria	In progress
147	LIMA	Develop works programme	2-3 years
148	LIMA	Develop procedures between LIMA, DPUD, DOLA and LGAs	3 - 4 years
149	WWC	Liaise with WWC	3-4 years
150	LIMA	Liaise with LGA and government agencies	2-3 years
154	LIMA	Review after 7 years	7 years
155	LIMA	Place policies and procedures as an appendix	In progress

Area Recommendations

A2	BPA LIMA	Develop a joint policy	2-3 years
A5	LIMA EPA	Submit management plan to EPA	3 years
A9	LIMA	Monitor problems, erect sign posts, barriers and fences	In progress
A10	LIMA LGA	Develop plan, implement as part of yearly works programme	3 years
A11	LIMA HSC	Develop plan for the area	In progress
A13	LIMA HSC	Develop plan for the area	In progress
A14	LIMA SECWA BCC	Develop plan and incorporate into yearly works programme	4 years
A15	LIMA BCC	Develop plan and incorporate into yearly works programme	In progress
A16	EPA	Liaise with EPA	3 years

Recommendation Number	Responsibility for Implementation	LIMA's Strategy for Implementation	Time Schedule
A17	EPA	Provide advice to EPA	In progress
A18	LIMA BCC	Advise BCC on requirements for area	2 years
A19	LIMA BCC	Incorporate into management plan	5 - 7 years
A20	LIMA	Develop works programme in association with LGAs	3 - 4 years
A21	LIMA	Incorporate into management plan	2-4 years
A22	DPUD LGA	Advise on foreshore requirements	In progress
A23	EPA	Liaise with EPA on implementation	3-5 years
A26	DPUD LGA	Advise on foreshore requirements	3-5 years
A27	CALM	Liaise with EPA on implementation	3-5 years
A29	LIMA	Liaise with LGA and landowners on plan preparation	2 - 3 years
A31	CALM	Liaise with CALM	4-6 years
A33	EPA LIMA	Liaise with EPA on boundaries	2-4 years
A35	LIMA Vested Agent Landowner	Condition of approval Annual works programme	2-4 years
A36	EPA LIMA	Liaise with EPA on boundaries	2-4 years
A37	LIMA	Restrict boating, disallow any dredging	In progress
A38	LIMA BPA	Liaise with BCC, WAWA	4-5 years

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APPENDIX 1

POLICIES

LIMA and the Waterways Commission have found the need for policies on certain aspects of planning and management for the waterways. It is the aim of these policies to provide additional guidelines for proponents preparing development proposals for LIMA's consideration.

Policies are to be developed and amended according to the Administrative Procedure 8.0 in Appendix 2.

Existing policies and those recommended in the Management Programme for development are listed in this document. Readers are urged to check with LIMA or the Waterways Commission on the status of policies.

1.0 Boatsheds and Boathouses (Private)
2.0 Boating Policy
3.0 Bridges
4.0 Dredging Policy
5.0 Foreshore Fire Control Policy
6.0 Foreshore Management Policy
7.0 Jetties Private
8.0 Jetties Public - Owned by Commercial Enterprise and Local Government
9.0 Launching Ramps and Slipways
10.0 Marinas and Boat Pens with Water Lease and Jetty Licence
11.0 Mosquito Control
12.0 Residential Development Policy
13.0 Restaurants and Tearooms
14.0 Retaining Walls
15.0 Stormwater Disposal Policy
16.0 Underground Storage Facilities

1.0 BOATSHEDS AND BOATHOUSES (PRIVATE)

1.1 EXISTING PRIVATE BOATSHEDS OR BOATHOUSES

1.1.1 Located abutting private property which has a waterside boundary

Policy

Owners of a boatshed or boathouse to enjoy continued use subject to compliance with all requirements of the licence granted under the Jetties Act.

1.1.2 Located abutting a public reserve or road reserve

Policy

Owners of a boatshed or boathouse to enjoy continued use subject to compliance with all requirements of the licence granted under the Jetties Act.

1.2 TRANSFER OF PRIVATE BOATSHEDS OR BOATHOUSES

1.2.1 Located abutting private property which has a waterside boundary

Policy

Recommend approval for the transfer provided that the boatshed or boathouse is in good order as required by the licence at the time of the application for transfer to the new owner and to the satisfaction of the management authority.

1.2.2 Located abutting a public reserve, road reserve or public jetty or wharf

Policy

Recommend approval for the transfer provided that the boatshed or boathouse is in good order as required by the licence at the time of the application for transfer to the new owner and to the satisfaction of management authorities.

Transfers of licences will not be recommended where the applicant does not own property adjacent or near to the jetty.

1.3 APPLICATION TO CONSTRUCT BOATSHEDS OR BOATHOUSES

Policy

All applications will be refused.

2.0 BOATING POLICY

2.1 BOATING AREAS

LIMA will develop a policy to address the issue of boating in the northernmost three kilometres of the estuary. This area consists of shallow mud flats with depths below half a metre and constitutes valuable feeding grounds for the fishery and is abundant in seagrass and macroalgae. It is an important wildlife and bird sanctuary.

2.2 EFFLUENT DISPOSAL FROM BOATS

All commercial craft - ferries, houseboats or passenger carrying vessels - should have sealed holding tanks for the collection of waste and suitable arrangements with local health authorities for pumpout facilities.

2.3 BOAT LAUNCHING

Boat launching in the waterway may only take place at approved launching sites (See Map 9).

a) LAUNCHING RAMPS

Approved boat launching ramps on the waterway occur at the following sites.

Leschenault Inlet

Stirling Street Ramp (south side)
Koombana Boat Ramp (north side)

Collie River

Eaton Boat Ramp (east of bridge)
Shoalhaven Boat Ramp (west of bridge)
Elbow Boat Ramp (Eastwell Road)

Leschenualt Estuary

Parris Road Boat Ramp
Knapps Channel

b) SMALL BOAT LAUNCHING AND LANDING AREAS

Small boats are defined as capable of being carried or less than four metres in length.

1. Opposite SCM south of pipeline.
2. Christina Park south of toilet site.
3. Opposite Lot 43 Old Coast Road.
4. Opposite Francis Street near memorial.
5. Dawes Channel.
6. Opposite Clifton Caravan Park.
7. Southern tip of the Peninsula. (Landing only)
8. Pipeline Peninsula. (Landing only)
9. Belvedere (Waterloo Head) Leschenault Peninsula.

2.4 SMALL BOAT CHANNELS

Owing to the proliferation of small boat channels in the Leschenault Estuary and Inlet and the danger to the ecology, no more licences for such dredging will be issued and the number of small boat channels in the estuary will be limited to seven for the time being with a further provision for one to be placed in a strategic location if the need arises in the future.

Seven channels currently authorised are shown in the accompanying diagram and listed hereunder:

1. Channel opposite SCM just south of pipeline
2. Channel at Christina Park south of toilet site
3. Channel adjacent Lot 43 Old Coast Road
4. Channel opposite Francis Street near Memorial
5. Dawes Channel
6. Channel opposite Clifton Caravan Park
7. Knapps Channel, Northern Estuary.

Channels other than those listed above can continue to be used until they become redundant through silting.

