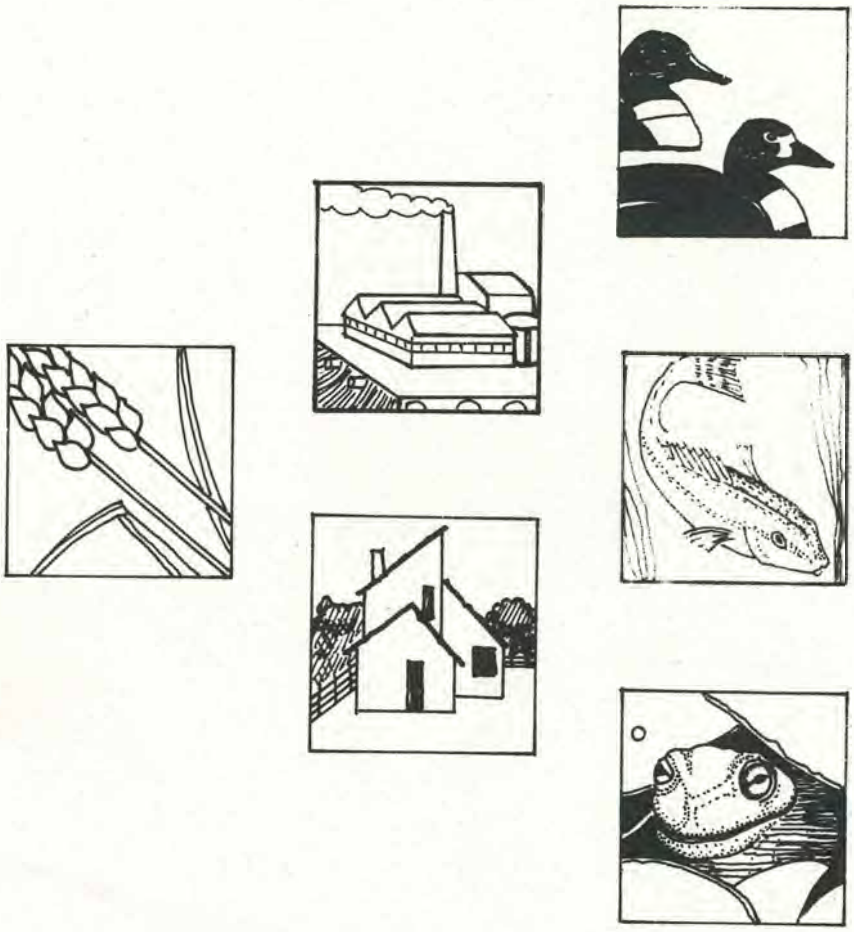
ALBANY WATERWAYS MANAGEMENT AUTHORITY

Draft Albany Waterways Management Programme



Waterways Commission
Report No 45
1994

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DRAFT ALBANY WATERWAYS MANAGEMENT PROGRAMME

Report to the Albany Waterways Management Authority

Caroline Seal

Waterways Commission
216 St Georges Terrace
Perth WA 6000

Report No 45,
January, 1994

ISBN 0-7309-5581-8
ISSN 0814-6322

MINISTER'S FOREWORD

The need for coordinated waterways management in Western Australia is recognised and supported by the Government. Many of our valuable waterways are under increasing pressure and require special management. Since the 1960's concern has been voiced about the condition of the water quality of the Albany harbours. Studies in the early 1970's confirmed the need to better manage and protect the harbours and their associated waterways.

The Albany waterways are important resources for the local community for recreational purposes, to visitors to Albany for tourism purposes and they provide an attractive environment in which to live. The State Government is committed to the conservation of this valuable asset.

The local community of Albany has played a vital role in management of the Albany waterways for some time. The Albany Waterways Management Advisory Committee was formed in 1976 and pushed strongly for a formal management presence in Albany. In 1986 the Environmental Protection Authority considered that urgent action was required to address the problems facing the Albany harbours. An intensive two year study was initiated into the ecology, circulation and pollutants in the harbours. From these studies the EPA made 12 major recommendations to the State Government. These recommendations made it clear that for the long term recovery of the harbours, immediate action to reduce pollution from industrial and domestic wastewater had to be taken in addition to better management of pollution from diffuse sources within the urban and rural catchments.

In 1990, in response to the EPA recommendations, Government made the decision to establish the Albany Waterways Management Authority (AWMA). The Authority was to provide an onsite community-based management of the waterways. This decision was the culmination of pressure for concerted management action. I commend those involved with the Albany Waterways Management Advisory Committee and those members of the community who continued to lobby for action, for their perseverance over the years.

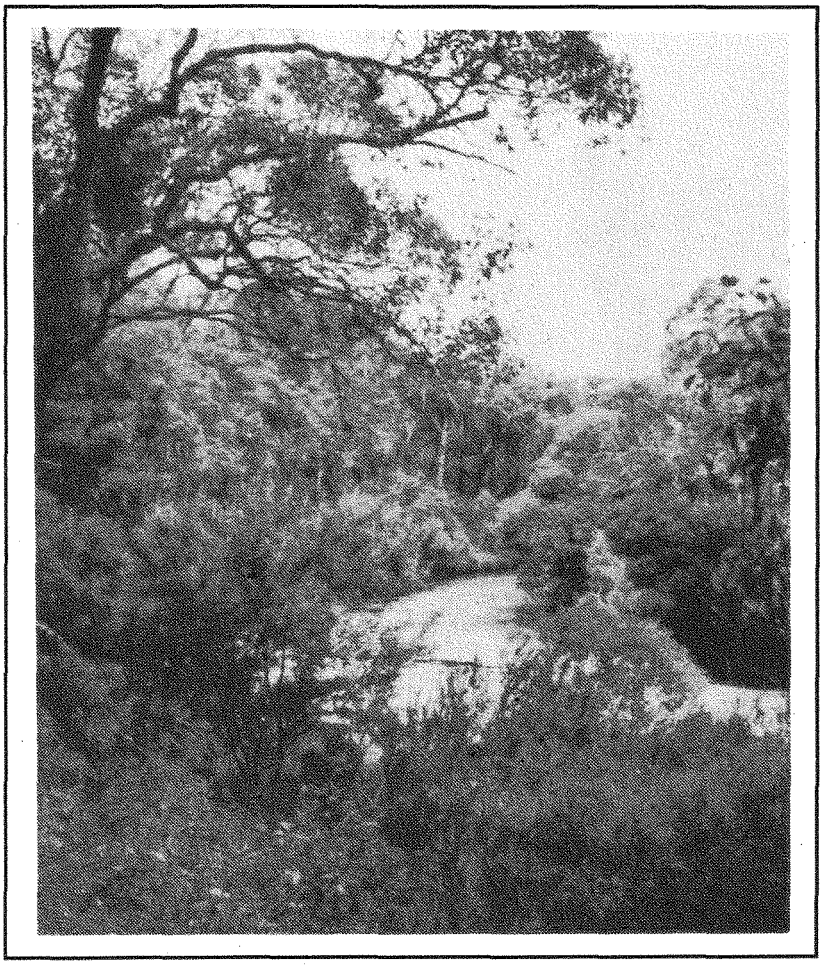
The Albany Waterways Management Authority has been operating for nearly three years. After an initial settling in period where members familiarised themselves with issues, the Authority is now working well with community groups and other agencies. A Management Programme, as required under the Waterways Conservation Act, has been developed to aid the Authority in its work. It provides a vision and direction for the Authority, the community and the many other agencies working in waterways and integrated catchment management for the next five to eight years.

The community now has an opportunity to comment on the Draft Management Programme. I urge you to read the document carefully and make your views known to AWMA. If more information is required, staff of AWMA are more than happy to help. Enclosed in the document is a form which you may use to make a submission. All comments made to AWMA will be carefully considered in the preparation of a final document to provide what I hope will be a Management Programme which all the community supports.

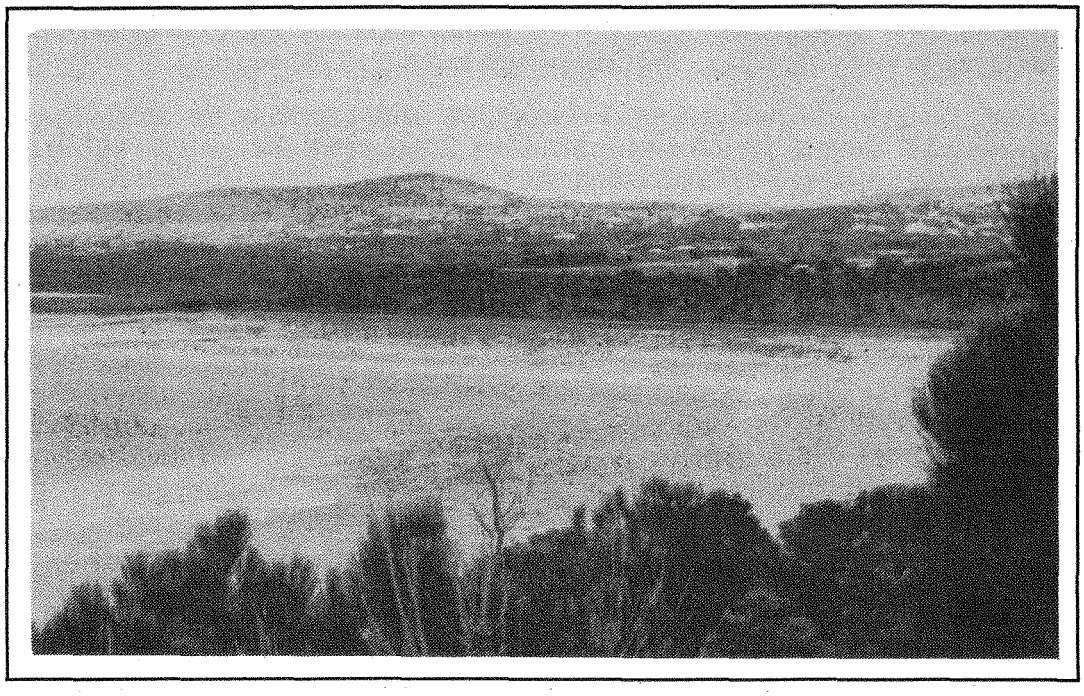
K. J. Minson.

Kevin Minson MLA

MINISTER FOR THE ENVIRONMENT



Kalgan River



Oyster Harbour from Bayonet Head

CHAIRMAN'S FOREWORD

The Albany waterways are a major asset to the community of Albany and its surrounding hinterland. Not only do the waterways provide a magnificent backdrop to the town of Albany but they also provide a major focus for residential, recreational and commercial development. The Albany harbours together with the rivers and many smaller creeks and streams in the catchment also provide a variety of wildlife habitats, important landscape features and places for people to enjoy.

Over the past few decades a number of environmental problems within the Albany waterways have emerged. Water quality of the harbours has deteriorated due to the input of nutrients and other pollutants from surrounding land uses.

This pollution has resulted in the decline of seagrass communities to a point where the ecological health of the waterbodies is severely threatened. As a consequence the scenic, conservation, recreation and tourism values of these beautiful waterways are also threatened.

The community's strong desire to address the problems facing the harbours prompted the establishment of the Albany Waterways Management Authority in 1991. The community has continued to support the Authority in its endeavours to manage the waterways. AWMA feels confident that the condition of the waterways has improved since its inception. Commitment has been made by many sectors of the community, the rural community have taken on board land management initiatives which will ultimately improve the quality of water draining from land in the catchment. The industrial and urban community are also playing their part by developing better ways to manage industrial discharge and urban runoff.

Although recent improvements have been seen in the condition of the Albany waterways, they continue to be subjected to a wide range of pressures. Development of the Draft Management Programme has allowed the Authority to look objectively at these pressures, identify issues of concern and develop workable solutions to address these issues.

The Management Programme is broad in nature. It looks at management principles, policies and approaches which provide the Authority with a focus and a direction for the coming years. It also recommends further investigations into the specific management needs of the various waterways in the catchment. The programme will guide decisions made by the Authority and help officers supporting the Authority in their day to day work. The main thrust of the Draft Programme is to support forward planning for land use and development around the waterways and reducing its impact on the natural functioning of the waterways.

The Authority believes the Draft Management Programme outlines actions which will be of great benefit to the waterways and their catchments. We hope the community will support management of the waterways and endorse the recommendations made in the Draft Programme. I urge you to read the document and provide comments to AWMA officers.

Matt Stephens

CHAIRMAN
ALBANY WATERWAYS MANAGEMENT AUTHORITY

ACKNOWLEDGEMENTS

Many people must be acknowledged for their assistance during preparation of this report.

Members of the Albany Waterways Management Authority for their patience during preparation of the document and their extensive advice on issues of concern to the local community.

Waterways Commission officers, especially Mike Kerr, Luke Pen and Beverley Thurlow for their technical assistance, Greg Baxter and Brett Harrison for map preparation and June Hutchison for editing.

ALBANY WATERWAYS MANAGEMENT AUTHORITY MEMBERSHIP

Mr M Stephens	**Chairman** **Community Representative**
Mr B Hudson	**Deputy Chairman** **Albany Port Authority**
Mrs A G Knight	**Mayor of Town of Albany**
Mr C Ayres	**President, Shire of Albany**
Mr W McGowan	**Shire of Plantagenet**
Mr R Kerruish	**Community Representative**
Mr K Benson	**Community Representative**
Mr R W Crabb	**Community Representative**
Mr J Blaney - Murphy	**Community Representative**
Mr R Richards	**Community Representative**
Mr G Paust	**Department of Agriculture**
Mr T Hambleton	**Water Authority of WA**

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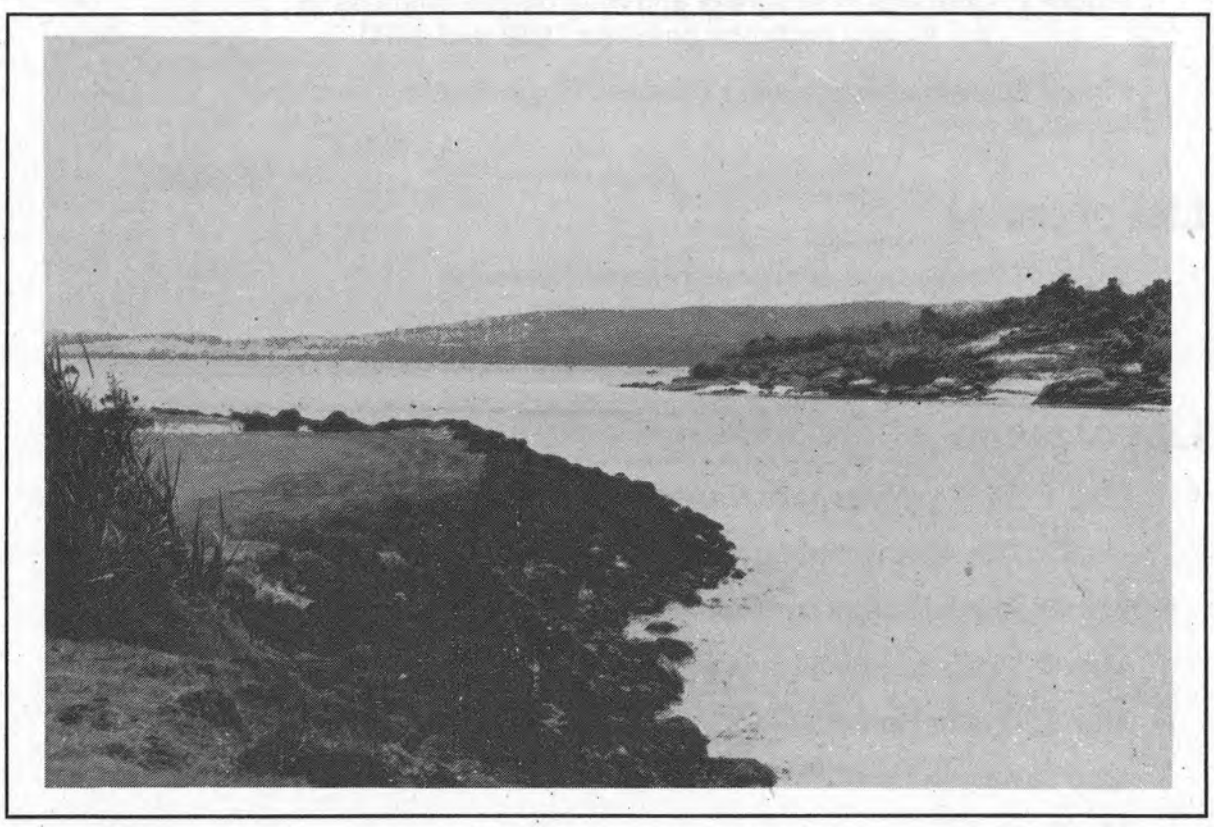

Oyster Harbour entrance channel

GUIDE FOR READERS

The coloured pages

Two sets of coloured pages are contained in the front of the document following this page. These provide the reader with easy access to information.

The **yellow** pages contain the **Summary** of the document which gives the reader a brief overview of the contents of the Management Programme.

The **green** pages list the **Actions** recommended in the Management Programme.

The main body of the document

The rest of the document contains the details of the Management Programme. The following gives an outline of what each chapter will tell you.

Introduction: outlines how and why the Management Programme was prepared, what it contains and how it will be implemented.

Part A: details the general principles of waterways management including the philosophy and approach of the Waterways Commission.

Part B: briefly describes the waterways environment, the issues relevant to the Albany waterways, and the role and operations of AWMA, and outlines what AWMA wishes to achieve.

Part C: outlines the issues facing the Albany waterways and the goals for management.

Part D: describes specific areas of the waterways and recommends management actions for these areas.

Part E: sums up how the Management Programme will be implemented

Abbreviations

Many organisations are mentioned in this Management Programme including State government agencies, local government authorities and community groups. For brevity, initials are used in most references. To aid the reader a foldout sheet listing all abbreviations is provided at the back of the document.

Glossary

Many terms are used which may not be familiar to the reader. A glossary explaining the meaning of these terms is provided at the back of the document.

How can I make a submission?

Public submissions on the Draft Albany Waterways Management Programme are now invited. All public submissions received will be considered before preparation of the Final Management Programme.

If you would like to make a submission towards preparation of the final document please comment on any part of the document you agree or disagree with. A tearout form is provided on the following page for this purpose. Send this to the Albany Waterways Management Authority by Friday 29 April 1994 at the address provided on the top of the form. Please note that submissions do not have to be confined to the length or layout of the form provided.