3.0 BRIDGES

3.1 EXISTING BRIDGES

3.1.1 Having waterside boundaries on both sides of the river

Policy

Owners of a bridge to enjoy continued use subject to maintaining it to a standard set by the Department of Marine and Harbours.

3.1.2 Public bridges owned by MRD, local government authorities or Westrail

Policy

Owners of a bridge to enjoy continued use subject to maintaining it to a standard set by the Department of Marine and Harbours.

3.2 APPLICATION FOR TRANSFER OF PRIVATE BRIDGE

Policy

Approval may be given for the transfer provided that the bridge is in good order as required by the standards set by the Department of Marine and Harbours.

3.3 APPLICATION TO CONSTRUCT A BRIDGE

3.3.1 Located on private land which has waterside boundaries on both sides of the river

Policy

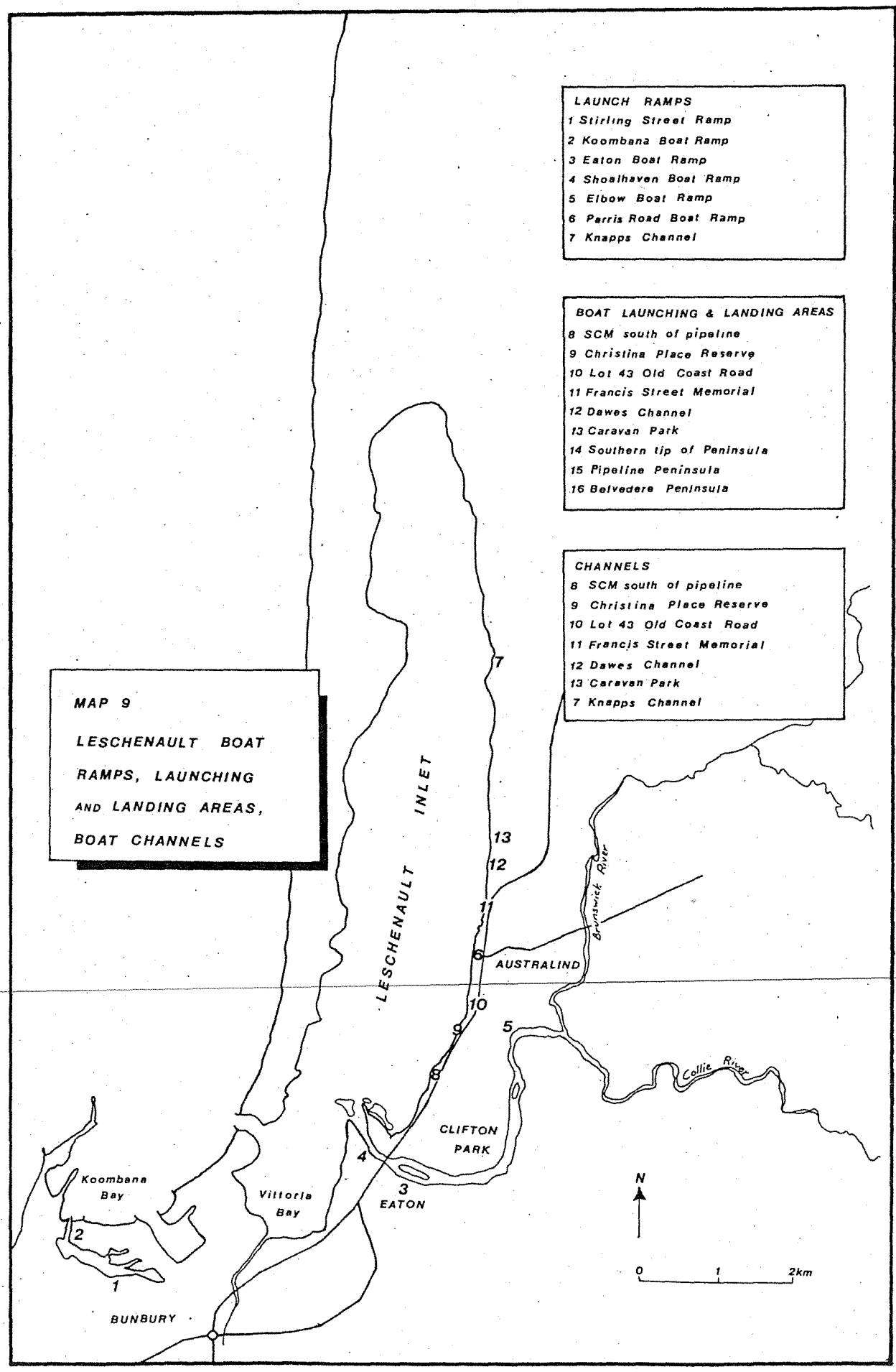
Approval to construct a bridge may be given provided that:

- The design of the bridge shall comply with the minimum design standards for such structures set by the Department of Marine and Harbours.
- The owner of the land produces a copy of the title verifying the waterside boundaries both sides of the river.
- The structure will not interfere with navigation of the waters.
- The design of the bridge is such that it gives the minimum interference to flood waters.

3.3.2 Public Bridges

Policy

Approval to construct a bridge may be given provided that:


LAUNCH RAMPS
1 Stirling Street Ramp
2 Koombana Boat Ramp
3 Eaton Boat Ramp
4 Shoalhaven Boat Ramp
5 Elbow Boat Ramp
6 Parris Road Boat Ramp
7 Knapps Channel
BOAT LAUNCHING & LANDING AREAS
8 SCM south of pipeline
9 Christina Place Reserve
10 Lot 43 Old Coast Road
11 Francis Street Memorial
12 Dawes Channel
13 Caravan Park
14 Southern tip of Peninsula
15 Pipeline Peninsula
16 Belvedere Peninsula
CHANNELS
8 SCM south of pipeline
9 Christina Place Reserve
10 Lot 43 Old Coast Road
11 Francis Street Memorial
12 Dawes Channel
13 Caravan Park
7 Knapps Channel
MAP 9
LESCHENAULT BOAT RAMPS, LAUNCHING AND LANDING AREAS, BOAT CHANNELS
LESCHENAULT INLET
AUSTRALIND
Brunswick River
Collie River
CLIFTON PARK
EATON
Koombana Bay
Victoria Bay
BUNBURY
N
0
1
2km

- The design of the bridge shall comply with the minimum design standards for such structures set by the Department of Marine and Harbours.

- The design of the bridge is such that it gives minimum interference to flood waters.

- There is access along the foreshore beneath the bridge.

- Fishing platforms, pedestrian paths and cycleways should be included where practicable.

4.0 DREDGING POLICY

(NB The following policy to be used until Recommendation 76 is implemented)

Dredging may only occur with the approval of the Authority. Approval may be given for the following:

a) The maintenance of existing boat channels or navigation channels.

b) To provide access to existing public jetties where silting has occurred.

c) Dredging to develop a facility e.g. the extension of the rowing course, where the Authority is satisfied that such dredging will not have a detrimental effect.

d) Development dredging, boat harbours, marinas etc. This class of dredging may only take place after appropriate environmental assessment and impact study of such works and under strict terms and conditions laid down by the Authority. Those terms and conditions would include such matters as spoil disposal, armouring and protection of the banks, ongoing maintenance, water quality monitoring and management responsibility.

5.0 FORESHORE FIRE CONTROL POLICY

Under the Waterways Conservation Act, Section 35 (8), a management programme may include a working plan to be carried out for the improvement, development and maintenance of the waters and associated land, the prevention and control of fires, the public utilisation of the area, the study, care and restoration of the natural environment, the conservation of indigenous flora and fauna.

In consideration of the above, the preparation of a controlled burning programme should:

a) Minimise risk to sensitive foreshore vegetation.

b) Minimise risk of banks erosion.

c) Minimise risk to wildlife.

d) Reduce the fire hazard behind the foreshore vegetation by regular mowing of areas adjacent to foreshore.

e) Continue to water and mown verges adjoining main picnic areas.

f) Encourage local government to develop a controlled burning programme in consultation with the Bush Fires Board and LIMA to reduce areas of potential hazard.

g) Encourage regular inspections of the foreshore area to assess the hazard and make recommendations for any variation to the programme.

6.0 FORESHORE MANAGEMENT POLICY

(NB The following Waterways Commission policy is endorsed in accordance with Recommendation 9)

6.1 PREAMBLE

It is the duty of the Waterways Commission (WWC) and the Swan River Trust (SRT) to manage, conserve, protect and enhance rivers, inlets and estuaries under their jurisdiction in accordance with the Waterways Conservation Act 1976-82 and Swan River Trust Act 1988 respectively. This function extends to the lands associated with the waterway including the foreshore reserve.

Generally, foreshore reserves exist because of their association with the waterway. Their planning, development and use are most important in waterway management because they:

a) Include plant and animal communities and physical features which form an integral part of the estuarine ecosystem.

b) Provide a buffer between the waterway and possible sources of water pollution.

c) Contain features which are part of the waterway landscape.

d) Enable public access in a manner consistent with the multiple use of the waterway.

The goal of waterway planning and management is to ensure a balance between the competing demands for the use and development of waterways and the need to conserve a healthy functional waterway environment for present and future generations.

This policy is designed to provide a uniform approach to establishing, planning and developing foreshore reserves in areas affected by the Waterways Conservation Act 1976-82 and the Swan River Trust Act 1988. It is intended to assist State and local government, developers, planning

consultants and the public by setting guidelines for development and management.

Outside the Metropolitan Region the Waterways Commission and its Management Authorities (PIMA and LIMA) provide advice to the local government planning authorities which determine development applications within the management areas of PIMA and LIMA. Within the Metropolitan Region, the Swan River Trust provides advice to the Minister for the Environment who determines applications for development within the Trust's Management Area. The Minister also sets conditions required to protect the waterways in the case of development proposals which are only partly within the management area of the Trust. The Swan River Trust must be consulted by the Department of Planning and Urban Development (DPUD) before it may determine any proposal which abuts the Management Area.

This Policy should assist in the establishment of appropriate foreshore reserves, guide the preparation of management plans, and outline management and funding of foreshore reserves.

6.2 OBJECTIVE 1 - TO ENCOURAGE THE ORDERLY ACQUISITION OF APPROPRIATE FORESHORE RESERVES AROUND WATERWAYS

POLICY GUIDELINES

6.2.1 General reserve acquisition principles

6.2.1.1 The Waterways Commission (WWC) and Swan River Trust (SRT) have adopted the following general principles for the acquisition and reservation of foreshore land.

6.2.1.2 Permanent development and subdivision should be set back from the waterway to allow public open space and to protect features of natural, scientific, landscape and cultural significance.

6.2.1.3 Where subdivisions or multi-unit developments occur adjacent to the waterway, the land comprising the set-back should be given by the developer free of charge in accordance with the provisions of Section 20A of the Town Planning and Development Act. It should be noted that land acquired in accordance with Section 20A is automatically vested in the Crown and reserved for the purpose shown on the plan of survey.

6.2.1.4 Where Crown land is being developed adjacent to the waterway, suitable foreshore reserves should be determined before development is approved. If a foreshore reserve already exists the WWC or SRT should also provide advice concerning any need to extend it.

6.2.1.5 Where a State authority has purchased freehold land on the foreshore, appropriate foreshore reserves should be determined before any development of that land is approved.

6.2.1.6 A number of factors should be considered when determining the width of foreshore reserves including:

a) The need to provide a buffer zone at the land-water interface to allow for changes in bank position including possible erosion.

b) Tidal and flooding characteristics which influence the position of high water mark and the estuary mouth.

c) The role of fringing vegetation as a biological filter in monitoring water quality and wildlife habitat, and preventing erosion.

d) The need to provide for recreation, conservation and landscape values.

e) The possible impact of rising sea levels associated with the predicted greenhouse effect.

6.2.1.7 The WWC and SRT should seek the advice of the Department of Marine and Harbours (DMH) about the effects of possible shoreline changes and the Water Authority of Western Australia (WAWA) about possible flooding when preparing recommendations on the acquisition of foreshore reserves.

6.2.1.8 Foreshore reserves being given over by developers of broad acre subdivisions should be at least 50 metres wide, although in upstream areas where the rivers are narrower a lesser width may be adequate. In highly developed areas close to the city where property values are higher the main concerns will be to ensure adequate public access and protect the river bank.

6.2.1.9 The boundary between the foreshore reserve and subdivision or development should be determined and pegged on the ground during a site survey undertaken by the developer and WWC staff. The DPUD should if possible advise developers of this requirement during preliminary discussions concerning the development.

6.2.1.10 Where a boundary has been pegged as provided for under 6.2.1.9, the WWC should request the DPUD to impose a condition whereby approval of the development or the subdivision is contingent upon the land intended to be included in the foreshore reserve for recreation, being shown on a Plan of Survey and vested in the Crown under Section 20A of the Town Planning and Development Act free of charge to the Crown and without payment of any compensation.

6.3 OBJECTIVE 2 - TO ENCOURAGE AND WHERE APPROPRIATE PARTICIPATE IN THE PREPARATION OF MANAGEMENT PLANS FOR ALL FORESHORE RESERVES WHICH ARE WITHIN OR ADJOINING WATERWAY MANAGEMENT AREAS

POLICY GUIDELINES

6.3.1 General guidelines for preparation of management plans

6.3.1.1 Under Section 30A of the Land Act 1933 the Minister for Lands may direct any person who has control of a reserve to produce a management plan which states how it will be developed, used and managed. Once the Minister approves the management plan and notifies the occupier of such approval the land cannot be developed and used other than in accordance with that plan. However, the Minister may approve variations to the plan.

Generally the Department of Land Administration requests the preparation of a management plan before reserves are vested in other authorities, organisations or people. However, plans are not often requested for reserves which are already vested.

6.3.1.2 Management plans should be prepared for all reserves which are within or adjoin waterways management areas. Where possible they should relate to current waterway management programmes.

6.3.1.3 The management plan should:

a) Define the location, area, and purpose of the reserve.

b) State in whom the reserve is vested.

c) Contain information about natural resources including geology, geomorphology, contours, hydrology, flood levels, wind directions, vegetation and wildlife, erosion and accretion.

d) Include information about cadastre, existing public uses, likely uses, constraints and important management issues.

e) Contain recommendations about the future development, management and use.

f) Outline funding arrangements for future management and maintenance.

g) Include information about the control of pests including mosquitoes and noxious weeds.