If more information is required prior to making your submission, officers of the Albany Waterways Management Authority and the Waterways Commission will be available to discuss any aspect of the Draft Management Programme.

Where can I get other copies of this document?

Further copies of the Management Programme are available for viewing at:

- Local government public libraries in Albany and Mount Barker.
- Local government offices in Albany and Mount Barker.

Copies of the document can also be obtained free of charge from:

- Albany Waterways Management Authority
  Albany Port Authority Building
  85 Brunswick Road
  Albany WA 6330
  Ph. (098) 414 988
- Waterways Commission
  16th Floor London House
  216 St Georges Tce
  Perth WA 6000
  (09) 327 9777

Draft Albany Waterways Management Programme
Public submission form

Project Officer
Albany Waterways Management Programme
C/- Albany Waterways Management Authority
Albany Port Authority Building
85 Brunswick Road
Albany WA 6330

Name:.....

Title:.....

Organisation:.....

Address:.....

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I would like to make the following comments on the Draft Albany Waterways Management Programme and would like them considered in the preparation of the Final Management Programme.

Comments:

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I would also like a copy of the Final Management Programme sent to the above address on its completion.

Signed

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SUMMARY

Background

A number of major environmental problems with the Albany harbours have been identified over the past three decades. Surveys have indicated that seagrass communities which are important to the ecological health of the harbours have declined. Waters of the harbours have been found to be enriched with nutrients and this has resulted in the accumulation of macroalgae within the harbours and the further decline of seagrass communities. Toxic contamination of the sediments within Princess Royal Harbour from industrial discharge was also identified in 1985. Much concern has been expressed over the years in regard to management of these harbours and numerous organisations, agencies and groups have been involved in improving the situation.

The Environmental Protection Authority (EPA) carried out extensive studies of the problems facing the Albany Harbours in 1988 and 1989 and made a number of recommendations to alleviate these problems. One major recommendation was the formation of a management organisation to provide an on-site coordinating role for management of the harbours and their associated waterways.

Albany Waterways Management Authority (AWMA)

The Albany Waterways Management Authority (AWMA) was established in 1991 to take on the onsite management role, to coordinate the implementation of the EPA recommendations and take responsibility for overall management of the waterways. The Authority was established under the Waterways Conservation Act 1976 and has a management area which encompasses the entire catchments of the Albany harbours.

AWMA is a locally-based management body which represents the community and State and local government. Its primary role is to protect and enhance the Albany waterways and their foreshores. It also has an interest in management of activities within the catchment of the Albany waterways which have the potential to impact on the waterways.

AWMA works to:

- Understand the Albany waterways and establish standards to maintain them as functional, healthy systems.
- Plan for the conservation, enhancement and appropriate development of Albany's waterways.
- Protect and rehabilitate the Albany waterways and encourage their sustainable use.
- Increase awareness and involvement in the conservation and management of the Albany waterways.

Purpose and aim of the programme

Under Section 35 of the Waterways Conservation Act, AWMA is required to a prepare a management programme for the waterways its management area The Draft Management Programme identifies strategies and actions required to address the issues facing the Albany waterways. The programme is designed to guide AWMA's operations and provide direction for other organisations, agencies and groups involved in waterways management.

The aim of the management programme is:

Aim

To improve and maintain the ecological health of the Albany harbours and associated waterways for the enjoyment of present and future generations by conserving, protecting and rehabilitating the waterways and their foreshores and by fostering appropriate development and land use practices which are compatible with the need to maintain the waterways as healthy functional systems.

Key management approaches

In developing the management programme AWMA has identified six major management approaches. These include:

Reducing nutrient inputs

The Albany waterways, in particular the Albany harbours are highly enriched with nutrients. These nutrients originate from rural, urban and industrial sources and are resulting in deteriorating water quality and growth of macroalgae within the harbours. AWMA must work towards reducing the amount of nutrients entering the waterways and thus slow the enrichment process. This will involve carrying out monitoring to identify nutrient sources, setting targets for nutrient inputs and working with farmer, industry and urban groups to reduce nutrient losses to the waterways.

Conserving the environment

Waterways are complex systems. They contain a variety of physical and biological components which interact through complex processes. Human activities can cause modification to the natural balance which exists within these ecosystems. AWMA recognises that the waterways environment needs to be conserved and viewed as an area of special and distinctive environmental significance. AWMA will work towards maintaining and improving the biophysical functions in the Albany waterways. This includes improving water quality, seagrass coverage and density and reducing macroalgal accumulations. It also involves protecting and rehabilitating foreshore areas, increasing the coverage of vegetation in the catchment, protecting ecosystems which exist on flood prone land. Social components of the environment such as landscape and cultural sites also need protection.

Planning for the future

AWMA has recognised that management must focus on balancing future development with the protection and enhancement of the waterways environment. For this reason there is a necessity for future development on and around the waterways to be properly planned, coordinated and managed so as to minimise the impact on the waterways. AWMA will work toward incorporating consideration of waterways into the planning processes at both local and regional levels. and encouraging a situation whereby future planning practices seek to protect the Albany waterways from the impacts of development .

Providing for community use

Waterways are significant scenic and aesthetic assets. People wish to use waterways and their foreshores for various recreational and tourism activities. AWMA acknowledges the value of waterways to the Albany community and wishes to promote their use in a manner which is compatible with protection of the natural waterway environment. AWMA will minimise the impact of recreational and tourism activities on the waterways environment by identifying suitable areas for these activities, assessing the environmental impact of activities and preparing plans to manage future use of the waterways and their foreshores.

Increasing concern for waterways

The community of Albany has a large part to play in management of its waterways. Although AWMA members are from the local community, there is a need to promote further community interest in the protection of the waterways and involve all elements of the community in their management. AWMA will do this by always being accessible to the community, providing information for a variety of audiences, providing input to education programmes and involving local community groups in rehabilitation and management projects.

Increasing our knowledge

Learning more about the ecological functioning of the waterways is extremely important when trying to verify and improve management techniques. AWMA will undertake research and environment monitoring as needed to increase their knowledge about the waterways. This will allow early identification of changes in the condition of waterways. Information gained from this research will also be shared with the community and other research organisations.

RECOMMENDED STRATEGIES AND ACTIONS

Strategies and actions for management of the Albany waterways are outlined and discussed in Part C of this document. Sixty strategies have been developed with a number of actions following each strategy. They are based on general principles of waterways management used in other parts of the Western Australia. The key players in implementation of the actions are given in abbreviated form after each action statement with the initiating agency highlighted in bold. Abbreviations are listed at the back of the document.

Reducing nutrient inputs

Nutrient loads

1. Ensure all sources of nutrients entering the Albany harbours are monitored.

    1.1 Coordinate an overall monitoring programme to measure nutrient loads entering the Albany harbours. Include the following components in this programme:

    •self monitoring by foreshore industries
    •representative monitoring of urban catchments by the Shire and Town of Albany
    •monitoring of urban point sources by the Shire and Town of Albany
    •joint monitoring of rural catchments by DAWA/ WAWA and AWMA
    •community involvement in monitoring of urban and rural catchments.

    Review monitoring arrangements to ensure they are efficient and effective.

    AWMA, LGAs, DAWA, WAWA, IND, COM

    1.2 Collate monitoring results and produce an annual audit of nutrient loads to the harbours. Identify nutrient hot spots in the catchments from this information.

    AWMA, LGAs, DAWA, WAWA, IND, COM

2. Carry out investigations to gain a better understanding of the effect of nutrient enrichment on the Albany harbours.

    2.1 Develop and utilise a model to refine initial estimates of nutrient assimilative capacity and target nutrient loads for the Albany harbours.

    AWMA

Rural nutrient sources

3. Minimise nutrient loss from rural diffuse sources in the Albany harbours catchments.

    3.1 Support and promote DAWA's strategies for reducing nutrient loss from rural diffuse sources including:

    •a soil testing programme to determine fertiliser needs for crops and pastures
    •the appropriate application of nutrients to agricultural soils
    •an increase in the use of water in the catchment
    •an increase in vegetation cover in the catchment
    •the use of farm planning to improve land management practices
    •the promotion of alternative land uses or soil treatments where soils have a low nutrient retention capacity
    •revegetation of streamlines on rural properties.

    DAWA, LCDCs, OHCG, AWMA, LOs

3.2 Liaise with the rural community to promote the concept of good land management for cleaner waterways. **DAWA,** AWMA

3.3 Provide advice to planning authorities on the suitability of land use proposals in the catchment with regard to nutrient loss to the waterways. **DAWA**, AWMA, LGAs, DPUD

4. Minimise nutrient loss from rural point sources in the Albany harbours catchments.

4.1 Assess effluent management methods for existing and proposed point sources such as dairies, piggeries and intensive horticulture and provide advice on methods to minimise nutrient loss. **LGAs**, DAWA, AWMA

4.2 Support the EPA's codes of practice and DAWA's environmental management guidelines for animal based industries including piggeries, poultry farms,rabbit farms, cattle feedlots and stock holding yards. **LGAs**, AWMA, EPA, DAWA

4.3 Develop a set of guidelines for the operation of nutrient intensive agricultural activities in order to minimise nutrient loss from these sources. Encourage the inclusion of these guidelines for nutrient intensive agriculture in local rural strategies. **DAWA**, AWMA, LGAs

5. Promote and support catchment planning in the Albany harbours catchments.

5.1 Develop guidelines for catchment groups and land conservation district committees to aid in the preparation of catchment plans. Incorporate the consideration of issues relating to waterway management into these guidelines.**DAWA**, LCDCs, OHCG, LGAs, AWMA

5.2 Provide information to catchment groups and land conservation district committees on the quality of water draining from their land to enable them to assess the performance of management strategies.**DAWA**, AWMA, LCDCs, OHCG

5.3 Liaise with catchment management groups and land conservation district committees to emphasise the need to plan for nutrient loss to the waterways and suitable management strategies to reduce that loss.**DAWA**, AWMA, LCDCs, OHCG

Urban nutrient sources

6. Minimise nutrient loss from **existing** urban diffuse sources in the Albany harbours catchment.

6.1 Support the appropriate prioritisation and implementation of backlog sewerage for urban areas within the Albany harbours catchments. **WAWA**, LGAs ,AWMA

6.2 Prepare public information for residents to encourage significant reduction of nutrient loss from their properties. Include the following issues:

- sensible applications of fertilisers on gardens
- water sensitive garden maintenance
- use and disposal of detergents
- maintenance of septic tanks
- alternative systems available when upgrading

LGAs, AWMA

7. Minimise nutrient loss from **existing** urban point sources in the Albany harbours catchments.

7.1 Assess effluent disposal and treatment methods for existing urban point sources and provide advice on measures to minimise nutrient loss. **LGAs**, AWMA

8. Minimise nutrient loss from **future** urban areas in the Albany harbours catchments.

8.1 Provide advice to planning authorities on future urban developments and their potential nutrient input to the waterways. **AWMA**, LGAs,DPUD

8.2 Promote the inclusion of water sensitive urban design into planning for new residential development. **AWMA**, LGAs, WAWA

8.3 Develop guidelines for developers and planning authorities to reduce nutrient loss from urban development. **AWMA**, LGAs, WAWA

8.4 Develop coordinated policies for stormwater disposal and domestic effluent disposal within the Albany Waterways Management Area. **AWMA**, LGAs, WAWA

8.5 Promote the use of alternative wastewater treatment in preference to septic tanks in locations where the water table is high or in close proximity to the waterways. **AWMA**, LGAs, WAWA

Industrial nutrient sources

9. Minimise nutrient loss from existing industries in the Albany harbours catchments.

9.1 Manage the water pollution components of industrial licences with delegated authority under the Environmental Protection Act 1985 including:

•receiving and assessing industry monitoring reports
•spot monitoring of industrial discharge
•setting appropriate licence conditions
•liaising closely with foreshore industries to improve process methods and waste treatment in order to further reduce nutrient losses.

AWMA, EPA, IND, APA

9.2 Assess effluent disposal methods and treatment strategies for industrial operations not licensed under the Environmental Protection Act 1985 and provide advice on measures to reduce nutrient loss. **LGAs**, AWMA

10. Minimise nutrient loss from future industry and industrial areas

10.1 Ensure that all new industrial developments which produce liquid effluent are connected to reticulated sewerage, or incorporate effluent management systems approved by EPA, WAWA, HD and AWMA. **AWMA**, WAWA, EPA, HD

10.2 Provide advice to planning authorities on the location and design of new industrial areas with particular regard to nutrient loss from these activities. **AWMA**, LGAs, DPUD

10.3 Work towards the future phasing out of all industrial discharge to the waterways. **AWMA,** EPA, WAWA

Conservation of the environment

Water quality

11. Monitor water quality of the major waterways within the Albany Waterways Management Area.

11.1 Develop a comprehensive water quality monitoring programme to identify changes in nutrient levels and other pollutants within the Albany waterways. AWMA

11.2 Support the FD, EPA and CSBP in the monitoring of sediments and biota of Princess Royal Harbour for heavy metal contamination to ensure levels remain acceptable. **FD**, EPA,CSBP,AWMA

12. Identify the level to which water quality needs to be maintained to support natural ecosystem functioning and community use.

12.1 Develop water quality criteria, objectives and standards for the Albany waterways. **AWMA**

12.2 Develop health indicators for the Albany waterways to identify changes in the ecological health of the waterways ecosystem and to measure the success of management strategies employed. **AWMA**

13. Maintain and improve the water quality in the Albany waterways.

Refer to actions for Reducing Nutrient Input

13.1 Provide advice to planning authorities on the impact of existing and proposed developments on the water quality of the Albany waterways. **AWMA,** LGAs, DPUD

13.2 Develop a contingency plan for dealing with pollution of the waterways from accidental spills and discharges. **AWMA**, DMH, APA

Seagrass and macroalgae

14. Monitor seagrass and macroalgae communities in the Albany harbours for change in density and coverage.

14.1 Regularly carry out surveys of seagrass and macroalgae. Map changes and report on current status. **AWMA**

15. Remove macroalgae accumulations from the harbours as quickly as possible.

15.1 Remove macroalgae using mechanical harvesters. Prioritise removal locations according to annual macroalgae surveys and carry out ongoing investigations into harvester effectiveness and efficiency. **AWMA**

15.2 Monitor harvesting operations for environmental impact. Refine harvester design to minimise environmental impacts where necessary.**AWMA**

16. Dispose of harvested macroalgae in an environmentally acceptable manner.

16.1 Investigate various macroalgal disposal options. Implement cost effective and environmentally acceptable disposal methods. **AWMA**

17. Improve knowledge about seagrass and macroalgae communities.

17.1 Investigate the seasonal and other cyclical variations in growth patterns of seagrass and macroalgae. **AWMA**

18. Reduce nutrient inputs to the Albany Harbours to reduce growth of further macroalgae.

Refer to Actions for Reducing Nutrient Inputs

Foreshore areas

19. Identify foreshore areas within the Albany Waterways Management Area requiring conservation and rehabilitation.

19.1 Assess the condition of foreshore areas around the Albany harbours and along the King and Kalgan Rivers. Include in this assessment consideration of the following issues:

- erosion
- vegetation condition
- public access
- use for recreational activities
- stock access

AWMA

19.2 Encourage the assessment of the condition of foreshore areas in private ownership by landowners and LCDCs. **AWMA**, LCDCs, OHCG, LOs

20. Make arrangements for the protection of foreshore areas which are of high conservation value or which contain intact foreshore vegetation.

20.1 Evaluate foreshore areas for establishment and vesting as reserves for the purposes of conservation of flora and fauna or waterways protection. **AWMA**, DOLA, CALM, LOs

20.2 Develop management agreements with landowners for the conservation and protection of foreshore areas in private ownership where appropriate. **AWMA**, LGAs, LOs

21. Carry out rehabilitation works in degraded foreshore areas within the Albany Waterways Management Area.

21.1 Develop a coordinated long term rehabilitation programme for degraded foreshore areas including the following management strategies

- •foreshore stabilisation
- •direction of public access and recreation activities into nodes
- •modification of recreational activities where necessary to avoid damage to banks
- •exclusion of stock from foreshore areas
- •re-establishment of foreshore vegetation
- •weed control

AWMA, LGAs, LCDCs, OHCG

21.2 Conduct rehabilitation works under joint arrangements with landowners, LCDCs and local government authorities. **AWMA**, LGAs, LCDCs, OHCG, LOs

21.3 Determine effective techniques for rehabilitating degraded foreshore areas. Develop a list of plant species suitable for revegetation of foreshore areas. **AWMA**, LGAs, LCDCs, OHCG

21.4 Work with LCDCs and catchment groups to promote the revegetation, fencing and exclusion of stock from foreshore areas in private ownership. Provide advice on methods of revegetation and suitable plant species. **AWMA**, LCDCs, OHCG, LOs

22. Ensure the protection of foreshore areas adjacent to future development.

22.1 Support the acquisition of foreshore reserves through the process of subdivision in accordance with Section 20A of the Town Planning and Development Act. **AWMA**, LGAs, DPUD, DEV

22.2 Ensure the boundary between private property and foreshore reserves is clearly defined and that the development of private property does not intrude onto the foreshore reserve. **AWMA**, LGAS, DEV

22.3 Require the preparation of foreshore management plans by developers for foreshore areas affected by developments near waterways. **AWMA**, LGAS, DPUD DEV

22.4 Limit commercial development in foreshore areas to tourist accommodation, restaurant operations and those developments requiring a water frontage (e.g. marine sales and maintenance operations, canoe and boat hire operations). **AWMA**, LGAs, DPUD, DEV

22.5 Where revenue is raised from commercial developments on foreshore land require the contribution of moneys for the upkeep of foreshore reserves and waterways management. **AWMA**, LGAs, DPUD, DEV

Catchment vegetation

23. Identify existing remnant vegetation in the Albany harbours catchments.

23.1 Support the mapping of remnant vegetation within the Albany harbours catchments. **DAWA**, CALM, DOLA, LGAs, BFB, AWMA

23.2 Determine management responsibility for remnant vegetation in the Albany harbours catchments. **DAWA**, CALM, DOLA, LGAs, BFB, AWMA

24. Conserve and enhance vegetation within the Albany harbours catchments.

24.1 Support and promote the protection of existing remnant vegetation within the catchment.**DAWA**, LCDCs, OHCG, LOs, CALM, AWMA