6.3.1.4 Permanent structures should be located on stable, well drained sites and in accordance with WAWA recommendations relating to flooding and DMH recommendations concerning shoreline movements.

6.3.1.5 The possible impacts of rising sea levels associated with the greenhouse effect should be considered when planning permanent structures on the foreshore.

6.3.2 Management plans prepared by State and local government authorities

6.3.2.1 Where foreshore reserves are vested in other State or local government authorities, the WWC and SRT will encourage that authority to prepare a management plan consistent with the beneficial uses preferred for that part of the river.

6.3.2.2 Where an activity associated with the reserve has a direct impact on the waterway, the WWC or SRT may provide assistance in the preparation of a management plan as outlined in 6.3.1.3 on a cost shared basis.

6.3.2.3 Where vacant Crown land (VCL) or unvested reserves exist within the management area or abut a waterway, the WWC or SRT will encourage a relevant State or local government authority, body or person to accept vesting of and prepare a management plan for the land.

6.3.2.4 Where VCL or unvested reserves exist within a management area and no other appropriate body or person is prepared to accept vesting of it, the WWC or SRT

will seek vesting and prepare a management plan.

6.3.2.5 Management plans prepared in accordance with 6.3.2.4 should be orientated toward protecting and rehabilitating the natural environment and minimising maintenance costs.

6.3.3 Management plans prepared as a result of development applications

6.3.3.1 Developments near waterways including subdivisions, multi-title developments, resort developments and marinas normally result in increased use of foreshores which may lead to environmental loss unless appropriate management is undertaken. Therefore areas affected by such developments should be covered by a management plan.

6.3.3.2 The preparation of a management plan should be the responsibility of the developer and it should be prepared at the developer's expense, as a condition of development approval by the relevant decision making body.

6.3.3.3 The content of a management plan prepared in accordance with 6.3.3.2 must be acceptable to the decision making body and the WWC or SRT. The plan should address all matters outlined in 6.3.1.3.

6.3.3.4 The extent of the area covered by a management plan prepared under this section should not be confined to the area of the development but include any adjoining land or waterway affected by it. The area covered by the management plan will be determined by the decision making body and WWC or SRT.

6.3.3.5 A management plan prepared in accordance with this section should address the issue of maintenance of the area during an establishment period agreed by the developer, decision making body and the WWC or SRT.

6.4 OBJECTIVE 3 - TO PROTECT, CONSERVE AND ENHANCE THE ENVIRONMENT OF THE FORESHORE RESERVE

POLICY GUIDELINES

6.4.1 General environmental protection

6.4.1.1 The Waterways Conservation Act 1976-82 obligates the WWC to conserve, manage and enhance the waters and associated land within its management areas. The Swan River Trust Act 1988 requires that the SRT protect and manage the Swan and Canning Rivers and certain adjoining lands. This Policy is intended to assist in meeting protection, conservation, enhancement and management obligations, as they apply to foreshore reserves.

6.4.1.2 Development should not substantially alter existing natural drainage patterns, sediment movements and water quality.

6.4.1.3 Areas of natural vegetation will be retained where practicable and degraded areas will be rehabilitated.

6.4.1.4 The regeneration of indigenous plant species should be encouraged.

6.4.1.5 Exotic species may be planted at recreation nodes if they are used to reinforce existing landscape features as outlined in the management plan.

6.4.1.6 Places of unique landscape, scientific and cultural significance should be conserved and managed, including geomorphological, ecological, anthropological and historic sites.

6.4.1.7 Off-road vehicles should be prohibited on environmentally sensitive areas.

6.4.2 Visual amenity

6.4.2.1 Waterway foreshores including some developed areas provide valuable landscape features. Landscape protection policies are required to protect and enhance existing vistas.

6.4.2.2 Views of waterways should be either protected or enhanced. Particular attention should be paid to areas seen from viewpoints including roads, scenic drives, public recreation areas and the water.

6.4.2.3 The waterway's distinctive visual elements should be protected or enhanced. The forms, lines, colours and textures of the landscape should be

analysed, focusing on landform, vegetation, water and land use. Development should harmonise with landscape elements in siting and design, particularly in regard to scale, height, colours and material.

6.4.2.4 Development planning should take into account the varying ability of waterway landscapes to accommodate change.

6.4.2.5 Development should be set back from visually prominent features such as headlands, ridgelines, cliffs, beaches and other features which provide a focus of attention.

6.4.2.6 To avoid intrusive development:

a) High buildings should not be sited close to the foreshore.

b) Services within the foreshore reserve should be underground where practicable.

c) Signs should not obstruct views of the waterway. They should be simple, easy to read, constructed of materials appropriate to the area and limited to real need. Where practicable they should be attached to existing structures and be close to the ground. Signs throughout the management area should be of a consistent design and constructed of similar materials.

d) Industrial, commercial and service facilities should only be located near waterways when it is essential that they have a waterside location; their design should be compatible with natural landforms, vegetation and nearby land uses. Such uses should generally be located within planned development nodes.

e) Alterations to existing landforms such as cutting, filling, grading, excavation and vegetation removal should be minimised and the landscape later restored to its former appearance unless the change creates a feature worthy of retention.

f) Service facilities such as water tanks, toilet blocks, drainage outfalls, etc., whose position is dictated by physical constraints, should be designed and constructed in such a manner as to minimise impact on the landscape.

g) Roads and car parks should be designed to be as unobtrusive as possible. Cut and fill should be minimised, natural contours should be followed as far as possible, vegetation damage minimised or new plantings of appropriate species carried out.

6.4.3 Water quality

6.4.3.1 Runoff and discharges may degrade estuarine water quality. Silt from any source can result in increased turbidity and drainage water may contain other pollutants.

6.4.3.2 To limit water quality problems the following guidelines should be applied to developments on or near foreshore reserves.

a) Sediment movement toward and into water bodies should not be increased above natural levels.

b) The hydrology of the area should not be altered.

c) Polluted or contaminated runoff should be treated at source to maximise the removal of pollutants.

d) Well vegetated estuarine margins should be maintained to act as nutrient and sediment filters.

e) Waste discharges into waterways should be eliminated if possible or licensed by the EPA in consultation with the WWC or SRT.

f) Where possible on-site septic effluent treatment should be avoided. Where on-site treatment is proposed consideration should be given to soil depth and effluent absorption capacity and the rate of groundwater movement with the aim of on-site retention and assimilation of wastes.

g) Stormwater drainage disposal should where possible be contained on site with no direct outlet to the estuary.

6.5 OBJECTIVE 4 - TO ENSURE PUBLIC ACCESS TO WATERWAYS CONSISTENT WITH THE PROTECTION OF THE ESTUARINE ENVIRONMENT

POLICY GUIDELINES

6.5.1 General environmental protection guidelines

6.5.1.1 Permanent and unobstructed public access to foreshores is a concept which Australians hold to be very important and the provision of public access is a major function of foreshore reserves. The retention of existing public access is a major consideration in any proposed changes to the boundary or use of existing foreshore reserves.

In some locations freehold land titles exist to the high water mark and often limit public access. The acquisition of a foreshore reserve in these locations is a priority.

Foreshore reserves may include environmentally sensitive areas which are not capable of sustaining unlimited public use. Access to these areas should be planned and managed to minimise damage.

6.5.1.2 The public should have some access to all foreshores unless environmental considerations preclude uncontrolled public access.

6.5.1.3 Intensive public use should be concentrated at appropriately located nodes which are identified in the management plan and developed appropriately.

6.5.1.4 Paths should be located to direct people away from environmentally sensitive areas. They should be designed and constructed in accordance with the Environmental Guidelines for Dual Use Paths.

6.5.1.5 Vehicular access to foreshore reserves should be relatively short loop roads originating outside the reserve. Long straight lengths of road parallel to the waterway should be avoided.

6.5.1.6 Roads should be routed around environmentally sensitive areas.

6.6 OBJECTIVE 5 - TO ENSURE THE ADEQUATE FUNDING OF ALL FORESHORE RESERVES WITHIN WATERWAY MANAGEMENT AREAS AND THE SWAN RIVER TRUST MANAGEMENT AREA

POLICY GUIDELINES

6.6.1 Management funding policy guidelines

6.6.1.1 The effective management of foreshores is dependent upon adequate funding which should be provided by the vestee or owner. Where vacant Crown land exists it may be necessary to implement the guidelines in 6.3.2 to achieve adequate management.

Normally the WWC and SRT should fund works directly associated with the waterway and the vestee or owner controlling the foreshore should fund works directly associated with the foreshore reserve.

6.6.1.2 All funding of foreshore reserves should be outlined in a management plan prepared in accordance with Objective 2.

6.6.1.3 Where a foreshore reserve is vested in a public authority and managed as part of its normal functions management should be funded by that authority.

6.6.1.4 Where land is vested in another authority and work is required to protect the waterway, such work should, where possible, be specified in the management plan and carried out on a cost sharing basis specified in the management plan.

6.6.1.5 The WWC or SRT may seek funds for work required to fulfil their functions under the Waterways Conservation and Swan River Trust Acts, such as providing recreational facilities. This funding should be for construction purposes only with maintenance being the responsibility of the vestee, unless the maintenance is directly related to the health and stability of the waterway.

6.6.1.6 Where land is unvested or vested in the WWC or SRT and the relevant Waterway Management Authority seeks the assistance of a LGA, such work will be funded by the WWC or SRT.

7.0 JETTIES PRIVATE

(NB This policy to be amended when Recommendation A2 is implemented)

7.1 EXISTING PRIVATE JETTIES

7.1.1 Located abutting private property which has a waterside boundary

Policy

Owners of this class of jetty to enjoy continued use subject to compliance with all the requirements of the licence granted under the Jetties Act.

7.1.2 Located abutting a public reserve or a road reserve.

Policy

Owners of this class of jetty to enjoy continued use subject to compliance with all the requirements of the licence granted under the Jetties Act.

7.2 TRANSFER OF PRIVATE JETTIES

7.2.1 Located abutting private property which has a waterside boundary.

Policy

Recommend approval for the transfer provided that the jetty is in good order as required by the licence at the time of the application for transfer to the new owner and to the satisfaction of the management authority.

7.2.2 Located abutting a public reserve or a road reserve.

Policy

Recommend approval for the transfer provided that the jetty is in good order as required by the licence at the time of the application for transfer to the new owner and to the satisfaction of the management authority.

Transfers of jetty licences will not be recommended where their applicant does not own property in the locality adjacent or near to the jetty.

7.3 APPLICATION TO CONSTRUCT PRIVATE JETTIES

7.3.1 Located on private property which has a waterside boundary.

Policy

These applications may be recommended for approval provided that:

- The design of the jetty shall comply with the minimum standards for such structures as set by the Department of Marine and Harbours.
- The owner of the private property produces a copy of his title verifying the waterside boundary.
- It will not interfere with navigation or current recreational use of the adjacent waters.
- Its length is not in excess of six (6) metres measure from H.W.M. and width not in excess of 1.5 metres.

7.3.2 Located abutting a public reserve or road reserve.

Policy

All applications for permanent structures of this nature be refused.

LIMA may under special circumstances recommend approval for a temporary jetty abutting a reserve for a special event conditional on it being removed after the event.

8.0 JETTIES PUBLIC - OWNED BY COMMERCIAL ENTERPRISE AND LOCAL GOVERNMENT

8.1 EXISTING PUBLIC JETTIES

8.1.1 Located abutting privately owned property.

Policy

The owners of the jetty to enjoy continued use subject to compliance with all requirements of the licence granted under the Jetties Act.

8.1.2 Located abutting a public reserve or road reserve.

Policy

The owners of the jetty to enjoy continued use subject to compliance with all the requirements of the licence granted under the Jetties Act.

8.2 TRANSFER OF PUBLIC JETTIES

8.2.1 Located abutting privately owned land.

Policy

Recommend approval for the transfer provided that the jetty is in good order as required by the licence at the time of application for transfer to the new owner and to the satisfaction of the management authority.

8.2.2 Located abutting a public reserve or road reserve.

Policy

Recommend approval for the transfer provided that the jetty is in good order as required by the licence at the time of application for the transfer to the new owner and to the satisfaction of the management authority.

8.3 APPLICATION FOR NEW PUBLIC JETTIES BY COMMERCIAL ENTERPRISE OR LOCAL GOVERNMENT AUTHORITIES

8.3.1 Located abutting land zoned commercial which has a waterside boundary.

Policy

These applications may be recommended for approval provided that:

- The design of the jetty shall comply with the minimum standards for such structures set by the Department of Marine and Harbours.
- The owner of the public jetty produces a copy of the title verifying the waterside boundary.
- It will not interfere with navigation of the adjacent waters.

8.3.2 Located abutting a public reserve or a road reserve.

Policy

These applications may be recommended for approval provided that:

- The design of the jetty shall comply with the minimum standards set by the Department of Marine and Harbours.
- It will not interfere with navigation of the adjacent waters.
- If the jetty application is submitted by a commercial enterprise then an agreement must be made with the local government authority containing at least the following:

  a) The local government authority accepting the jetty and applying for the jetty licence.

  b) The commercial enterprise to pay all costs relating to the cost of the jetty.

  c) The commercial enterprise's acceptance of all maintenance costs of the jetty.

  d) The jetty being available for use by the public.

9.0 LAUNCHING RAMPS AND SLIPWAYS

9.1 EXISTING LAUNCHING RAMPS AND SLIPWAYS

9.1.1 Located abutting private land which has a waterside boundary.

Policy

Owners of the launching ramps and slipways to enjoy continued use subject to compliance with all the requirements of the licence granted under the Jetties Act.

9.1.2 Located abutting a public reserve or road reserve.

Policy

Owners of the launching ramps or slipways to enjoy continued use subject to compliance with all the requirements of the licence granted under the Jetties Act.

9.2 TRANSFER OF PRIVATE LAUNCHING RAMP OR SLIPWAY

9.2.1 Located abutting private property which has a waterside boundary.

Policy

Recommend approval for the transfer provided that the launching ramp or slipway is in good order as required by the licence at the time of the application to transfer to the new owner and to the satisfaction of the management authority.

9.2.2 Located abutting a public reserve or a road reserve.

Policy

Recommend approval for the transfer provided that the launching ramp or slipway is in good order as required by the licence at the time of the application to transfer to the new owner and to the satisfaction of the management authority.