24.2 Assist in the development of a strategy for revegetation of the Albany harbours catchments. **DAWA**, LCDCs, OHCG, LOs, CALM, AWMA

24.3 Support LCDCs, catchment groups, DAWA, and landowners to increase vegetation cover in the Albany harbours catchments. **DAWA**, LCDCs, OHCG, LOs, CALM, AWMA

24.4 Support full implementation of the catchment clearing guidelines for the South Coast and follow up of compliance with conditions. **DAWA**, LCDCs, OHCG, LOs, CALM, AWMA

24.5 Support the development of tree based industries in the Albany harbours catchments. **DAWA**, LCDCs, OHCG, LOs, CALM, AWMA

24.6 Support the integration of revegetation of farm land into farm planning. **DAWA**, LCDCs, OHCG, LOs, CALM, AWMA

Fisheries

25. Minimise the impact of fishing activities on the ecological functioning of the waterway.

25.1 Liaise with the Fisheries Department to protect breeding areas and fish habitat. **AWMA**, FD

25.2 Seek referral of all aquaculture proposals and provide advice to the Fisheries Department on the impact of these proposals on the waterway environment having particular regard for the impact on seagrass communities. **AWMA**, FD

25.3 Liaise with the Fisheries Department to prepare educational material on the conservation of the fishery resource. **AWMA**, FD

25.4 Encourage research to be undertaken on species taken by commercial and recreational fishing and the impact of water quality changes on fish stock. **AWMA**, FD

Landscape

26. Protect high valued landscapes through appropriate land use and development mechanisms.

26.1 Carry out a landscape study for the Albany waterways. Include in this study the identification of landscape attributes and suitable means of protection. **AWMA**, LGAs

26.2 Ensure landscaping plans implemented by local government and developers are consistent with AWMAs overall landscape plan. **AWMA**, LGAs, DEV

26.3 Encourage LGAs to protect landscape values through town planning schemes and local rural strategies. **AWMA**, LGAs

26.4 Provide advice to planning authorities on the impact of development on the landscape of the Albany waterways **AWMA**, LGAs, DPUD

Floodprone land

27. Minimise the impact of development around the waterways on the natural process of flooding.

27.1 Encourage WAWA to carry out a flood study of the Albany waterways and prepare flood maps identifying the floodway, flood fringe and flood plain for use by planning authorities when assessing the impact of planning proposals. **WAWA,** AWMA, LGAs, DPUD

27.2 Ensure all planning proposals in close proximity to the waterways are referred to WAWA for advice on the impact proposals may have on flooding. **AWMA,** WAWA, LGAs, DPUD

27.3 Develop a policy for development of floodprone land taking into account potential impacts on the natural process of flooding and the ecological functioning of this land. **WAWA**, AWMA, LGAs, DPUD

28. Minimise the impact of development on the ecological values of floodprone land.

28.1 Identify areas where filling of floodprone land may result in the loss of important flora and fauna and ensure planning authorities are aware of the significance of these areas. **AWMA**, LGAs, DPUD

Cultural sites

29. Minimise the impact of development around the waterways on the Aboriginal and European heritage values.

29.1.Consult with the Department of Aboriginal Sites, WA Museum, to determine if planning proposals or management actions on or adjacent to the waterways will have adverse impact on Aboriginal sites. **AWMA,** LGAs, DPUD, WAM

29.2. Consult with the Heritage Council of Western Australia to determine if planning proposals or management actions on or adjacent to the waterways will have adverse impact on European heritage values. **AWMA,** LGAs, DPUD, HCWA

30. Identify and protect important European historic sites on or around the waterways.

30.1 Encourage the incorporation of European historic sites into recreation and tourist planning for the waterways. **LGAs**, AWMA,WATC, MSR

30.2 Encourage the development of historic attractions around the waterways where educational information can be provided to raise public awareness of the history of the Albany area. **LGAs**, AWMA,WATC, MSR

30.3 Encourage the listing or registration of significant European historic sites with the State's Register of Heritage Places or the National Estate Register to ensure their future protection. **AWMA**, LGAs, HCWA, AHC

Planning for the future

Regional planning

31. Include consideration of waterways protection in regional planning decisions.

31.1 Provide advice to DPUD in regard to waterway conservation needs during preparation of the regional planning strategies. **AWMA**, DPUD, GSDA

31.2 Ensure that AWMA is consulted by DPUD on proposed amendments to the Albany Regional Planning Strategy which affect waterways. **DPUD**, AWMA, GSDA

32. Support and utilise regional strategic planning mechanisms for the protection of the waterways environment.

32.1 Support and assist in the implementation of the Albany Regional Planning Strategy. **AWMA**, DPUD, GSDA

32.2 Ensure the AWMA Management Programme and other plans developed for the area are consistent with the Albany Regional Planning Strategy. **AWMA**, DPUD, GSDA

Local planning

33. Include consideration of waterways protection in local planning decisions.

    33.1 Develop and implement a system for planning proposals which may impact on the waterways to be referred to AWMA for advice. **AWMA**, LGAs, DPUD

    33.2 Provide advice to local planning authorities on planning proposals referred to AWMA. **AWMA**, LGAs, DPUD

    33.3 Ensure the nature of advice provided to planning authorities is such that it is relevant and structured in a manner which can easily be incorporated into the planning approval system. **AWMA**, LGAs, DPUD

    33.4 Establish a system to monitor acceptance and implementation of AWMA conditions on planning proposals. **AWMA**, LGAs, DPUD

    33.5 Develop sets of guidelines for developers on particular waterway issues for consideration in design and planning of development proposals. **AWMA**

34. Support and utilise local strategic planning mechanisms for the protection of the waterway environment.

    34.1 Actively participate in the preparation, development and review of town planning schemes and local rural strategies, structure plans and other local planning mechanisms to ensure adequate consideration of waterways issues. **AWMA** LGAs

    34.2 Develop guidelines for the protection and enhancement of waterways for consideration in the preparation of town planning schemes and local rural strategies. **AWMA**

35. Keep local planning authorities informed on issues affecting the waterways and how management strategies can be incorporated into local planning.

    35.1 Provide local government authorities with waterways information on or immediately following publication (e.g. reports, policies, leaflets etc). **AWMA**

    35.2 Conduct yearly seminars for relevant local government officers on issues relating to waterways management. **AWMA**

Climate change

36. Include consideration of climate change in decision making in regard to waterways management and protection.

    36.1 Support the State Government's Greenhouse Strategy, particularly in regard to recommendations made about sea level rise. **AWMA**, WAWA

    36.2 Include consideration of possible sea level rise when providing advice on the impact of development around the waterways. **AWMA**, WAWA, LGAs, DPUD

    36.3 Take into consideration the rise in sea level when assessing the width and shape of foreshore reserves to ensure the protection of a sufficient amount of foreshore area should sea levels rise. **AWMA**, WAWA, DOLA

    36.4 Ensure that foreshore facilities and structures are adequately designed and located to accommodate possible sea level rise. **AWMA**, LGAs, DMH, WAWA, APA

Providing for community use

Recreation

37. Monitor trends in recreational use of the waterways and associated foreshores and identify the need for further recreational facilities.

    37.1 Carry out assessments of recreational use through survey, observation, and public comment. **AWMA**, LGAs, MSR, APA

    37.2 Investigate approaches by recreational groups regarding the need for further recreational opportunities and facilities. **AWMA**, LGAs, MSR, APA

    37.3 Liaise with local government authorities to provide recreational facilities where necessary **AWMA**, LGAs, MSR, APA

    37.4 Investigate and report on the impact of existing recreational activities on the waterway environment. Develop management strategies to minimise impact. **AWMA**, LGAs, MSR, APA

38. Encourage recreational activities and facilities which are compatible with the protection of the waterways environment.

    38.1 Assess proposed recreational activities for their impact on the waterway environment. **AWMA**, LGAs, MSR, APA

    38.2 Prepare a list of activities considered appropriate and inappropriate for the waterways environment. **AWMA**, LGAs, MSR, APA

    38.3 Liaise with local government authorities and recreation groups to support appropriate recreational activities. **AWMA**, LGAs, MSR, APA

    38.4 Advise on the location of further recreational facilities to avoid environmentally sensitive areas. **AWMA**, LGAs, MSR, APA

    38.5 Encourage the development of information leaflets on recreational use for the protection of the waterways. **AWMA**, LGAs, MSR, APA

39. Ensure adequate and appropriate foreshore areas for recreational activities.

    39.1 Assess subdivisions for their impact on recreational use of the foreshores. **AWMA**, DPUD, LGAs, APA

    39.2 Request suitable public open space in foreshore areas adjacent to subdivisions. **AWMA**, DPUD, LGAs, APA

    39.3 Identify suitable foreshore areas to be developed for recreational purposes. **AWMA**, DPUD, LGAs, APA

40. Ensure adequate management and maintenance of foreshore recreation areas and facilities.

    40.1 Investigate appropriate vesting for areas which accommodate foreshore recreation. **AWMA**, DOLA, LGAs

    40.2 Develop management plans for recreation areas in conjunction with local govemment or other vesting agencies. **AWMA**, LGAs

    40.3 Encourage developers to contribute to the cost of management of adjacent foreshore recreation areas. **AWMA**, LGAs, DOLA, DEV

    40.4 Develop a strategy for upgrading and maintaining boat ramps and boating channels around the Albany harbours. **DMH**, AWMA, LGAs

Tourism

41. Encourage and support tourist facilities and activities which are compatible with the protection of the waterways environment.

    41.1 Assess tourist development proposals for their impact on the waterways. Advise planning authorities of these impacts and suggest amendments and management strategies where appropriate. **AWMA,** WATC, GSDA, LGAs

    41.2 Prepare interpretive information about the waterways to assist tourists in their understanding and enjoyment of the waterways. **AWMA,**WATC, GSDA, LGAs

    41.3 Support tourist activities and facilities which provide educational material about the waterways. **AWMA**, WATC, GSDA, LGAs

42. Support planning for future tourist facilities and activities.

    42.1 Support the Great Southern Tourism and Recreation Strategy and implement recommendations regarding the waterways made in the Tourist Development Implementation Strategy for the Great Southern Region. **AWMA**, WATC, GSDA, LGAs

    42.2 Liaise with the WA Tourist Commission and the Great Southern Development Authority to ensure waterway issues are taken into account when preparing tourism strategies. **AWMA**, WATC, GSDA, LGAs

    42.3 Support the identification of areas which could be developed as attractive tourist locations without damage to waterways. Liaise with developers and tourist promoters to develop these areas. **AWMA,** WATC, GSDA, LGAs

Public access

43. Ensure the provision of public access to the waterways.

    43.1 In conjunction with LGAs carry out surveys to determine the level and type of public access required by the local community and visitors. **AWMA,**LGAs

    43.2 Determine priorities for the provision of public access around the waterways **AWMA,**LGAs

    43.3 Encourage the acquisition of adequate foreshore reserves through the process of subdivision in order to provide public access to the waterways. **AWMA,**LGAs, DOLA

    43.4 Investigate the feasibility of entering into agreements with private landowners to allow public access to the waterways through private property where appropriate. **AWMA,**LGAs

    43.5 Liaise with local government authorities and other vesting bodies to upgrade public access to foreshore areas. **AWMA,**LGAs

    43.6 Liaise with local government authorities to provide dual use paths at suitable locations around the waterways. Design all dual use paths according to the State Government's 'Environmental Guidelines for Dual Use Paths'. **AWMA,**LGAs

44. Ensure public access is compatible with the protection of the waterway environment.

    44.1 Restrict public access or design appropriate public accessways to protect environmentally sensitive foreshore areas. **AWMA**, LGAs

    44.2 Identify suitable areas to develop as public access nodes. Develop management plans for these areas. **AWMA**, LGAs

    44.3 Discourage vehicular access along foreshore areas. **AWMA**, LGAs

    44.4 Monitor foreshore areas for problems with public access and liaise with local government to develop strategies to manage these problems. **AWMA**, LGAs

44.5 In conjunction with local government authorities, identify areas around the waterways suitable for designated uses including horse riding and dog exercise. Provide access in identified areas for these purposes. **AWMA**, LGAs

Increasing concern for waterways

Community involvement and information

45. Provide information about AWMA's operations, the state of the waterways and planning and management matters to the community.

45.1 Prepare a public information and promotion plan which includes:

•release of media statements on matters of community concern.

•preparation of an annual report to the community on the activities of AWMA and the state of the waterways.

•preparation of leaflets and other material o n issues of concern to the community.

•attendance at community events,e.g. Albany Show, Mount Barker Show

•delivery of talks to schools and community groups on matters relating to waterways protection

AWMA

46. Determine community attitudes, aspirations and needs and incorporate into management and planning.

46.1 Carry out surveys on specific issues to determine community needs. **AWMA**

46.2 Conduct public workshops and meetings to discuss issues of concern to the community. **AWMA**

46.3 Promote and facilitate community advisory committees for issues of specific concern to the community. **AWMA**

47. Involve and consult the community in planning and management decisions made in regard to waterways protection.

47.1 Maintain a list of all interested parties (community groups, individuals, local government, State Government) and seek their support and participation. **AWMA**

47.2 Support and aid catchment based community groups in their activites in the area of land and water care. **AWMA**, DAWA, LCDCs, OHCG

47.3 Invite the community to make comment on management programmes, plans and policies. **AWMA**

47.4 Use accessible public media (radio, television, State, local and community newspapers) to advertise activities, meetings and opportunities for public comment. **AWMA**

47.5 Advertise and invite expressions of interest from. the community for representation on AWMA. **AWMA**

47.6 Develop a public record of all management and planning proposals being considered by AWMA. **AWMA**

47.7 Consider and act on any matters brought to the attention of AWMA by the community. **AWMA**

Education

48. Provide educational material to user groups to promote desirable use of waterways.

    48.1 Prepare leaflets on various pertinent issues to waterways management.

        Examples include: Foreshore usage/ Development along waterways/ The development process and development approvals/ Recreational use of the waterways/ Land use and the waterways/ Waterbird habitat and protection/ Industry and the waterways/ What the householder can do for the waterways.

        AWMA

49. Provide information for schools about the waterways.

    49.1 Encourage and assist in the preparation of a coordinated education programme which:

    - is linked to the education curriculum
    - includes practical hands-on activities
    - includes information which is accessible and interesting to teachers and children
    - is aimed at varying age groups.

    AWMA, DAWA, SCHs, LCDCs

    49.2 Continue and expand the Ribbons of Blue programme for the Albany waterways. **AWMA**

50. Collect information about waterways for educational purposes.

    50.1 Prepare an Albany Resource Book containing a collection of resource information about the waterways. **AWMA**

    50.2 Prepare topic sheets on selected resource information from the resource book. **AWMA**

Increasing our knowledge

Research

51. Carry out research necessary for the planning and management of the Albany harbours.

    51.1 Conduct research which will improve the knowledge of the ecological functioning of the waterway environment. **AWMA**

    51.2 Collect resource information necessary to make informed management decisions. **AWMA**

    51.3 Conduct research in conjunction with local government, State government agencies and community groups where appropriate. **AWMA**, LGAs, State govt agencies, OHCG

    51.4 Utilise all funding mechanisms available to obtain necessary funds to conduct research. **AWMA**

52. Ensure the coordination of research undertaken for the Albany waterways.

    52.1 Participate in internal and external research committees to determine research priorities. **AWMA**

    52.2 Participate in the GOTAG to ensure coordination of research. **AWMA**

53. Exchange research information with other relevant organisations and individuals.

    53.1 Distribute research findings to relevant organisations on completion. **AWMA**

    53.2 Provide regular reports to the GOTAG on research progress and findings. **AWMA**

    53.3 Provide a summary of research progress and findings in an annual report to the community. **AWMA**

Monitoring

54. Carry out effective and efficient environmental monitoring necessary for planning and management of the Albany waterways.

    54.1 Conduct environmental monitoring to identify changes in the condition of the Albany waterways.**AWMA,** DAWA,OHCG

    54.2 Regularly review monitoring programmes to ensure they are efficient and effective. Include in this review consideration of the need for and design of the programmes. **AWMA,** DAWA,OHCG

    54.3 Appoint members of the local community who live near or use the waterways as honorary inspectors under the Waterways Conservation Act to keep an eye out for changes in the waterways environment. **AWMA,** WWC

    54.4 Carry out investigations into monitoring techniques and equipment to enable more efficient and effective data collection. **AWMA**

    54.5 Carry out investigations into methods of data handling and reporting to enable more efficient and effective data analysis. **AWMA**

55. Exchange monitoring results with other relevant organisations and individuals.

    55.1 Distribute monitoring results to relevant organisations on completion. **AWMA**

    55.2 Provide regular reports to GOTAG on monitoring results.**AWMA**

    55.3 Provide a summary of monitoring results in an annual report to the community. **AWMA**

Management of local areas

Albany harbours and major rivers

56.Identify the physical, biological and cultural resources of Albany harbours and the King and Kalgan Rivers and assess their condition.

56.1 Carry out environment investigations into the condition and significance of the foreshores of the Albany harbours and the King and Kalgan Rivers. Include in these investigations:

- Identification and mapping of all physical , biological and cultural resources including:

  Cadastral (Crown reserves, vacant Crown land, private property, roads,)
  Topographical (contours, bathymetry)
  Vegetation (extent and communities present, areas of weed encroachment)
  Environmentally sensitive areas (waterbird habitat and breeding areas, fish habitat and breeding areas, areas containing rare flora and fauna)
  Landscape features
  Recreation areas and facilities
  Fencing locations and areas where stock have access to foreshore areas.
  Areas where erosion is occurring.
  Historic sites
  Industrial/commercial development
  Existing land use
  Location of future development, subdivision or urban expansion

- Assessment of the condition of the resources listed above.

- Identification of opportunities and constraints on development, human use and conservation which need to be considered in future planning and management.

AWMA

57. Identify future management requirements for the Albany harbours and the King and Kalgan Rivers.

57.1 Prepare recommendations for future management of the foreshores of the Albany harbours and the King and Kalgan Rivers based on environmental investigations. Include in these recommendations:

- recommendations regarding the management of foreshore reserves.
- suitable vesting authorities and management of vacant Crown land.
- management mechanisms for privately owned foreshore areas
- means of protection for environmentally sensitive areas.
- management plans for specific foreshore reserves or areas which are in a degraded state or are under increasing pressure
- foreshore protection works in areas where foreshores are degraded.