Transfers of licences will not be recommended where the applicant does not own property in the locality adjacent or near to the jetty.

9.3 APPLICATION TO CONSTRUCT A LAUNCHING RAMP OR SLIPWAY

9.3.1 Located abutting private land which has a waterside boundary.

Policy

These applications may be recommended for approval provided that:

- The design of the launching ramp or slipway shall comply with minimum design standards for such structures set by Department of Marine And Harbours.
- The owner of the land produces a copy of the title verifying the waterside boundary.
- The structure will not interfere with navigation of the adjacent waters.

9.3.2 Located abutting a public or road reserve.

Policy

These applications will not be recommended for approval.

10.0 MARINAS AND BOAT PENS WITH WATER LEASE AND JETTY LICENCE

10.1 EXISTING MARINAS AND BOAT PENS

Owners of these marinas to enjoy continued use subject to compliance with all the requirements of the licence granted under the Jetties Act.

Extension of pens or re-arrangement of pens may be recommended provided that:

a) The extension of pens or re-arrangement of pens must be within the existing water lease.

b) The design of the pens shall comply with the minimum design standards for such structures set by the Department of Marine and Harbours.

10.2 APPLICATION TO TRANSFER A MARINA

Policy

Approval may be recommended to transfer a marina provided it is in good order as required by the standards set by the Department of Marine and Harbours.

10.3 APPLICATION TO CONSTRUCT A MARINA LOCATED ON PRIVATELY OWNED OR LEASED LAND WITH A WATERSIDE BOUNDARY

Policy

A marina may be recommended for approval provided there is sufficient water area available without interference to navigation, swimming areas, water skiing areas or wildlife reserves.

The design of the marina and pens shall comply with the minimum design standards for such structures set by the Department of Marine and Harbours.

11.0 MOSQUITO CONTROL

In accordance with Recommendation 79, a policy will be developed on mosquito control. Readers should contact LIMA or the Waterways Commission to determine the status of the recommendation.

12.0 RESIDENTIAL DEVELOPMENT POLICY

12.1 GENERAL

a) LIMA is opposed to further private residential development on the eastern foreshore of the estuary between Buffalo Road (north end) and the Preston River (south end). Further residential development of the foreshore would conflict with the aims and objectives of the Waterways Conservation Act Section 24 (4) (a).

"In performing its functions the Commission shall have regard to-

The interests of navigation, fisheries, agriculture, water supply, recreation and leisure time occupation for the benefit of the public, the natural beauty and amenity of the area, and the preservation of the public right of access".

b) LIMA believes there is scope for private development for recreational and tourist activities rather than private residential projects on prime foreshore areas.

c) An alternative to private development would be the acquisition of remaining private foreshore areas by the appropriate government authority for future public use.

d) In the area bounded by Buffalo Road, Scenic Drive and the Old Coast Road, all residential development other than the existing subdivision should be confined to the east of the escarpment and the foreshores should remain in existing rural use and for recreational or tourist activity.

e) There should be no private residential development anywhere on the western foreshore of the estuary.

f) Residential development on the foreshores of the Collie, Brunswick and Preston Rivers should not occur below the 100 year flood line where areas of environmental value exist.

g) All rural residential subdivisions adjacent to the waterways should be deep sewered to prevent the entry of leachates. The only exception to this is where the lot sizes are greater than one hectare.

h) All stormwater runoff from residential subdivisions should be suitably trapped.

12.2 RESIDENTIAL CANAL DEVELOPMENT

The Authority considers that the waterways of the Leschenault Estuary, Inlet and rivers are not suitable for residential canal development.

These waterways are nutrient enriched and experience abundant macroalgal growth and microscopic algal blooms in the lower reaches of the Collie River.

These conditions could lead to water quality management problems in artificial waterways connected to these waters.

Canal developments generally are located on low-lying land adjacent to the waterways. This land is mostly wetland (either rush marsh or samphire marsh). Port and flood control works have removed a large amount of this type of wetland from the system. The remaining wetlands are an important part of the estuarine system and their protection is a prime objective of LIMA.

Should a development be proposed then the criteria for approval of canal developments, as set out in the Canal Steering Committee Report, should be strictly adhered to.

The following criteria will be applied by LIMA in its assessments of such developments:

1) The proposal should not increase nutrient loading to the estuarine system and should, where possible, reduce nutrient loading. A nutrient management plan would be required and should detail the current situation, anticipated loading, fertiliser practices, water quality monitoring, future management of the land and associated stormwater management.

2) The proposal should provide for public access through the development particularly along the foreshore.

3) The proposal should not involve land of environmental value such as wetland habitats, backwaters, System 6 areas, flora and fauna reserves or conservation areas.

13.0 RESTAURANTS AND TEAROOMS

13.1 EXISTING RESTAURANTS OR TEAROOMS

13.1.1 Located on or adjacent to a foreshore where the natural landscape has already been substantially modified abutting either public land or privately owned land.

Policy

Owners of these restaurants to enjoy continued use subject to compliance with the provisions of the Jetties Act.

13.2 TRANSFER OF RESTAURANTS OR TEAROOMS

13.2.1 Located on or adjacent to a foreshore where the natural landscape has already been substantially modified.

Policy

Approval may be recommended to transfer a restaurant/tearoom provided it is in good order in accordance with standards set by the Department of Marine and Harbours.

13.3 APPLICATION TO CONSTRUCT A RESTAURANT OR TEAROOM

13.3.1 Located on or adjacent to a foreshore where the natural landscape has already been substantially modified.

Policy

Approval may be recommended to construct a restaurant/tearoom provided it complies with the design standards for such structures set by the Department of Marine and Harbours.

14.0 RETAINING WALLS

(NB Regulation 15 Waterways Conservation Regulations 1981)

Notes

1) A licence is necessary to construct a retaining wall.

2) There is no provision to license retaining walls.

3) A retaining wall must not be removed without first obtaining the written permission of the Waterways Commission or relevant Management Authority.

4) The Commission may by notice in writing require the person having control of the retaining wall to carry out such maintenance as it considers appropriate.

14.1 EXISTING RETAINING WALLS

14.1.1 Located on private land which has a waterside boundary.

Policy

The owner of a retaining wall to enjoy continued use subject to monitoring it in accordance with the provisions of Regulation 15 of the Waterways Conservation Regulations 1981.

14.2 TRANSFER OF RETAINING WALLS

14.2.1 The Waterways Conservation Regulations 1981 do not contain any provision relating to the transfer of retaining walls.

14.3 APPLICATIONS FOR RETAINING WALLS

14.3.1 Located on private land which has a waterside boundary.

Policy

A licence to construct a retaining wall (Form 4, Schedule 1 of the Waterways Conservation Regulations 1981) may be issued provided that:

- The design of the retaining wall shall comply with the minimum design standards for such structures set by the Department of Marine and Harbours.

- The design of the retaining wall shall in the opinion of the Management Authority be in harmony with the area where it is proposed.

- The construction of a retaining wall is essential to provide stability to the bank.

- The owner produces a certificate of title verifying that the private land has a waterside boundary.

- The retaining wall shall not enter into the waterway beyond the waterside boundary of land except:

  a) Where a vertical wall is proposed and the waterside boundary of the land as shown on the diagram and the title is an irregular line, the wall may be constructed on a fair average straight alignment.

  b) Where a sloping or battered wall is proposed the point at which the wall meets the line of the mean summer tide as determined by the relevant authority, shall not project beyond the boundary of the land except where a fair average line is approved as in (b) above.

  c) In the event of a dispute between the Commission and the owner as to the location on ground of the waterside boundary of the land, a licensed surveyor shall be appointed at the owner's cost to determine and peg the boundary.

14.3.2 Located on public land abutting the water.

Policy

A licence to construct a retaining wall (Form 4, Schedule 1 of the Waterways Conservation Regulations 1981) may be issued provided that:

- The design of the retaining wall shall comply with the minimum design standards set by the Department of Marine and Harbours.

- The design of the retaining wall shall in the opinion of the Management Authority be in harmony with the area where it is proposed.

- The construction of a retaining wall is essential to provide stability to the bank.

- The retaining wall shall not extend beyond the waterside boundary of the land except:

  a) Where a vertical wall is proposed and the waterside boundary of the land as shown on the diagram and the title is an irregular line, the wall may be constructed on a fair average straight alignment.

  b) Where a sloping or battered wall is proposed the point at which the wall meets the line of the mean summer tide as determined by the relevant authority shall not project beyond the boundary of the land except where a fair average line is approved as in (a) above.

  c) In the event of a dispute between the Commission and the owner as to the location on ground of the waterside boundary of the land, a licensed surveyor shall be appointed at the owner's cost to determine and peg the boundary.

15.0 STORMWATER DISPOSAL POLICY

In accordance with Recommendation 56 LIMA will develop a policy on stormwater disposal. Readers should contact LIMA or the Waterways

Commission to determine the status of this recommendation.

16.0 UNDERGROUND STORAGE FACILITIES

In accordance with Recommendation 69 LIMA will develop a policy on underground storage facilities. Readers should contact LIMA or the Waterways Commission to determine the status of this recommendation.

APPENDIX 2

In accordance with Recommendation 155, administrative procedures relating to applications for licences, approvals and permits are outlined in this Appendix. These procedures involve liaison and consultation between various government and local government agencies.

In some cases procedures have yet to be developed.

Procedures should be amended as departmental structures and legislation change.

Readers are advised to contact LIMA and/or the Waterways Commission regarding the status of administrative procedures.

ADMINISTRATIVE PROCEDURES

1.0 AQUATIC EVENTS APPROVAL

In accordance with Recommendation 130, LIMA will develop an administrative arrangement for the approval of aquatic events.

2.0 'CONDITIONS OF APPROVAL' IMPLEMENTATION

In accordance with Recommendation 150, LIMA will develop an administrative arrangement to ensure that developments are implemented in accordance with 'conditions of approval'.

3.0 HIRE AND DRIVE OPERATIONS APPROVAL

- Proponent lodges application with LGA.
- LGA agrees to operation on its foreshore reserve and forwards application to DMH.
- DMH consults LIMA and other affected parties.

4.0 INDUSTRIAL LICENSING

In accordance with Recommendations 34 and 69, LIMA will develop an administrative arrangement regarding the licensing and monitoring of industrial discharge.

5.0 JETTY, BOAT RAMP, WATER LEASE LICENCES

- Proponent lodges application with DMH.
- DMH consults LIMA and other affected parties.
- DMH considers comments and issues or refuses application.

6.0 LEASEBACK FORESHORE RESERVES

In accordance with Recommendation 148, LIMA will develop an administrative procedure to permit the leaseback of foreshore reserves to adjacent landowners where appropriate.

7.0 PLANNING APPROVAL (CONSISTENT WITH TOWN PLANNING SCHEME)

- Developer be encouraged to consult with LIMA, local government authority and other affected agencies prior to lodgement of application.
- Application to local government authority.
- Council seek comment of affected agencies including LIMA.
- LIMA forward comments to Council including details of any licences etc. that need to be issued by LIMA.
- Council issue development approval with conditions or reject proposal.

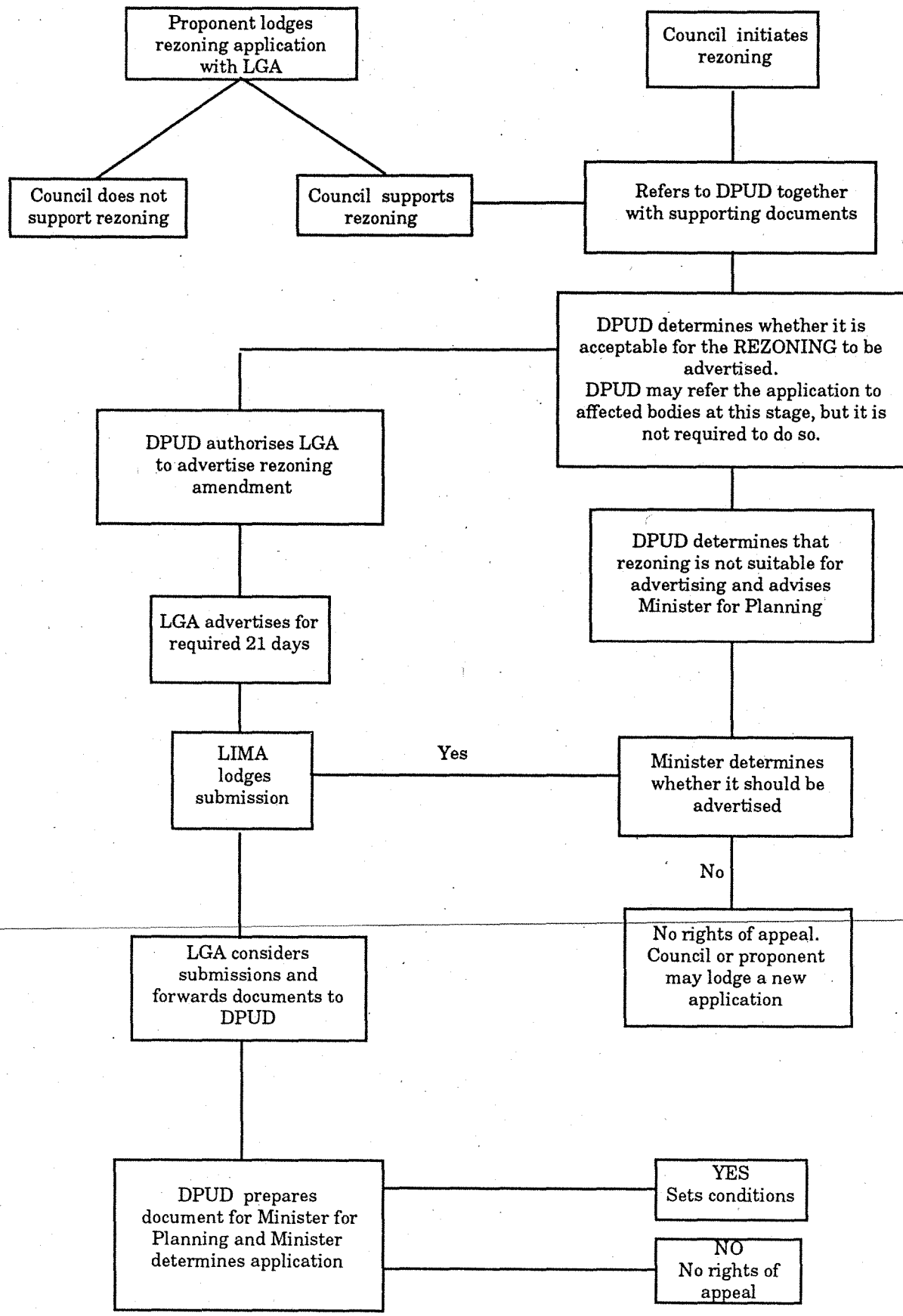
8.0 POLICY PREPARATION AND AMENDMENT

1 Policies can be amended or developed due to changes in circumstances.
2 New policies and policy changes must be negotiated with affected parties.
3 Policies can be incorporated into the programme without the need for gazettal.
4 LIMA has the right to modify policies in very special circumstances. Modification can only be approved by a two-thirds majority of members at a full Authority meeting.