Identify responsible organisations or individuals to implement management recommendations and prioritise implementation.

AWMA

58. Identify the area of critical importance for the ecosystem of the Albany harbours and King and Kalgan Rivers and ensure its protection.

58.1 Identify the Waterways Protection Precinct for the Albany harbours and King and Kalgan Rivers in accordance with Waterways Commission guidelines. **AWMA**

58.2 Protect the environment within the Waterways Protection Precinct in accordance with Part A Section 5 of this Management Programme. **AWMA**

Tributaries within the catchment

59. Encourage and support management of tributaries in the Albany Waterways Management Area

59.1 Provide information to landowners, LCDCs and catchment groups of the value and importance of managing waterways on private property. **AWMA,** DAWA, LCDCs, CGs, LOs

59.2 Encourage the consideration of waterway protection and rehabilitation in the farm and catchment planning process. **AWMA,** DAWA, LCDCs, CGs, LOs

59.3 Provide information to landowners, LCDCs and catchment groups regarding methods of protection and rehabilitation. **AWMA,** DAWA, LCDCs, CGs, LOs

59.4 Establish demonstration sites where successful rehabilitation of streamlines on private property has been achieved. **AWMA,** LCDCs, CGs, LOs

59.5 Conduct seminars and workshops for LCDCs and catchment groups to provide information regarding waterways protection and rehabilitation. **AWMA,** LCDCs, CGs

59.6 Encourage school groups to adopt local waterways for restoration projects. Provide information to aid teachers in this process. **AWMA**, LCDCs, LGAs, SCHs

60. Minimise the impact of development on the bed and banks of major tributaries within the Albany Waterways Management Area.

60.1 Request planning authorities to refer all development proposals that may impact on the bed and banks of major creeks to AWMA for comment. **AWMA,** LGAs, DPUD, DEV

INTRODUCTION

MAP 1: ALBANY WATERWAYS MANAGEMENT AREA

1. PURPOSE OF THE MANAGEMENT PROGRAMME

The Albany Waterways Management Authority (AWMA) is required under Section 35 of the Waterways Conservation Act 1976 to prepare a management programme for the management area under its control (Refer Map 1). AWMA is also required to keep the management programme under review.

A management programme is prepared as a guide for the operations of a waterways management authority and other agencies involved in management of land and water resources. The programme provides an overall guide for management by identifying actions that need to be undertaken and roles and responsibilities of various agencies. It has been established over time that these programmes are generally effective for about seven years. After this time, issues affecting the waterways are re-examined and the programme reviewed and updated, where necessary.

AWMA is bound to ensure that its decisions and advice are consistent with its management programme. However, the programme does not bind other government or non-government agencies. The programme is developed in conjunction with other agencies with responsibility for waterway and catchment management. This consultative process ensures that management objectives and recommendations are achievable.

2. PREPARING THE PROGRAMME

A number of steps were undertaken in the process of preparing the management programme. These included:

1. An assessment of the waterways environment including the physical, biological and social characteristics of the Albany harbours and their associated waterways. Information was collected by means of a literature review and various field operations. The information collected together with other waterways information will be incorporated into a resource book for the Albany waterways.
2. Identification of the roles and responsibilities of various agencies and organisations operating in land and water care in Albany Waterways Management Area. This also involved collecting information on what these bodies currently are doing. The information was used in determining the most appropriate agencies to carry out actions recommended in the management programme.
3. Identification of issues facing the waterways. An issues list was prepared and circulated to relevant agencies for comment.
4. Development of a vision for the Albany waterways -how the community would like the waterways to be in the years to come. From this vision, the aim and goals of the management programme were developed.
5. Development of action plans outlining the tasks needed to be undertaken to achieve the aim and goals. During development of the actions, consultation with other agencies was undertaken where those agencies had roles or responsibilities relevant to waterways management.
6. Preparation of a draft document and release for a three month comment period. During this time, the community has an opportunity to prepare written submissions commenting on the contents of the draft management programme.
7. Following the public comment period submissions received will be considered and where appropriate incorporated into the final management programme.
8. Gazettal of the Albany Waterways Management Programme. Once gazetted, the management programme will guide the operations of AWMA and other agencies involved in land and water care within the Albany Waterways Management Area.

3. INVOLVING THE COMMUNITY

Community involvement in preparation of the management programme is essential to its success. AWMA is a community based management organisation which attempts to involve the community in decision making processes. Without the support of the community successful management would be difficult.

During preparation of the draft management programme, wide consultation was carried out with all sectors of the community concerned with management of the Albany waterways. Hopefully, this has led to the development of a programme which is achievable and is supported by the community.

Community input was gained by invitation to all State government agencies, local government authorities, land conservation district committees and community groups to provide ideas and comments for the programme. Meetings with officers from various agencies were also undertaken.

The management programme is currently in a draft form. A final document will be prepared following a three month public comment period. During this time the community will have the opportunity to provide comments to AWMA on an issue of interest or concern regarding the programme. The Guide for Readers at the front of the document gives details of how to make a submission.

4. STRUCTURE OF THE DOCUMENT

The management programme does not contain detailed technical information and the reader is referred to quoted references for this information. A guide for readers is given at the front of the document to aid the reader in working through the information presented. Coloured pages are also provided at the front of the document summarising the management programme and listing the management actions recommended in the programme. A summary of the major components of the document is given below:

Part A: Managing the waterways - details the general principles of waterways management. This gives the reader an understanding of the philosophy and approach of the Waterways Commission and its waterways management authorities before setting the scene for Albany.

Part B: The Albany perspective - outlines specific information relating to the management of the Albany waterways. This includes a brief description of the waterways environment (readers are referred to quoted references for more information), the issues relevant to the Albany waterways, a description of the role and operations of AWMA and an outline of what AWMA wishes to achieve.

Part C: Meeting the challenge - outlines the goals and the actions needed to address the issues. A brief discussion of each issue outlining history, management implications etc. is also given in this section.

Part D: Management of local areas - describes specific areas of the waterways and recommends management actions for these areas. The waterways are split into five management units - Princess Royal Harbour, Oyster Harbour, King River, Kalgan River and river tributaries within the Albany Waterways Management Area.

Part E: Making it all happen - sums up how the management programme will be implemented and the necessary cooperation and liaison required.

5. RESPONSIBILITY FOR IMPLEMENTATION

One hundred and sixty eight management actions are contained in the management programme. These are the tasks which need to be carried out to manage the waterways environment. The responsibility for implementation does not rest solely with the Albany Waterways Management Authority. Other organisations involved in land and water care are also responsible for implementation of some of the actions.

The key players for each action or set of actions are indicated by having the initials of the players placed alongside each action. In instances where two or more players are involved, the organisation listed first in bold is responsible for initiating implementation and liaising with other organisations listed to carry out the necessary task. Ultimately AWMA has overall responsibility for coordinating implementation of all of the actions in the programme For ease of reference, a foldout list of abbreviations of all organisations listed is provided at the back of the document.

Some actions are already implemented by organisations including AWMA in their day to day charter and activities or were considered important enough to commence prior to completion of the draft programme. By recommending these actions, AWMA confirms that particular activities are appropriate and necessary for management of the waterways environment. These actions should continue under the relevant organisations.

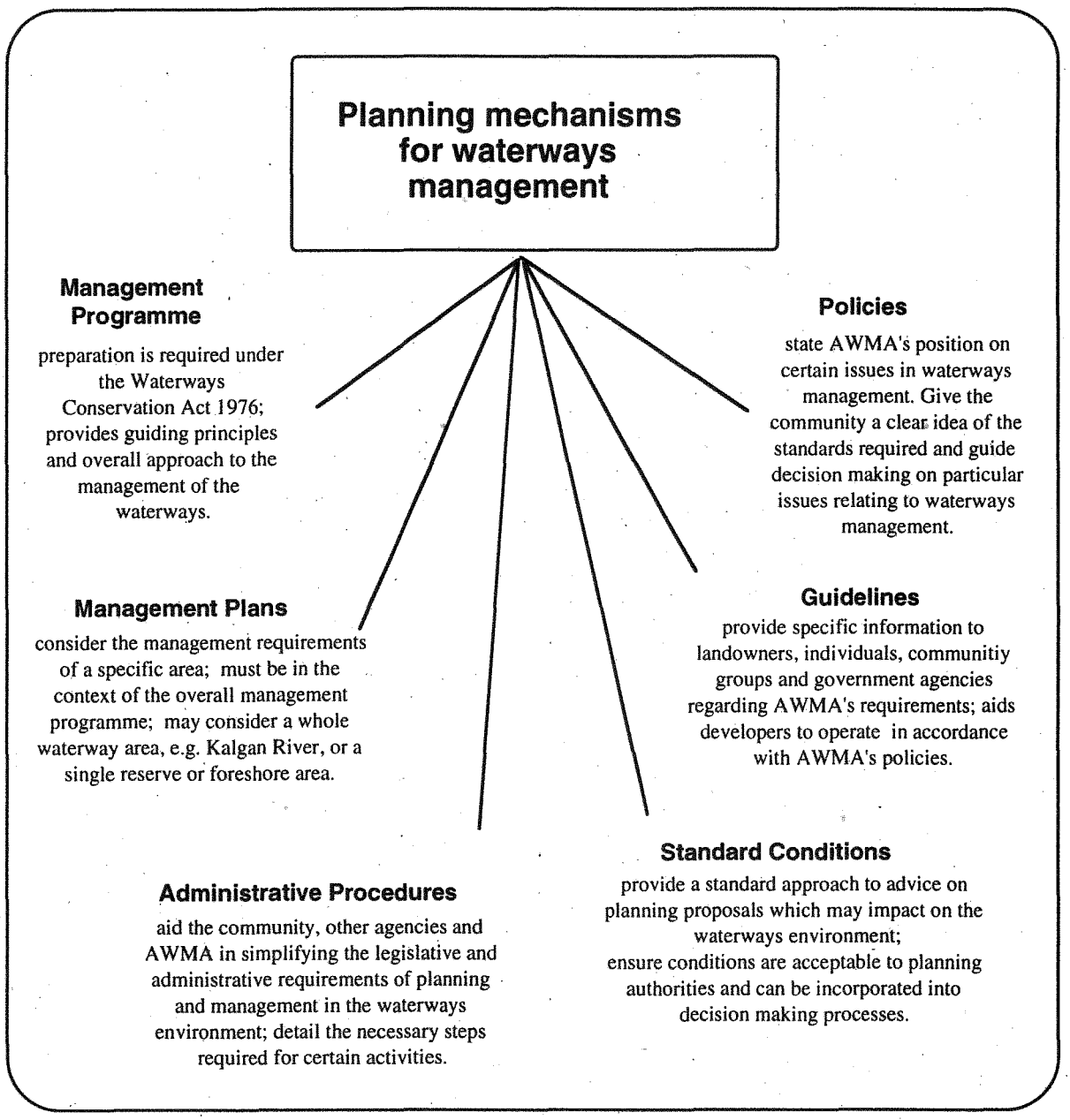
6. PLANNING MECHANISMS FOR WATERWAYS MANAGEMENT

The management programme is a mechanism used to guide management of the Albany waterways. It aids AWMA in decision making and in determining the day to day activities it and other organisations should undertake in order to manage the problems facing the waterways. AWMA also has a number of other mechanisms available to it, which assist in streamlining its activities and ensuring consistency in its management approach. Figure 1 below outlines these mechanisms. More detail on each of these mechanisms is given in Part E of this document.

The management programme is the overall guiding document for all these planning mechanisms. It sets the basic principles on which the other mechanisms are developed. In a perfect management situation the management programme would be prepared prior to any of the others. In reality these mechanisms are prepared and used concurrently with the management programme.

Vegetation in the catchment, especially along streamlines, traps nutrients and other pollutants, provides wildlife habitats and places for people to enjoy.

Figure 1:Planning mechanisms for waterways management



PART A: MANAGING THE WATERWAYS

The Waterways Conservation Act (the Act) was proclaimed in 1976 and established the Waterways Commission. The Commission was set up to conserve and manage Western Australia's waterways through a cooperative and coordinated approach to waterways planning and management activities carried out by local and State government and the community.

The Commission has the potential to manage any waterway in the State. Under the Act, any waterway in need of coordinated management can be declared a management area, with defined boundaries. The powers of the Act then apply to this area and a local community based management authority is established.

The Albany Waterways Management Authority (AWMA) is one of five waterways management authorities operating in the State. The other authorities manage Wilson Inlet, the Peel-Harvey Estuarine System, Leschenault Estuary and the Avon River. The Swan River Trust manages the Swan-Canning River System under separate legislation. Each of the Chairmen of these management bodies is a member of the Waterways Commission.

This section of the management programme outlines the Waterways Commission's general approach to waterways management and briefly describes the management methods employed. The purpose of this section is to provide the reader with an introduction to waterways management prior to focusing on the management of the Albany waterways. Further information on the role and operations of AWMA is given in Part B of the programme.

1. A VISION FOR THE FUTURE

In order to manage natural resources, any management organisation must identify what it is working towards. In the case of the waterways this involves the local community based management authorities consulting the community to determine what they want the waterways to look like in the future. Consultation is carried out through a number of mechanisms including public comment on various documents and issues relating to waterways management, community representatives on AWMA providing comment, feedback from AWMA's annual report to the community and AWMA's everyday communication with community organisations and individuals. Through these various mechanisms the waterways management authority must build a picture of the community's 'vision' for the future.

Once a ' vision ' of what is wanted has been developed, management can then be geared towards realising this vision. The Waterways Commission has developed an overall vision for the waterways that it manages in Western Australia. The vision is for the next five to ten years and provides a goal to work towards and gives perspective to the day to day work of tackling current waterways issues and problems. Each waterways management authority needs to develop its own vision for each individual waterway. AWMA's vision is outlined in Part B: Section 3.

The Commission's vision of the future sees the State's waterways as healthy, functional systems, each with its unique character and all being cherished features of the Western Australian environment.

Within this vision river, estuary and inlet waters and foreshores should be clean and as unpolluted as possible. Birds and other wildlife should inhabit natural areas in each system, and fish, waterbirds and other organisms native to the waterway should exist in viable populations. The environment should display a variety of visual landscapes, planned and managed to provide opportunities for recreation, tourism, commercial development and conservation. Each waterway should have an established information base against which environmental changes and the impacts of catchment land use and development can be measured.

In this vision, residents and visitors have access to major waterways' foreshore areas for recreation and tourism, whilst respecting the rights of private landowners. Activities with a low impact on the environment, such as swimming, wading and yachting should be encouraged in preference to activities like speed boats and jet skis which have a greater potential to impact on the waterways environment. Where development abuts the waterway's environment it must be well planned and managed.

Commercial and transportation uses of the waterways should be encouraged in specified areas providing the use is sustainable and has no negative impact on the waterways.

An important aspect of the vision is that the local community takes great pride in its waterways and is actively involved in protecting and managing them, both directly and through local government authorities. The activities of State government agencies in waterways management areas should be coordinated through the Waterways Commission.

2. A PHILOSOPHY FOR TODAY

In working toward the vision, the Waterways Commission and its waterways management authorities have developed several 'basic beliefs' on which management is based.

Conservation of waterways environments now will ensure maximum use for the greatest number of people for the future.

- The waterways should be managed, on behalf of the community, to balance conservation of the natural environment with the competing demands by people for tourism, recreational, commercial and residential access.
- The natural waterway environment should be retained wherever possible and rehabilitated where necessary.

- Any use of the waterways should be sustainable and have minimal or no detrimental impact on the environment or on legitimate users.
- Use of the waterways should be facilitated as long as it is sustainable and has minimal impact on the environment. Access and use which have little or no impact and maximise public enjoyment should be encouraged in preference to other uses.

The Commission and its waterways management authorities represent the long term interests of the people of Western Australia and every effort should be made to ensure that their needs direct the Commission's activities.

- Community involvement should be sought through direct representation on waterways management authorities, and by informing, educating and involving the community in relevant issues.

Waterways are dynamic systems and a proactive approach to planning and management is needed to enable them to sustain the pressures of a range of uses.

- The Commission should be aware of, and learn from, experiences elsewhere and avoid repeating the mistakes made in other places through neglect of waterways problems.

Waterways are not isolated ecosystems. Conservation and good management of waterways depends on sound management of their catchments.

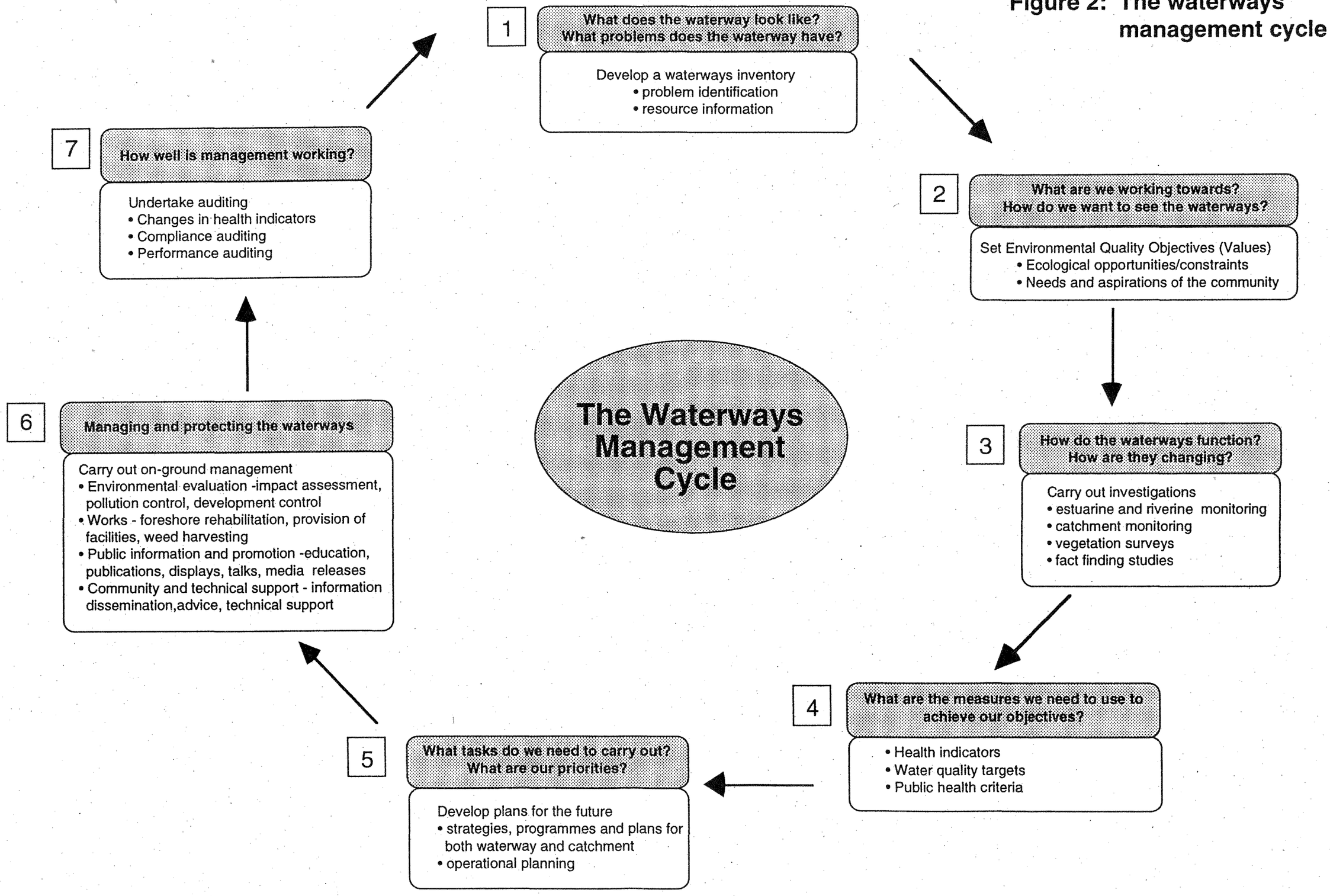
- An integrated approach to catchment management is vital to successful waterways conservation and management.
- Government at all levels, industry and the community at large must work together to prevent or minimise further degradation and to rehabilitate waterways.
- The Commission should actively support the Government's Land and Water Care, and Integrated Catchment Management Policies.

3. THE MANAGEMENT CYCLE

In addition to the development of a vision and a management philosophy, successful management of any waterway system involves a number of common steps. Figure 2 represents these steps and the order in which they should be carried out. The steps form a cycle which includes constant review of what is being undertaken and the effect it is having on the waterway. The Waterways Commission and its waterways management authorities use this cycle as the basis for waterways management in Western Australia.

Waterways management depends on sound management of the catchment.

Figure 2: The waterways management cycle



4. A CATCHMENT APPROACH TO WATERWAYS MANAGEMENT

The establishment of waterways management area boundaries has evolved over time and has not been consistent since the Waterways Conservation Act was proclaimed in 1976. Initially, the extent of management areas tended to reflect the most the Waterways Commission could achieve in the face of doubt and hostility from other State government and local government authorities. As a result, management areas were confined to the estuarine lagoon, lower reaches of rivers and a limited amount of associated land.

In recent years, it has become clear and accepted by the Commission that effective waterways management depends on good land use management in the catchments. The Waterways Commission has therefore strongly supported improved catchment management and made clear its interest in the catchment.

The Commission's direction has been complemented by the State Government adoption of the Integrated Catchment Management Policy. Integrated catchment management is the means of coordinating land use planning, water resource planning and conservation at a regional level which is based on the natural links between land and water resources (river or groundwater catchments). It is a process which goes across government agencies and local government, and depends on the community (particularly landowners) working out solutions to problems at a local level.

In response to this change in thinking, when AWMA was established there was widespread agreement that the management area should include the entire catchment. Hence, the management area was declared for the entire catchments of Princess Royal and Oyster Harbours. The Waterways Commission believes this catchment approach is most important as it builds links between waterways management and catchment management.

As management areas extend to cover entire catchments some confusion has developed about the role of the Waterways Commission and the waterways management authorities in the catchment. Some authorities and individuals assume the Commission's direct management role now extends over the land within the catchment. This misconception is exacerbated by the Commission's role in the evolving process of integrated catchment management.

Land Conservation District Committees are clearly the main mechanism for undertaking land management improvements at a community level in agricultural catchments, with the aim of improving on-farm management. In turn, on-farm land management needs to be put in the context of catchment and waterways management so that the results include sustainable agriculture and healthy waterways. In this context, the Commission considers the Department of Agriculture to be the most appropriate agency to take the lead in catchment management planning within these catchments.

The decision to base the Albany Waterways Management Area on the catchments of Princess Royal and Oyster Harbours was on the premise that one of the key management strategies of the Authority would focus on catchment management. It would be impossible or inappropriate for the Authority to take a lead role in catchment management planning, especially where the predominant land use is agriculture. However, it is important that the Authority takes a special interest in the catchment and provides a supportive role to catchment managers.

In particular, the Commission has a coordinating role for catchment monitoring in the Albany harbours catchments and works closely with other agencies to produce annual audits of nutrient loads entering the harbours. The purpose of this exercise is to collect information on the quality of the water discharging into the harbours and provide catchment managers, decision makers and landowners with information on the quality of water draining from the catchment. This enables the success of specific management initiatives to be assessed and it also provides an indication of where management initiatives are most needed in the catchments.

5. THE WATERWAYS PROTECTION PRECINCT

To further define the role and scope of a waterways management authority within the overall catchment picture, the Waterways Commission has recently adopted the concept of the Waterways Protection Precinct within each of its management areas. The precinct describes the area of critical importance in protecting the waterways ecosystem. This area includes the waterway and adjoining foreshore land. The precinct is the area in which waterways management authorities are most active. Figure 3 overleaf provides a diagrammatical representation of the precinct.

A waterways management authority will identify the Waterways Protection Precinct within its gazetted waterways management area. Within this area the authority will play a direct management role in conserving and rehabilitating the waterways ecosystem. As the precinct defines the area of critical importance to waterway ecosystem functioning, an authority will work to ensure that this functioning is not threatened by land use changes, development or other potential environmental impacts.

A Waterways Protection Precinct may include Crown reserves, vacant Crown land and private property. As a waterways management authority would not necessarily control the land within the precinct it would seek to influence the type and extent of environmental change within the precinct. In addition waterways management authorities may seek to work with other agencies and landowners to enhance the waterway environment within this precinct.

The limit of a Waterways Protection Precinct is illustrated by a line on a plan or a map.. The width of the precinct varies as it is based on a number of factors including the extent and quality of the vegetation, the extent of floodway and the flood fringe, erosion, topography and landscape aesthetics. It may also include planning considerations such as existing reserves, public access, recreation needs and strategic planning decisions made for the area. The Albany Waterways Management Authority is currently undertaking specific studies and investigations to address these factors and thus determine the boundaries of the Albany Waterways Protection Precinct (Refer Part D).

A waterways management authority will undertake the following activities within the precinct:

1. **Maintain the biological functioning of the waterway environment by:**

- Identifying and monitoring health indicators which will indicate change in waterway functioning.
- Determining the ownership of fringing and remnant catchment vegetation and developing strategies for its protection.
- Monitoring drainage into the waterway and encouraging the retention of vegetation as a biological filter.
- Identifying habitat areas important to native fauna and seeking their protection.
- Undertaking studies to improve our understanding of ecosystem functioning.

2. **Improve and enhance the waterway environment by:**

- Undertaking work to protect and rehabilitate areas of foreshore vegetation in cooperation with landowners and relevant agencies.
- Carrying out erosion control works where necessary to maintain stability of the waterways environment.

3. **Limit the impact of development on the waterway environment by:**

- Providing advice to various decision making authorities about development of land which enables its use without unacceptable change to the waterways environment.
- Investigating the rezoning of land in the precinct in order to provide advice to decision making authorities on how changes in land use would affect the ecological functioning of the waterway.

- Identifying visually appealing features of the waterways environment providing advice to decision making authorities about developments which may impact on these features.

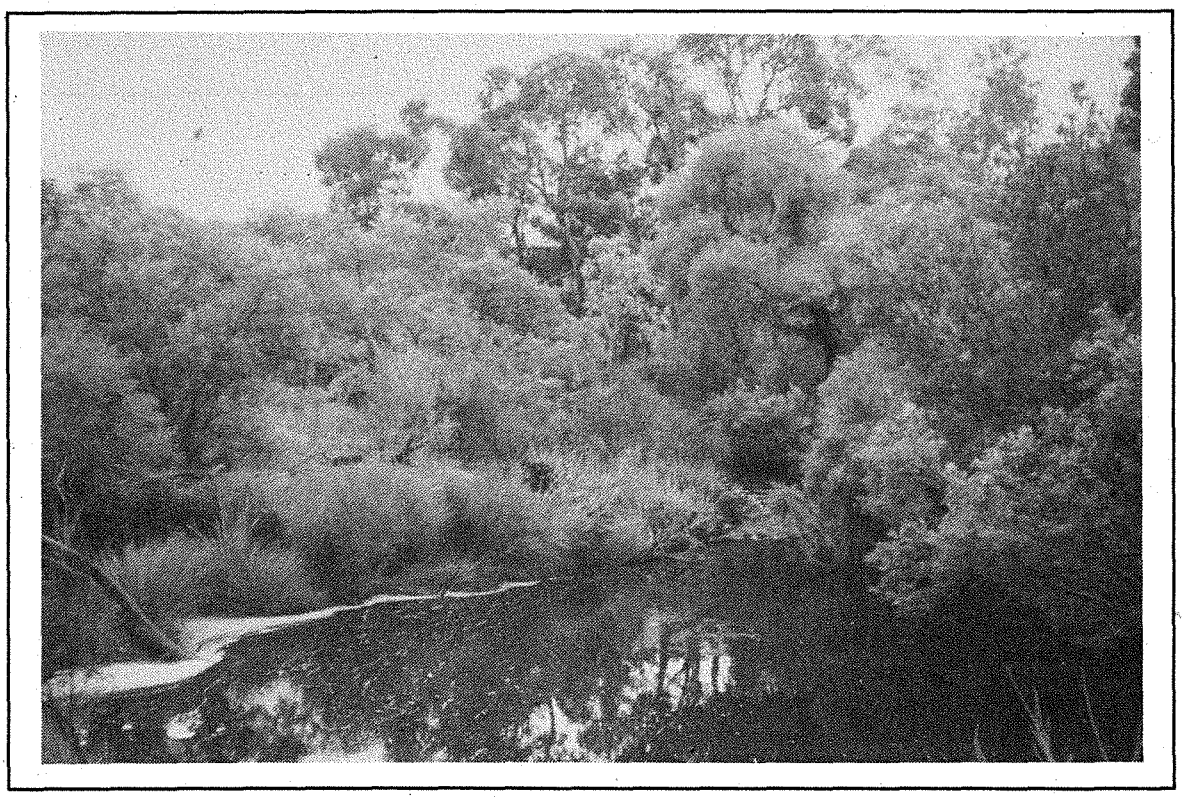
4. Encourage the appropriate ownership and management of the waterways environment by:

- Seeking the acquisition and reservation of any privately owned waterway and foreshore areas and recommending appropriate vesting.
- Developing management agreements with landowners where reservation is not possible or appropriate.
- Making recommendations for the vesting and management of existing vacant Crown land and reserves.
- Encouraging local landowners to form local management groups to become involved in waterway management issues.

5. Improve community access to and use of the waterways environment by:

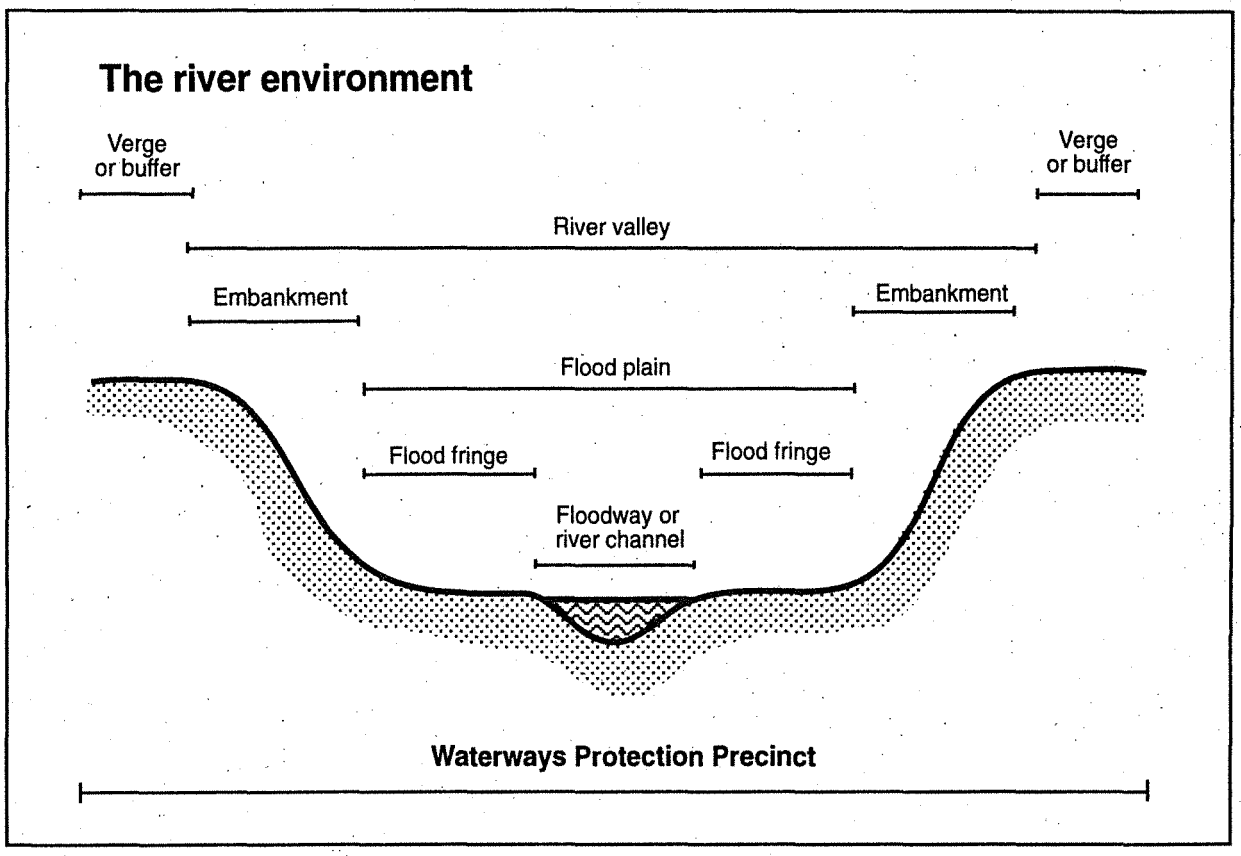
- Identifying areas suitable for recreational use and public access without environmental damage.
- Identifying recreational activities compatible with the waterways environment.
- Providing facilities for recreation and public access, in conjunction with local government authorities.

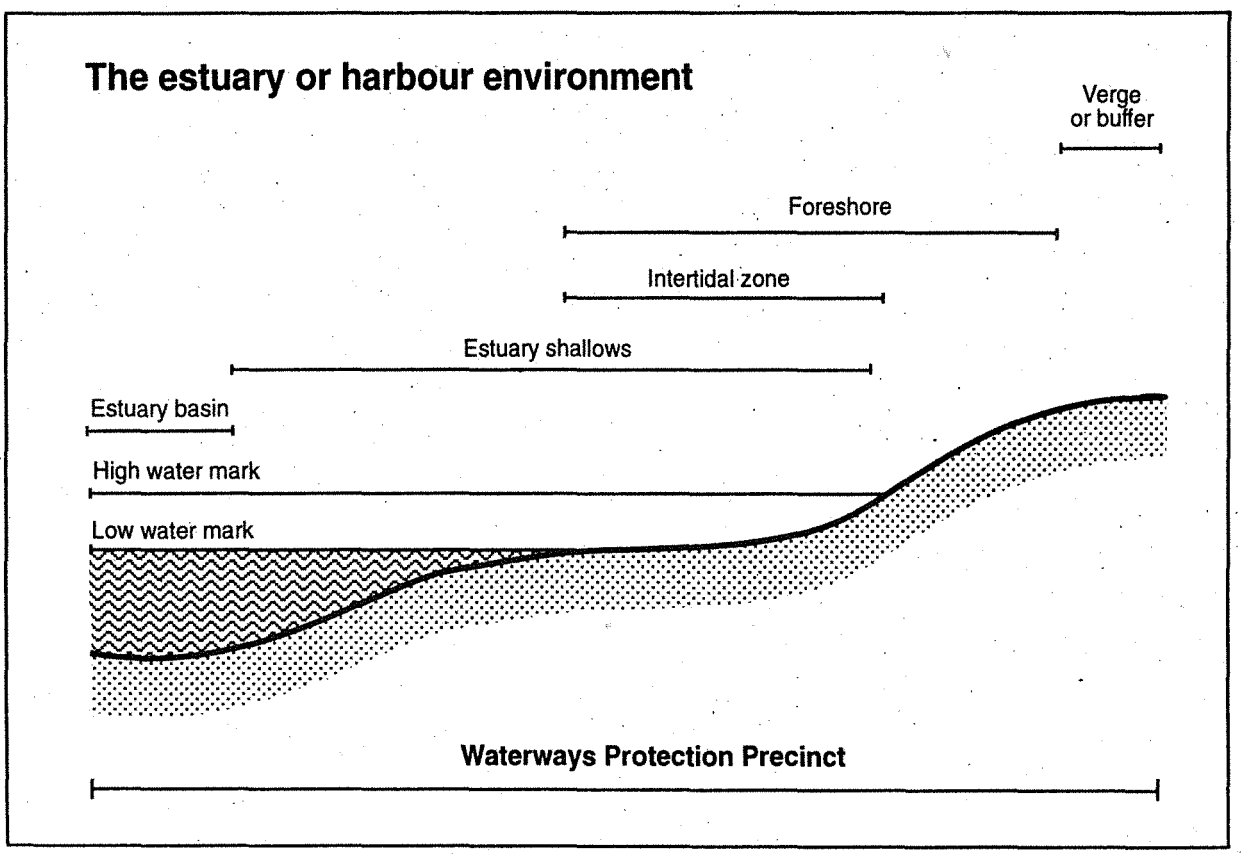
Outside the precinct, management responsibilities lie primarily with the community based land conservation district committees and catchment groups. A waterways management authority would take an advisory role in this area providing support to catchment management bodies and advice on the impact of land use on the waterways environment.