9.0 REGIONAL PLAN REVIEW

In accordance with Recommendation 5, LIMA will develop an administrative procedure to ensure referral of proposals to amend the Bunbury Region Plan.

10.0 REZONING APPLICATIONS



11.0 SUBDIVISION APPLICATIONS

- Proponent lodges application with LGA.
- LGA forwards to DPUD with its comments.
- DPUD refers applications to affected bodies including LIMA.
- DPUD considers comments of affected bodies and determines application.
- DPUD refuses application or approves with conditions.
- Proponent may lodge an appeal with the Town Planning Appeal Tribunal against the refusal or regarding specific conditions.
- Tribunal determines matter.

12.0 TOWN PLANNING SCHEME REVIEW

- LGA consults with affected bodies in preparation of its scheme.
- LGA lodges scheme with DPUD.
- DPUD advertises scheme for public comment.
- Comments on scheme considered.
- Scheme gazetted.

APPENDIX 3

ACCIDENTAL SPILLAGE CONTINGENCY PLAN

AIM:

A Contingency Plan to assist the Leschenault Inlet Management Authority combat pollution of the inlet and other waterways and estuaries in the region by oil and chemical spillage.

DESCRIPTION OF AREA:

Leschenault Estuary covers an area of some 25 square kilometres. It has a tidal flow through the Cut at about 4-5 knots, and a tidal change of one metre.

The Estuary is the home and breeding grounds for many species of birds, wildlife and shell fish, and is highly rated by tourists.

During the summer months, this area is affected by winds from the east in the morning and from the south-west in the late afternoon and evening.

In the winter months, the wind is from the north-west, turning to the south-west in times of fine weather.

Other waterways in the region

Vasse and Wonnerup Estuary
Hardy Inlet (Blackwood River)
Capel River
Margaret River

Refer to list of Environmentally Sensitive Areas.

POSSIBLE THREATS:

1) Fracture or leakage from SCM Chemicals Ltd pipeline into estuary.

2) Roll over of transport vehicles causing spillage of oils and chemicals into estuary and other waterways and rivers.

3) Pollution from industrial sources.

4) Spillage from pleasure craft.

5) Sea source could enter estuary and inlets via incoming tide.

ASSESSMENT OF THREAT:

1) Could happen at any time.

2) Road is in constant use by tankers conveying petroleum and chemicals.

3) Factories working 24 hours a day, growing industrial areas.

4) Area is a popular fishing spot to hundreds of craft.

RISKS:

1) Life and property.

2) Economic.

3) Ecological - a number of environmentally sensitive areas listed in Appendix.

4) Amenities - threat to water supply, power supply etc.

PHASES OF OPERATION:

1) First Notice:

First notice to be directed or reported to the Police Department.

The Police to then notify all other parties.

It is most important for all groups to be notified of the event.

The decision to become involved or not must be made by them, and not some other party.

Police
Western Australian Fire Brigade
Conservation and Land Management
Marine and Harbours
Leschenault Inlet Management Authority
Bunbury City Council
Dardanup Shire Council
Harvey Shire Council
Bunbury Port Authority
State Emergency Services
Water Authority of Western Australia
Ambulance
Environmental Protection Authority

2) Identification:

- Police or Fire Brigade
- Hazchem codes/Transport manifests

3) Containment:

- Police to set up a command post and be co-ordinators.

- Western Australian Fire Brigade to be the Combat Authority.

- Methodology of containment to be determined according to the circumstances of the event, through consultation with all concerned group representatives on site.

4) Recovery:

To be determined according to the circumstances of the event.

5) Disposal:

Liaise with local councils and Health Department.

6) Associated Costs:

Each group to determine individual costs to be presented to those responsible.

RESOURCES:

Lists of all equipment resources are compiled and kept at Bunbury Police Station.

Specific water borne pollution control equipment:

Department of Marine and Harbours Fremantle	(09) 335 0888
Bunbury Port Authority	(097) 21 2800
Fremantle Port Authority	(09) 430 4911
Swan River Trust	(09) 481 0121
Leschenault Inlet Management Authority	(098) 21 1875

SCOPE:

This plan was originally intended to cover the waterways that are contained within the Leschenault Inlet Management Authority boundaries. However, due to the fact that other waterways within the South West Region are at risk from oil and chemical spillages, particularly from road transport accidents, it has been decided that the scope of the contingency plan will be extended to cover all of the waterways within the South West Region.

ENVIRONMENTALLY SENSITIVE AREAS

BUNBURY AND SURROUNDING SOUTH WEST REGION

Leschenault Estuary

Leschenault Inlet

Collie River

Brunswick River

Preston River

Ferguson River

Capel River

Vasse and Wonnerup Estuary (The Deadwater)

Geographe Bay (adjacent to Busselton and Dunsborough)

Margaret River

Blackwood River (Hardy Inlet, Swan Lake, The Deadwater)

Off shore islands
- Sugarloaf Rock
- Hamelin Bay Islands
- Flinders Island group
- St Alouarn Island
- Seal Island

ABBREVIATIONS

BCC	Bunbury City Council
BFB	Bush Fires Board
BPA	Bunbury Port Authority
CALM	Department of Conservation and Land Management
DMH	Department of Marine and Harbours
DOA	Department of Agriculture
DOF	Department of Fisheries
DOLA	Department of Land Administration
DOM	Department of Mines
DPUD	Department of Planning and Urban Development
DSC	Dardanup Shire Council
EPA	Environmental Protection Authority
HCWA	Heritage Council of Western Australia (a new organisation which supercedes the Western Australian Heritage Committee)
HD	Health Department of Western Australian
HSC	Harvey Shire Council
LGA	Local Government Authority(ies)
LICMG	Leschenault Integrated Catchment Management Group
LIMA	Leschenault Inlet Management Authority
MCAC	Mosquito Control Advisory Committee (superseded the Mosquito Control Review Committee)
NT	National Trust
SECWA	State Energy Commission of Western Australia
SD	State Development (formerly the Department of Resources Development)
SWDA	South West Development Authority
WAFB	Western Australian Fire Brigade
WAM	Western Australian Museum
WATC	Western Australian Tourism Commission
WAWA	Water Authority of Western Australia
WWC	Waterways Commission