A vegetation buffer between a waterway and any adjacent land use is important to protect waterway functioning.

Figure 3: Diagramatical representation of the Waterways Protection Precinct





PART B:
THE ALBANY PERSPECTIVE

1. THE WATERWAYS

The town of Albany is located on the south coast of Western Australia (35° 02' S, 117° 54' E). Albany experiences a Mediterranean climate with hot dry summers and cool wet winters. Princess Royal Harbour and Oyster Harbour are located to the south and north-east of the town of Albany respectively (Refer Map 2).

Princess Royal Harbour is a roughly oval shaped, marine embayment. The harbour is approximately 8 km long and 4 km wide and oriented in a north-west to south-east direction. The total area of the harbour is approximately twenty nine square kilometres. The town of Albany is situated on the harbour's north shore.

No major rivers discharge to Princess Royal Harbour, however a network of drains collecting water from agricultural and industrial land to the west of the harbour discharge to the harbour on its western shore. Limeburners Creek also enters the harbour on its southern shore. The catchment area of Princess Royal Harbour covers an area of 8351 ha.

Oyster Harbour is located to the north-east of the town of Albany. The harbour is roughly rectangular in shape and approximately 5 km long and 3 km wide. The harbour has a total area of approximately sixteen square kilometres. and was formed by the drowning of a river valley during the Pleistocene era, approximately 130 million years ago.

Two main tributaries enter Oyster Harbour on its northern shore. The Kalgan River is about 140 km long and drains an area bounded by Cranbrook to the north and Mount Barker to the west. The King River is about 25 km long and drains land between Mount Barker and Albany.

The catchment area of Oyster Harbour extends northward to the southern face of the Stirling Ranges and covers an area of 304092 ha (Refer Map 3). Numerous tributaries feed into the King and Kalgan Rivers from throughout the catchment.

1.1. Waterways ecosystems

Two major types of waterway ecosystems exist within the management area. These include the estuarine ecosystem of Oyster Harbour and the riverine ecosystem of the King and Kalgan Rivers and the many small water courses which flow through the catchment area. The land within the catchment area forms a further environment which needs to be considered.

Princess Royal Harbour is a marine embayment which although strictly speaking is not an estuarine ecosystem, as it does not have the same river inflow as an estuary, does display some of the characteristics of an estuarine ecosystem. For the purposes of this document it has been considered as an estuarine ecosystem.

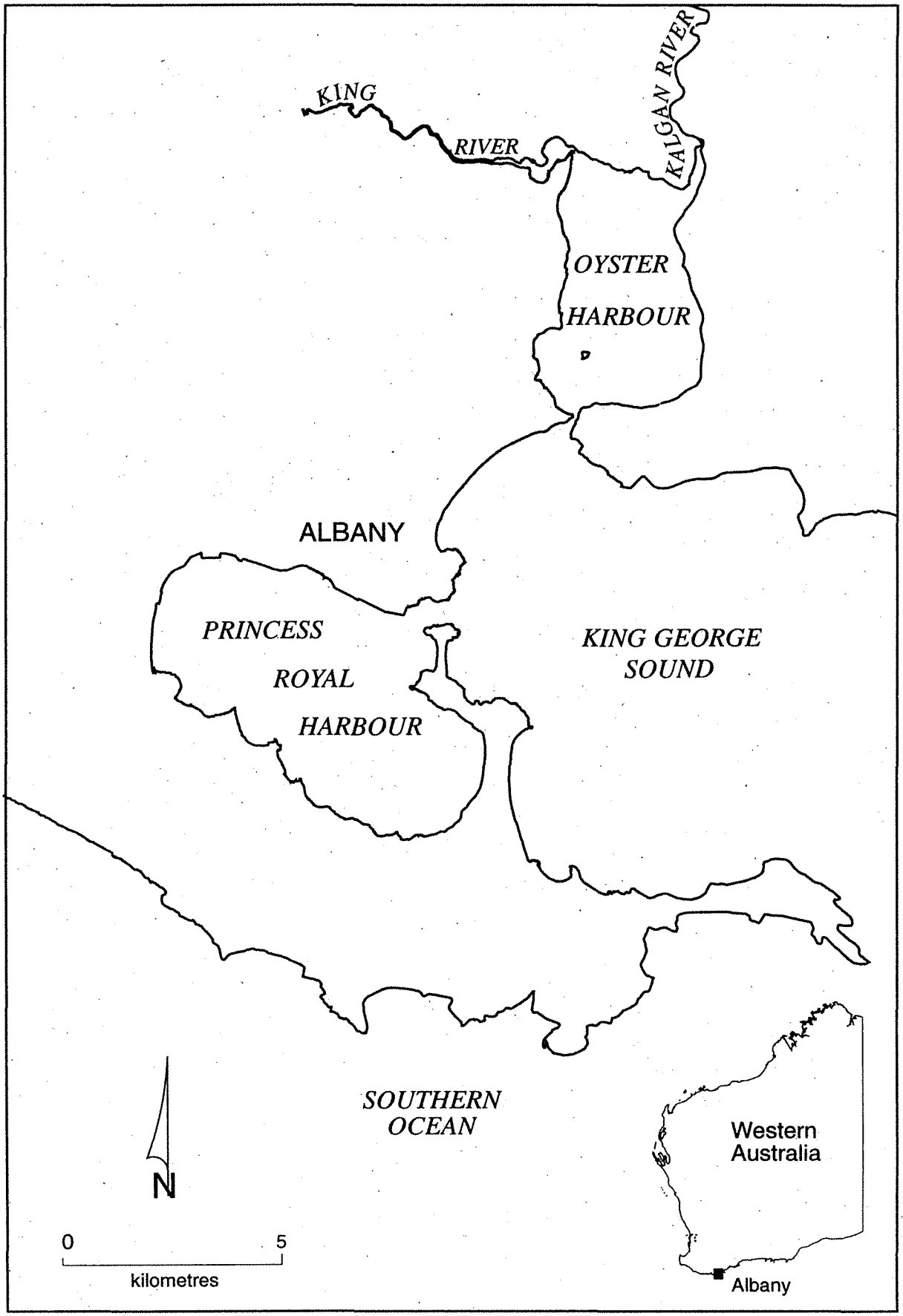
An ecosystem can be defined as a functional unit including both the organisms and the non living environment together with the processes and interrelationships which maintain that unit. The estuarine and riverine ecosystems each contain a different set of components which sets it apart from the other. Components of any ecosystem do not operate independently, interactions occur between different biological, physical and chemical components through a number of complex processes. These processes give the ecosystem functional stability. Alteration to one component or process within the ecosystem can upset this stability and disrupt the natural ecosystem functioning.

1.1.1 The estuarine ecosystem

Estuarine ecosystems are an important zone of contact between freshwater and marine environments. These ecosystems are complex in nature because they are influenced by at least three adjacent ecosystems: the rivers draining into their waters, the open sea and the adjacent terrestrial ecosystems.

The combination of shelter, food supply and suitable physical habitat makes the estuarine ecosystem of great importance to wildlife. For example many species of marine fish use estuarine ecosystems as spawning, feeding and nursery areas, while waterbirds can gather on estuaries to feed and roost both during the winter and on migration. Estuaries can be permanently, seasonally or

MAP 2: ALBANY HARBOURS



only occasionally open to the sea with sandbars, sandspits or sand dunes blocking their entrance. Oyster Harbour can be classified as an estuarine ecosystem. Both systems however, provide relatively near to marine conditions for flora and fauna in comparison with other estuaries on the south coast of Western Australia. This is due mainly to the fact that both harbours are permanently open to the sea and therefore have good exchange with marine waters.

1.1.1.1 Estuarine characteristics

Despite marine influences, Princess Royal Harbour and Oyster Harbour display characteristics which are typical of estuarine ecosystems. These include:

Salinity

Estuarine ecosystems typically have salinity levels which fluctuate with the inflow of fresh water from rivers. This fluctuation can often lead to the creation of a stratified flow, being the result of an intrusion of heavier salt water from the ocean under the less saline lighter outflow of water from rivers. Stratification usually occurs in the winter months when fresh water from the rivers is entering the system. Stratification can be beneficial in assisting the movement of organisms and other materials in and out of the estuary. However it may also result in the deoxygenation of bottom waters with consequent deleterious effects.

The salinity of both Princess Royal Harbour and Oyster Harbour is close to that of marine waters (around 35 parts per million). Salinity levels tend to be higher than those in marine waters in summer due to evaporation and lower in winter due to freshwater inflow. These seasonal fluctuations are less pronounced in Princess Royal Harbour due to its small catchment and the lack of freshwater riverine input.

Princess Royal Harbour is generally well mixed vertically and displays very weak stratification. In summer, the waters of Oyster Harbour are generally vertically stratified in salinity, temperature and therefore density. This stratification is thought to be important in governing the availability of nutrients contained in river discharge to benthic macroalgae (EPA 1990a).

Nutrients

Nutrients are important chemical compounds in waterway ecosystems as they are vital to the maintenance of plant and animal life systems. Estuarine ecosystems have a number of mechanisms which are able to store high levels of nutrients. Estuaries in their pristine condition have the majority of nutrients tied up in the plant biomass usually in seagrasses and tidal marsh vegetation. This plant material provides an important food source for grazing fish and waterbirds. This nutrient storage capacity makes the estuarine ecosystem one of the most productive ecosystems in the world.

Excess quantities of plant nutrients (usually nitrogen and phosphorus) can enter estuarine ecosystems as a result of human activities and cause a disruption to the natural functioning of the ecosystem. Often this condition, referred to as eutrophication, is recognised by the increased production of algae and other aquatic plants. Both Oyster Harbour and Princess Royal Harbour are eutrophic. Excess nutrients entering the systems have resulted in the growth of algae which are accumulating in the harbours. Investigations indicate that these accumulations are smothering the naturally productive seagrasses and causing a decline in the density and coverage of these valuable plant communities(Refer Part C Section 2.2).

Algal growth in Princess Royal Harbour is more pronounced than in Oyster Harbour because nutrient inputs to the harbour are from local sources and enter the harbour throughout the year. The harbour waters are well mixed and residence times are long. Hence, most of the incoming nutrients remain in the harbour long enough for macroalgae to use them for growth. Nutrient input to Oyster Harbour on the other hand comes mainly from river catchments in sporadic flow much of which is carried straight out to sea in surface flow before it can be mixed into the water body and used for algal growth (EPA 1990a).

The sediments of both the harbours also provide an important storage mechanism for nutrients. The sediments in Oyster Harbour have been estimated to be the largest pool of both phosphorus and nitrogen, containing at least 80% of the harbours' total nitrogen and total phosphorus (EPA 1990a). Under certain conditions these stored nutrients may

become available for algal growth. This store of nutrients must be carefully considered when developing management strategies for the harbours.

Circulation and tidal flow

Water circulation is an important characteristic which aids in the mixing of waters within a semi-enclosed waterbody. This movement of water transports nutrients and plankton, removes plant and animal wastes, controls salinity and shifts sediments. The level of circulation within a water body is greatly influenced by the level of tidal flow and the predominant wind forces.

The waters of Princess Royal Harbour have good circulation and therefore are generally well mixed. Circulation is mainly influenced by wind driven circulation and by tidal currents close to the mouth of the harbour.

Circulation within Oyster Harbour varies seasonally. In winter, water discharged from rivers quickly traverses the harbour undergoing little mixing. This fresh surface water is discharged well out into King George Sound providing an effective mechanism for flushing nutrients from the harbour. In the summer months, the harbour becomes vertically stratified with some mixing resulting from the summer sea breezes (EPA 1990a).

The water exchange, referred to as flushing, between an estuary and the adjacent marine environment is also important as it determines the rate at which pollutants will be removed from the ecosystem. Many species of biota are also dependent on tidal flow and flushing mechanisms in their transport between estuarine and marine environments.

Estuaries with poor flushing capacities generally experience more problems associated with the input of pollutants from surrounding land uses than those with high flushing rates. As Princess Royal Harbour and Oyster Harbour are both permanently open to the marine waters of King George Sound, flushing rates are generally high. It is estimated that under average conditions surface waters remain in Oyster Harbour for 2 days or less and bottom waters reside in the harbour for about 10-20 days (EPA 1990a). A typical 90% flushing time for Princess Royal Harbour is about 20 days (EPA 1990a). In contrast, other estuaries on the south coast of Western Australia have flushing times in the order of months or years.

Sheltered areas

Sheltered areas within a estuarine ecosystem provide important quiet and protected areas which are utilised by fauna for breeding and feeding. Many marine organisms enter estuaries to use these areas, as similar areas do not exist in the open marine environment.

Oyster Harbour and Princess Royal Harbour provide numerous sheltered areas where breeding and feeding can be carried out. As the adjacent Southern Ocean experiences strong, predominantly south-westerly winds, these harbours provide a safe haven for many organisms.

The south and eastern shores of Princess Royal Harbour in particular are sheltered from south-westerly winds as they lie in the lee of the Vancouver Peninsula. The south-eastern shore of Oyster Harbour is also sheltered as it lies in the lee of Mount Martin.

Shallow waters

Shallow areas within a estuarine ecosystem are productive areas where light penetrates to plants on the bottom, fostering the growth of important aquatic biota. These shallow areas also provide safe places which are not frequented by many marine predators.

Oyster Harbour has extensive areas of peripheral shallows, with depths less than 1 m occurring over approximately half of its total area. The shallows are active deposition sites for sediments arriving in river floods particularly in the vicinity of the King and Kalgan river mouths. Shallows are found along the entire eastern side of the harbour along with similar regions in the south-west and north-west corners of the harbour comprising about 40 % of the total area of the harbour (EPA 1990b).

Princess Royal Harbour is composed of a deep basin bordered by shallow sand flats. Approximately half of its total area is less than 2 m deep, and the shallow sand flats are most extensive off the western and southern shores and along the Vancouver Peninsula.

1.1.2 The riverine ecosystem

Riverine ecosystems are generally less complex in nature than estuarine ecosystems as they are not influenced by the marine environment. These ecosystems vary from a narrow creek which runs only in winter to the lower reaches of a river which drains a large area of land.

Riverine ecosystems of south-western Australia can be divided into three distinct zones. These are the long narrow channels which meander along the flood plain, broad shallow riffle zones and deep broad pools. A typical channel is often no more than a few metres across, while a riffle can be 5 to 20 metres across. Riffle zones may consist of shallow water passing over stones forming rapids, while in other areas it can be densely vegetated, with shallow water passing between clumps of sedges and tree stems (Pen In prep a).

Deep pools are found dotted along the length of river where the water velocity slows and deposition occurs. In south-western Australia, these pools are as long as 50 to 500 metres and are typically 20 -50 metres across and 3 to 9 metres deep (Pen In prep a)

Aquatic communities are quite different in the three riverine situations owing to their quite different physical characteristics. The communities of the pools and channels are generally similar in nature to those of lakes, ponds and often estuarine ecosystems, being quite diverse in nature, However, the communities that exist in the riffles are more specialised species adapted to their harsh conditions. Ecologically, the river pools are an important part of the river ecosystem as they always retain water over the hot dry summer/autumn months when the channel and riffle zones dry up. These areas therefore provide refuge habitat in times of drought for many aquatic animals, including birds, turtles, water rats, fish, crayfish, shrimp and mussels (Pen In prep a)

Riverine ecosystems are greatly influenced by their adjacent terrestrial environment. A large proportion of the energy flow within the ecosystem is based on the organic matter imported from adjacent land. Clearing of vegetation along rivers for agricultural purposes has altered this energy flow.

The two major riverine ecosystems within the Albany Waterways Management Area are the King and Kalgan Rivers. Numerous smaller creeks and streams feed into these rivers from throughout the catchment. The King and Kalgan Rivers drain into Oyster Harbour on its north shore. The rivers display characteristics of an estuarine ecosystem for seven and nine kilometres upstream respectively. Tidal influence extends into these reaches of the two rivers.

The riverine reaches of the King and Kalgan Rivers experience similar seasonal changes to many other rivers in the high rainfall areas of the south-west of Western Australia. The waters can be fresh or nearly so in winter, with a salinity gradient developing along their length when flow slackens in the summer months. The waters often become stratified (EPA 1990b). Both rivers carry nutrients originating from adjacent agricultural land to Oyster Harbour, especially in time of high river flow.

The riverine section of the Kalgan River winds through agricultural land stretching northward to the southern face of the Stirling Ranges. The King River extends in a westerly direction draining areas south of Mount Barker. Further information regarding the landforms, vegetation and the condition of the Kalgan and King Rivers is given in Part D Sections 3 and 4.

1.1.3 Waterway biota and habitats

A number of different habitats have been identified in the estuarine and riverine ecosystems within the Albany Waterways Management Area. These areas provide certain living conditions for flora and fauna species and play an important role in ecosystem functioning. A brief description of each habitat and its associated biota is given below. Some habitats are found in both the estuarine and riverine environments, while others are specific to a particular ecosystem type.

Seagrass meadows

Although seagrass meadows have declined greatly over recent years (Refer Part C Section 2.2) these areas still cover a substantial proportion of both Oyster Harbour and Princess Royal Harbour. Three principal marine species are found in the harbours including *Posidonia australis,*

Posidonia sinuosa and Amphibolis antarctica. Small areas of two estuarine species, *Ruppia megacarpa and Halophila ovalis,* are also found in Oyster Harbour (EPA 1990.b).

Seagrass meadows are important to the ecological functioning of estuarine systems because they provide shelter for many marine invertebrates and some fish species. The complex root and rhizome system of seagrasses also aids in maintaining the stability of the estuary floor and provides a stable habitat for molluscs, worms and other invertebrates found in the estuarine sediments.

Seagrasses are also extremely important to the productivity of the estuarine system. The decomposition of seagrass leaves produces a large amount of organic matter which adds to the formation of detritus, a major source of food for a variety of fish and invertebrates of commercial and recreational value.

Sandbanks and mudflats

Shallow sandbank and mud flat areas are located on the fringes of both Princess Royal and Oyster Harbour. In Princess Royal Harbour the most extensive areas are off the western and southern shores. In Oyster Harbour the entire eastern shoreline is shallow sand flats. Similar areas also exist at the mouths of the King and Kalgan Rivers.

These areas are rich feeding areas for waterbirds, particularly after tidal inundation. Invertebrate fauna are found in large numbers in these areas, providing an important food source for fish and bird species.

Macroalgae are usually found in the shallow sandbank areas of the two harbours. The free floating algae accumulates in these areas, especially on the eastern shores of Oyster Harbour and the south-eastern shores of Princess Royal Harbour because of prevailing winds and currents. The macroalgae species include the common estuarine species of green algae, *Cladophora* and *Chaetomorpha.*

Open water

The open waters of Oyster Harbour and Princess Royal Harbour provide a habitat for many fish species. Common species include the black bream, sea mullet, yellow-eyed mullet, flathead and cobbler. Most commercial species found in the harbours are common coastal marine fish which spawn at sea and use the harbours as nursery feeding areas. Most of the fish species found in the harbours move up the Kalgan and King Rivers as far as the rock bars, but only black bream and sea mullet are found further upstream. Mulloway is also found upstream in the Kalgan River (EPA 1990b). Several species of birds including pelicans and cormorants are also found fishing in the open waters of the harbours. Many species of waterbirds are also found utilising the open water of river pools in the King and Kalgan Rivers.

Fringing vegetation

The margins of the harbours and rivers support a variety of vegetation. Fringing vegetation plays an important role in the natural functioning of a waterway system. Not only does the vegetation stabilise the banks thereby reducing the chance of erosion but it provides wildlife habitats and traps sediment nutrients and pollutants draining from surrounding land.

Harbour fringing vegetation

Low lying areas around Oyster Harbour support saltmarsh fringing forests. These wetland areas are extremely productive parts of the estuarine ecosystem because they are a major source of detritus which provides a major food source for other organisms in the ecosystem.

Three main areas within Oyster Harbour support these sorts of habitats. These include:

- An extensive wetland area on the south-west shore of Oyster Harbour where Yakamia Creek and the creek running from Lake Seppings enter the Harbour. This area is dominated by *Astartea fascicularis* with *Acacia myrtifolia* and *Oxylobium lanceolatum. Juncus kraussii* dominates the outer fringe, backed by *Melaleuca cuticularis* trees and *Baumea juncea.*
- Extensive samphire flats in the shallows upstream and downstream of the Lower King Bridge with salt marsh plants dominated by *Sarcocornia quinqueflora* and *Suaeda australis* in the wetter parts and the larger *Halosarcia halocnemoides*

and Halosarcia lepidosperma on the drier parts, and *Juncus kraussii* and *M.cuticularis* on rising ground behind.

- A narrow samphire fringe on the south-eastern shore of the harbour with *Sarcocornia quinqueflora, Suaeda australias* and *Halosarcia* spp., and patches of *J. kraussii* and *Melaleuca cuticularis* marsh behind.

(EPA 1990b and Pen In prep b)

These areas provide important feeding and roosting areas for waterbirds including waders, and waterfowl. Migratory waders also feed in these areas putting on fat during the summer months to prepare for their long journey to their breeding grounds in the northern hemisphere. Groups of migratory waders observed in these areas include sandpipers, plovers, stilts and stints. Many of these birds are protected by international agreements.

Riverine fringing vegetation

In estuarine regions of the rivers the saltwater paperbark *Melaleuca cuticularis* is the dominant tree, usually growing among dense stands of fringing rush *Juncus kraussii* and the tall tufted sedge *Gahnia trifida* . As the rivers become fresh, the saltwater plant species are replaced by a fringing forest of *Eucalyptus calophylla* (marri), *Eucalyptus rudis* (flooded gum) and *Melaleuca rhaphiophylla* (swamp paperbark), over a variety of freshwater sedges, including *Lepidosperma effusum* and *Baumea juncea*, and the tall shrub *Astartea fascicularis*. *Eucalyptus rudis* and *M. rhaphiophylla* dominate in swampy areas.

A number of tree species or tall shrubs, including *Eucalyptus occidentalis* (swamp yate), *Banksia seminuda* (river banksia) *Oxylobium lanceolatum*, *Trimalium floribundum* and *Hakea oleifolia*, are also found along freshwater parts of the river. The upper parts of the Kalgan River become increasingly saline upstream and estuarine species, typical of Oyster Harbour, dominate the floodway of the river along with a number of *Melaleuca* species (Pen In prep b)

In the fresh high rainfall sections of the rivers the upper embankments of the river valleys are dominated by forest of *Eucalyptus calophylla* and *E. marginata* (jarrah). On the Kalgan River this forest gives way to heaths of *Calothamnus quadrifidus, Thryptomene saxicola* and *Darwinea citriodora*, broken in places by scrub of *E.marginata* and *Eucalytpus decipiens*, on rocky ground. Further upstream where the country becomes drier and the river valley shallower, the surrounding woodland of *Eucalyptus wandoo* and *E. occidentalis* comes to dominate the upper river embankments.

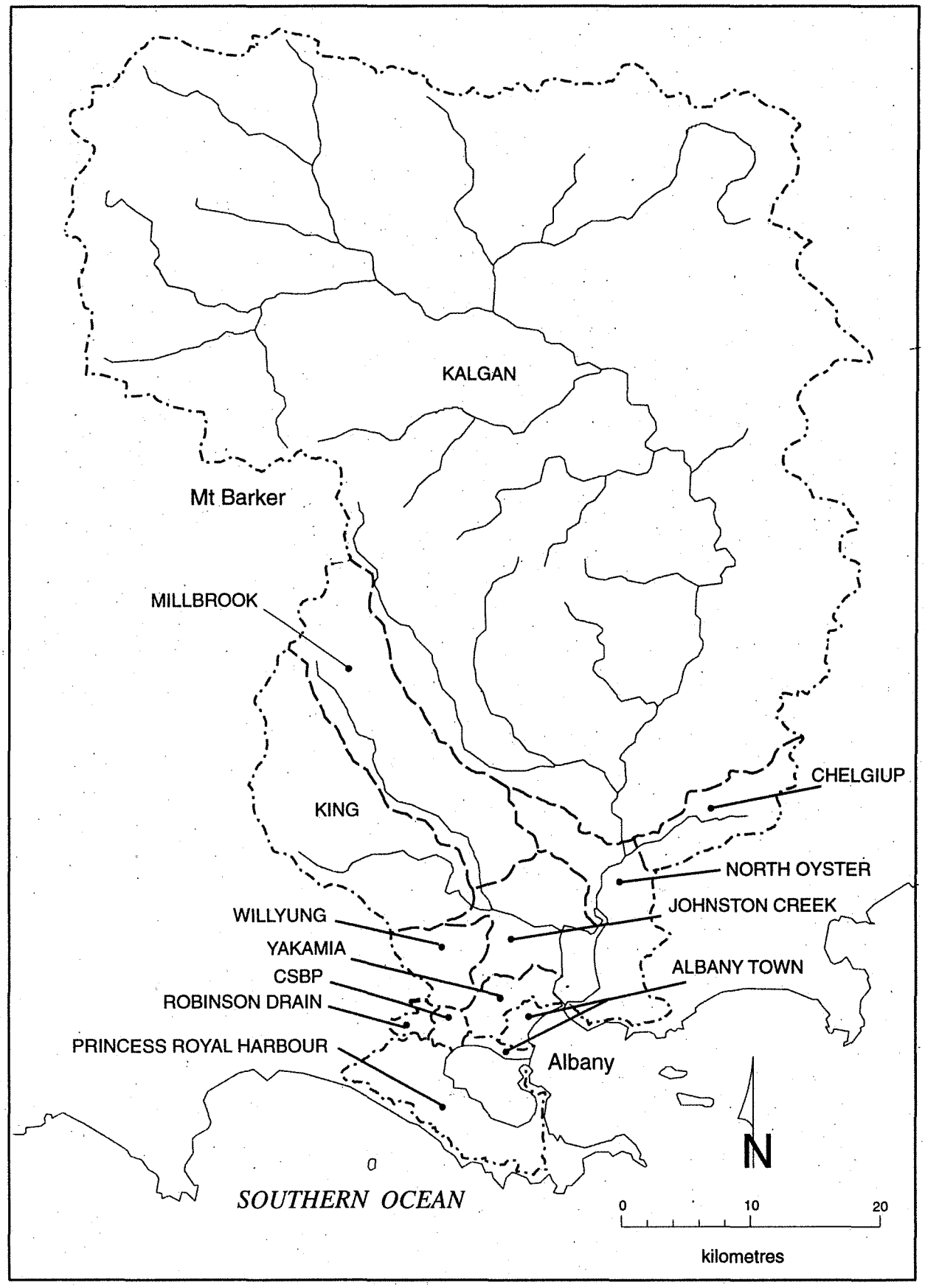
In freshwater areas of the rivers the fringing vegetation is mostly healthy, but where fences have not been maintained, livestock have grazed and trampled out native species and, along with frequent fires, have encouraged the growth of introduced grasses. The loss of deep rooted native vegetation has led to the erosion and subsidence of river embankments in places. In the upper region of the Kalgan River, increased salinisation has killed native fringing forests over large sections. In some cases, salt tolerant tree species, such as the saltwater paperbark *M.cuticularis*, are present to replace the less tolerant ones, in a response to increasing salinity, but where they are absent the forest is simply replaced by rushes or worse, annual grasses which provide little support to the river embankments.

1.1.4 The catchment area

Oyster Harbour catchment has a total area of 304092 ha and the smaller catchment of Princess Royal Harbour has a total area of 8351 ha.

Oyster Harbour's large catchment extends to the Stirling Ranges and includes a large area of internal drainage east of the Kalgan River. Subcatchments of the Oyster Harbour catchment include King, Millbrook, Upper Kalgan, Lower Kalgan, North Oyster, Chelgiup, Willyung, Johnston Creek, Yakamia, and the town of Albany. The location of these subcatchments is shown on Map 3.

MAP 3: ALBANY HARBOURS' CATCHMENTS



Most of the southern part of the Oyster Harbour catchment is in the Shire of Albany. However, the Kalgan River catchment extends north into the Shires of Plantagenet and Cranbrook. Mill Brook, a main tributary of the King River, extends into the Shire of Plantagenet.

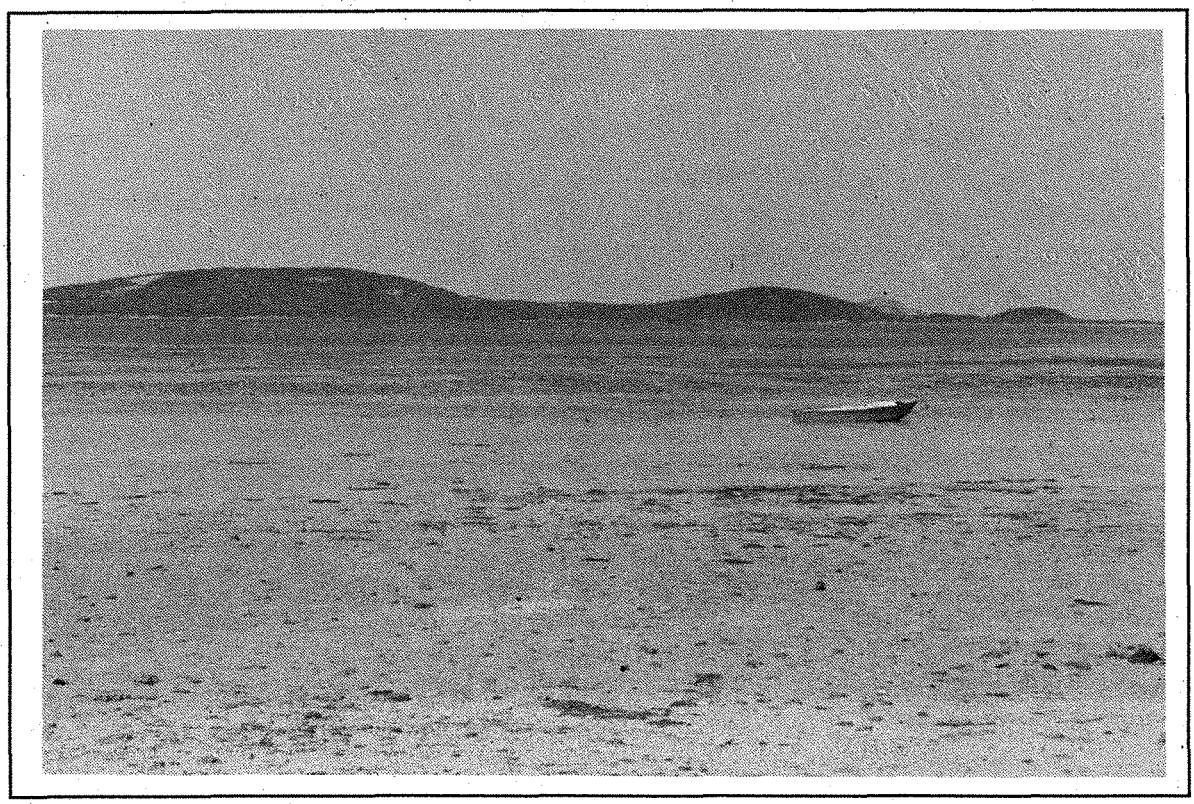
East of the Kalgan River a large area of sand plain has no external drainage and many of the small lakes and swamps are saline. The lower reaches of the King and Kalgan Rivers have short, steep, irregular slopes with much spongolite and occasional granite outcrops. The slopes generally comprise sandy and gravelly yellow duplex soils with terraces of deep loamy sands and some yellow duplex soils. The narrow valley floors are filled with river sediments.

The Department of Agriculture estimates that 219077 ha of land has been cleared within the Oyster Harbour catchment primarily for agricultural purposes. This represents 72% of the total catchment area. The major agricultural land use in this catchment is sheep and cattle grazing, with cropping and viticulture also carried out.

The Princess Royal Harbour catchment is very different in nature having no natural river systems flowing into it. Instead, numerous agricultural and urban drains discharge into the western end of the harbour. These drains collect runoff from agricultural land in the Robinson Estate and Marbellup-Elleker region in addition to effluent from local industry.

A large part of the Princess Royal Harbour catchment is vested as a National Park and various other recreational reserves lie within the area. Land in the western section of the catchment is zoned rural and a variety of farming enterprises are carried out here including beef farming and potato growing.

The Department of Agriculture estimates that 2952 ha of land has been cleared within the catchment area, representing 35 % of the total catchment. This is a relatively low percentage of the total area of the catchment due to the large area still vegetated within Torndirrup National Park.



Shallows in Princess Royal Harbour provide important feeding areas for waterbirds.

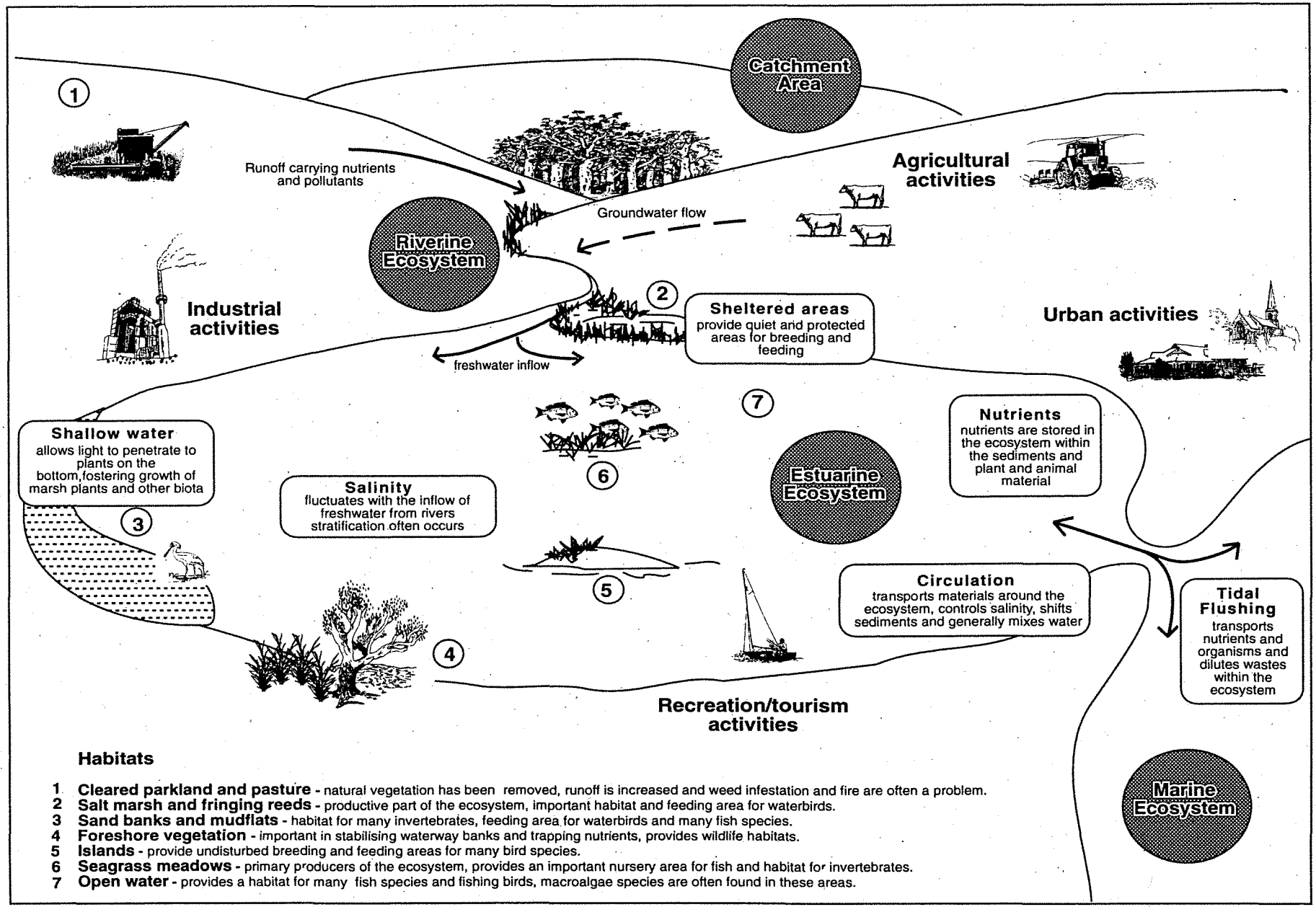


FIGURE 4: WATERWAYS ECOSYSTEMS

1.2 Human use of the waterways

Human activities have the potential to have a major adverse impact on the habitats and ecosystems of the Albany waterways. Some activities can directly disturb, reverse or accelerate the basic processes of waterway functioning. Other activities degrade water quality, reducing waterway amenity.

The following description briefly describes the manner in which the population of Albany and its many visitors use the waterways and their catchment. Part C discusses how these uses have affected the waterways and necessary strategies to minimise further impact.

1.2.1 History of development

Aboriginal people have occupied the south-west of Western Australia for at least 40 000 years. The earliest recorded dates for an Aboriginal site in the Albany region is around 19 000 years.

The Aboriginal population of the south-west is thought to have reached at least 6000 prior to European settlement and evidence suggests that in the Albany area Aborigines tended to have seasonal migration between coastal areas and inland woodlands and forests.

European exploration of the Albany area began with the Dutch in the 17th century. Rivalry between the French and British, 150 years later, led to several important expeditions in the area including that of Vancouver who explored the coast from Walpole to King George Sound.

Oyster Harbour was named by Vancouver when he explored the coast in 1791 and found abundant oysters. He also named King George Sound and Princess Royal Harbour and Breaksea, Michaelmas and Seal Islands.

The British decided to establish a settlement under Major Lockyer at King George Sound in December 1827. This was the first official European settlement in Western Australia (known as Frederickstown).

Exploration of inland areas near Albany was carried out in the late 1820s and early 1830s and further interest in the area was generated by John Eyre's epic journey from Adelaide along the coast to Albany in 1841.

Following initial settlement of Albany in 1827 development of surrounding areas was relatively slow with the majority of farming country not being opened up until the turn of the century. Since the Second World War, there has been a dramatic expansion in farming areas along the South Coast, with new releases being based on both war service settlement and civilian schemes.

From the 1830s to the 1850s whaling and sealing were active along the coast by American, British and French and other overseas whalers who often visited Albany. A whaling depot and trading base was established in 1839 at Cape Riche and a further whaling depot at Two Peoples Bay in 1839.

1.2.2 Current waterway use

The Albany Waterways are currently used by the Albany community for a number of activities. Major activities include commercial fishing, port activities. and a variety of recreational activities.

Commercial fishing and aquaculture

Commercial fishing is carried out in both Princess Royal Harbour and Oyster Harbour as well as in King George Sound. The principal fish product is pilchards which are netted in King George Sound and Princess Royal Harbour. Other important commercial fish species include cobbler, leatherjacket, Australian herring and Australian salmon.

Aquaculture is becoming an increasingly important activity along much of the Western Australian coast. The Albany harbours in particular are a suitable environment for these activities. Currently a an oyster farm has been established in Oyster Harbour and it is also anticipated that a land based abalone industry and hatchery will be developed at Frenchman Bay. Mussel farms are also proposed for the harbours and King George Sound. A number of aquaculture leases occupy parts of Oyster Harbour , King George Sound and Princess Royal Harbour.

Port activities

Port activities are carried out adjacent to the Town of Albany at Port Albany. The port has three land backed berths with a total length of 608 m. The port exports products such as wheat, barley, oats and lupins and imports fertiliser materials and petroleum products .

Excluding Fremantle, Albany was the busiest port in the southern half of the State in terms of gross tonnage and number of vessels in the 1970s. However, today, port usage has declined and the Port of Albany handles about half that of Geraldton and Bunbury.

Industry

A number of industries currently are licenced to discharge effluent to the waters of Princess Royal Harbour and Oyster Harbour. These include:

- Southern Processors Pty Ltd which processes vegetables including peas, beans and potatoes.
- Albany Woollen Mills Pty Ltd which dyes and spins wool and synthetic fibres to produce carpet yarns.
- CSBP and Farmers Ltd Albany - a superphosphate works.
- Ocean Foods - a oyster farm and processing plant operating at Emu Point.
- Albany Port Authority for loading and unloading of vessels within the Port of Albany.

Part C Section 1.4 provides further information on industry and industrial effluent disposal to the harbours.

Recreation and tourism

Recreational activities are carried out on the waters of Princess Royal Harbour, Oyster Harbour and King George Sound as well as on the King and Kalgan Rivers. The main recreational activities on and around the waterways are fishing, sailing, picnicking, walking, swimming, sight seeing, diving and windsurfing. Part C: Section 4 provides further information on the recreational resources of the area.

The Albany area is a major tourist destination of the south-west coast of Western Australia. It forms a part of the tourist destination termed the Rainbow Coast extending from Bremer Bay to Walpole. The Rainbow Coast offers magnificent coastal scenery and views. The town of Albany also has a high historical significance with many preserved buildings and landmarks depicting early settlement in Western Australia. The heritage of Albany together with its aesthetic values make tourism a major land use in the area.

1.2.3 Current catchment use

Residential and commercial activities associated with the town of Albany are carried out on the northern shore of Princess Royal Harbour. Residential areas are also found at Little Grove on the shores Princess Royal Harbour and Lower King, Bayonet Head and Emu Point on the shores of Oyster Harbour.

Further afield from Albany land use is predominantly agricultural. Within the Princess Royal Harbour catchment the principal activities include market gardening and sheep and beef farming.

The main agricultural pursuit in the Oyster Harbour catchment is sheep and cattle grazing. Wheat, barley and oats are also grown in the northern areas of the catchment around Mt Barker including Kendenup and Upper Kalgan. Viticulture is also carried out within the catchment with a concentration of this activity around Mt Barker and near Albany. This land use is rapidly expanding in the region.

1.2.4 Land ownership

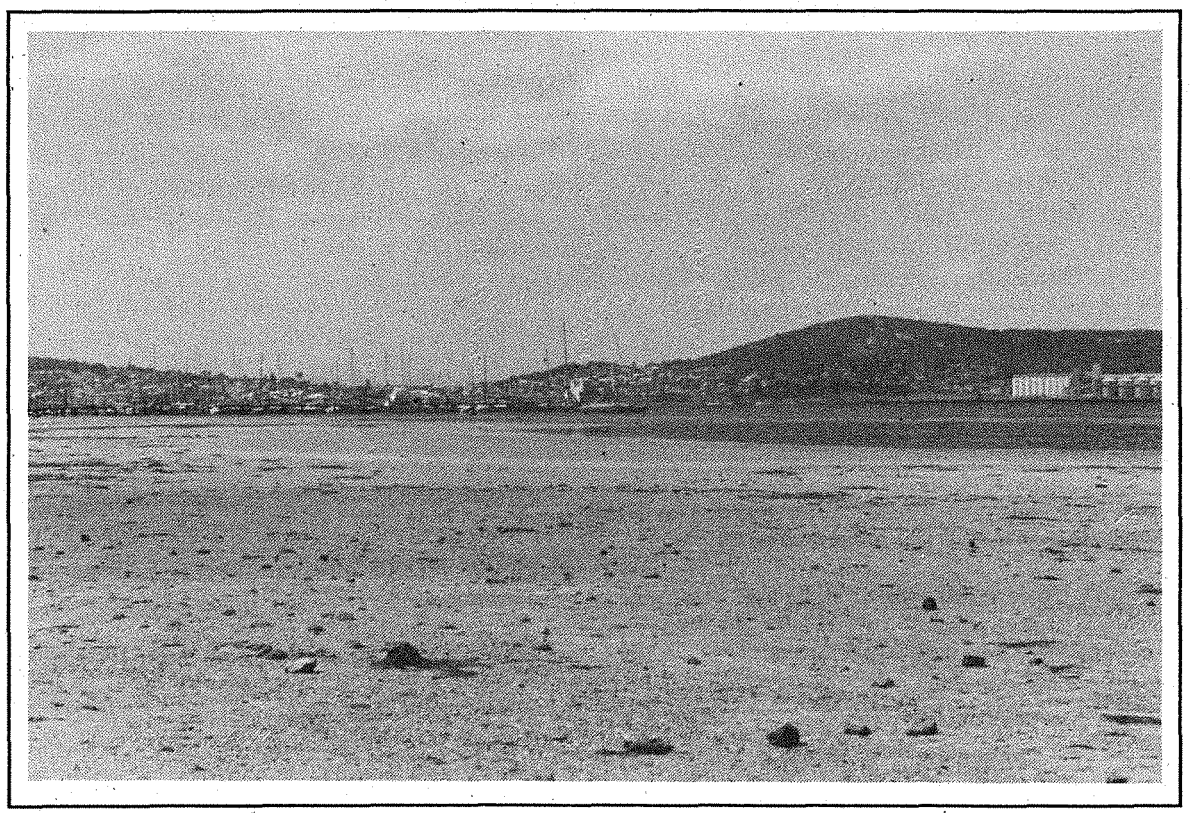
The foreshore land around the Albany harbours and along the King and Kalgan Rivers is a mixture of private property, and publicly owned land (existing as either Crown reserve or vacant crown land). Vesting of Crown reserves lies with a number of organisations including the Shire and Town of Albany, National Parks and Nature Conservation Authority, and the Western Australian Wildlife Authority.

Foreshore areas on the northern shore of Princess Royal Harbour exist primarily as Crown reserve. These areas are close to the townsite of Albany and the Albany Port and have been reserved for a variety of reasons associated within the Port and the urban centre of Albany. To the west and south of the harbour the majority of land is privately owned with many titles extending to high water mark. Vancouver Peninsula on the eastern shore of the harbour is covered by a large reserve vested in the Shire of Albany for recreational purposes. Torndirrup National Park also covers a large area to the south and east of the Peninsula. The park is vested in the National Parks and Nature

Conservation Authority and managed by Department of Conservation and Land Management.

Foreshore areas around Emu Point at the entrance to Oyster Harbour are primarily in public ownership and reserved for recreational purposes. Further up the western shore of the harbour a large reserve exists for flora and fauna conservation. North of this reserve a narrow strip of vacant Crown land stretches along the foreshore up to the mouth of the King River. Behind this strip is mainly private land. The northern and eastern shores of the harbour are mostly in private ownership with the existance of some high water mark titles and a few reserves. The south-eastern corner of the harbour is a large unvested National Park and a reserve vested in the Town of Albany.

A foreshore reserve extends along much of the Kalgan River to the Upper Kalgan Bridge. This reserve is narrow on the eastern bank and wider on the western bank where subdivision has occurred. Upstream of the Upper Kalgan Bridge the majority of the river foreshore is in Crown reserve and therefore public ownership Two large reserves for the purposes of Conservation of Flora and Fauna and Parklands exist along this section of the river and a large area exists as vacant Crown land. The foreshore areas of the King River are in public ownership in the downstream sections. However, in upstream areas the foreshore is still in private ownership and a number of high water mark titles still exist.



The foreshores of the Albany harbours are used for a number of purposes by the Albany community.

2. AWMA - ROLE AND OPERATIONS

2.1 History of waterways management

Establishment of the Albany Waterways Management Authority was the first formalised step towards management of the Albany harbours and their associated waterways. Previously, many agencies with varying management responsibilities were involved in management of the Albany waterways.

Initial management of the harbours was carried out by the Albany Port Authority. This was by necessity, and due to the fact that Princess Royal Harbour and King George Sound were, and remain, vested in the Albany Port Authority for harbour purposes. Vesting being under the provisions of the Albany Port Authority Act 1926-1979. The Authority initiated and administered investigations into environmental matters relating to the area.

In 1976, the Waterways Conservation Act was proclaimed and waterways management authorities were established for the Swan River, the Peel Inlet and the Leschenault Estuary. Soon after this time, it became evident that the Albany Port Authority was becoming increasingly involved in environmental matters and was not equiped to carry out management. As a result, the Authority made a request to the then Department of Conservation and Environment to establish a waterways management authority for the harbours and their environs.

As the Waterways Conservation Act was designed for estuarine and river management and was considered inadequately to cover harbour situations it was recommended that an authority not be established under this Act. Instead, the Department of Conservation and Environment recommended the establishment of an Advisory Committee to provide a forum for exchange of information and advice, both to the Albany Port Authority and the government on management of the harbours.

The Albany Waterways Management Advisory Committee (AWMAC) was established in November 1977. The Committee was made up of representatives from Albany Port Authority, Albany Chamber of Commerce, South Coast Licensed Professional Fishermen's Association, Town of Albany, Shire of Albany, Albany Port Industries Association, Albany Conservation Society and relevant State government agencies.

The activities of AWMAC revolved around a monitoring and research programme designed to provide some basic data as to the environmental condition of the Albany harbours, and in particular Princess Royal Harbour. A major role of the Committee was also to provide a watching brief on the need for a waterways management authority to manage the harbours.

During the following years, AWMAC held numerous discussions with the Waterways Commission and local authorities with a view to establishing a more formal, ongoing management process. In 1982, a discussion paper entitled 'Waterways Management Authority - Albany WA' was circulated by the Department of Conservation and Environment and included the recommendation to establish a waterways management authority under the Waterways Conservation Act. The decision was an agreement by the three local government authorities and other groups represented on the AWMAC.

In January 1983, the then Premier, Hon. Ray O'Connor, announced that a management area under the Waterways Conservation Act would be declared for Princess Royal Harbour and other waterways in the Town and Shire of Albany. Mr O'Connor announced that negotiations with the Town and Shire Councils about local involvement in the administration of the new management area would be carried out.

In November 1983 when mercury contamination was found in Princess Royal Harbour, the need for an appropriately resourced management organisation was emphasised once again. AWMAC continued to push for the establishment of a waterways management authority.

In 1984, a review of the Environmental Protection Act placed the establishment of any formal management body on hold. AWMAC was informed that once Cabinet had determined the future role of the EPA, action would be taken on the proposal to

establish a management authority in Albany. The proposal also needed to await the outcome of the Government's deliberations on a report of the Task Force on Land Resource Management in South Western Australia, as it contained a recommendation for the Waterways Commission to be incorporated with the proposed conservation and land management department.

Further concern was expressed in regard to the mercury problem in 1985 and 1986 and the Committee wrote to the Director of the Environmental Protection Authority expressing support for a proposal to establish a full time study team to look at the problems facing the harbours, operating under the umbrella of an appropriate management organisation. The EPA responded by initiating a major increase in research activity in Princess Royal Harbour in 1986 - 87.

By 1987, AWMAC and the EPA had been monitoring the mercury problems in Princess Royal Harbour for three years and environmental studies had identified other emerging problems. A build up of nutrients and a decline in seagrass coverage in the harbours were observed. The need for management of these problems became urgent. As a result, the Western Australian Government approved funding for an intensive two year study into the ecology of the Albany harbours on the understanding that the study would provide long term solutions to the problems facing the harbours.

2.1.1 EPA recommendations

During 1988 and 1989 the EPA undertook intensive studies of the problems facing the Albany harbours and published the Albany Harbour Environmental Study 1988-1989. Twelve recommendations to remedy the problems of the harbours where made from results of this study. These were documented in 'Recommendations of the Environmental Protection Authority in relation to the environmental problems of the Albany harbour, EPA Bulletin 442'. The general objectives of the recommendations were to :

- reduce the input of pollutants into the harbours to acceptable levels;
- evaluate the removal of nutrient enriched sediments and the removal of algae responsible for smothering seagrass from the harbours; and
- create a management regime to coordinate the environmental management of the Albany waterways.

Recommendation 1 was to establish a management organisation to provide for future on-site management of the Albany harbours. It was recommended that a waterways management authority could be established under the Waterways Conservation Act with direct local government and community involvement.

AWMA currently coordinates implementation of the other eleven recommendations. A list of the recommendations is provided in Appendix 1 at the back of this document.

2.2 Establishment of AWMA

The Albany Waterways Management Authority was formally established on the 17 May 1991. This action was the culmination of over a decade of lobbying by AWMAC and other organisations for a management presence with the appropriate expertise to manage the problems facing the Albany harbours. AWMA was the fourth waterways management authority to be established under the Waterways Conservation Act.

2.2.1 Membership

AWMA has twelve members selected from amongst the local community for their knowledge of local affairs. Members are appointed by the Minister for the Environment, generally for a three year term. Membership currently includes (at 30 September 1993):

- one chairperson representing the community.
- three local government representatives (Town of Albany, Shire of Albany, Shire of Plantagenet).
- two State government representatives (WA Department of Agriculture and the Water Authority of WA).
- one represenative from the Albany Port Authority.
- five community members covering a broad range of interests including conservation, industry and farming.

The Chairperson of AWMA is also a member of the Waterways Commission as is the Commissioner for Waterways, Chairpersons of the other management authorities and the Chairperson of the Swan River Trust. The Commission directs policy and guides overall waterways management, whereas local management is undertaken by AWMA.

The Waterways Commission and AWMA are supported by the staff of a public sector agency also called the Waterways Commission. The agency is divided into the following five major work areas which undertake various functions necessary for waterways management.

- Environment Investigations and Standards
- Development and Management Planning
- Waterways Protection and Enhancement
- Community Awareness and Education
- Corporate Services

Staff of these divisions provide advisory, research, planning, promotional, construction, pollution control and administrative support to AWMA. AWMA is presently staffed by two professional officers and a secretary. The relationship between the Waterways Commission, the waterways management authorities and the Waterways Commission public sector agency is represented in Figure 5.

2.2.2 Management area

The Albany Waterways Management Area was gazetted in May 1991. The management area essentially comprises all of the waters of Princess Royal Harbour, Oyster Harbour, part of King George Sound and the land and waters within the Albany harbours catchments as shown in Map 1. This is the area in which the Authority's powers under the Waterways Conservation Act apply.

2.2.3 Powers

Powers under the Waterways Conservation Act allow the Albany Waterways Management Authority to carry out activities necessary to manage the Albany waterways. The powers include the following:

- **Pollution control**

Pollution control powers are delegated to AWMA under the Environmental Protection Act. They include licensing of industry, pollution abatement, initiation of prosecution and the appointment of pollution control inspectors. The powers focus on the control of point sources of pollution such as industry and have little or no application when dealing with diffuse sources such as agricultural activities.

- **Requesting details from other authorities**

AWMA has the power to request details of proposed town planning schemes, subdivisions, developments or changes in land use where there is a likely impact on the waterways and to make recommendations to the appropriate planning authority. AWMA has no approval powers in this area and therefore its recommendations are only advisory. However the planning authority must consider AWMA's advice before making a decision on a proposal.

- **Activities on the bed or the banks of the waterways**

AWMA has the power to control certain activities in the bed and along the banks of the waterways, including damage or alteration to the bed or the banks, and considers activities such as dredging, filling, building of structures, drainage and waste disposal. AWMA, as required under the Act, provides approval and issues a licence for the majority of these activities.

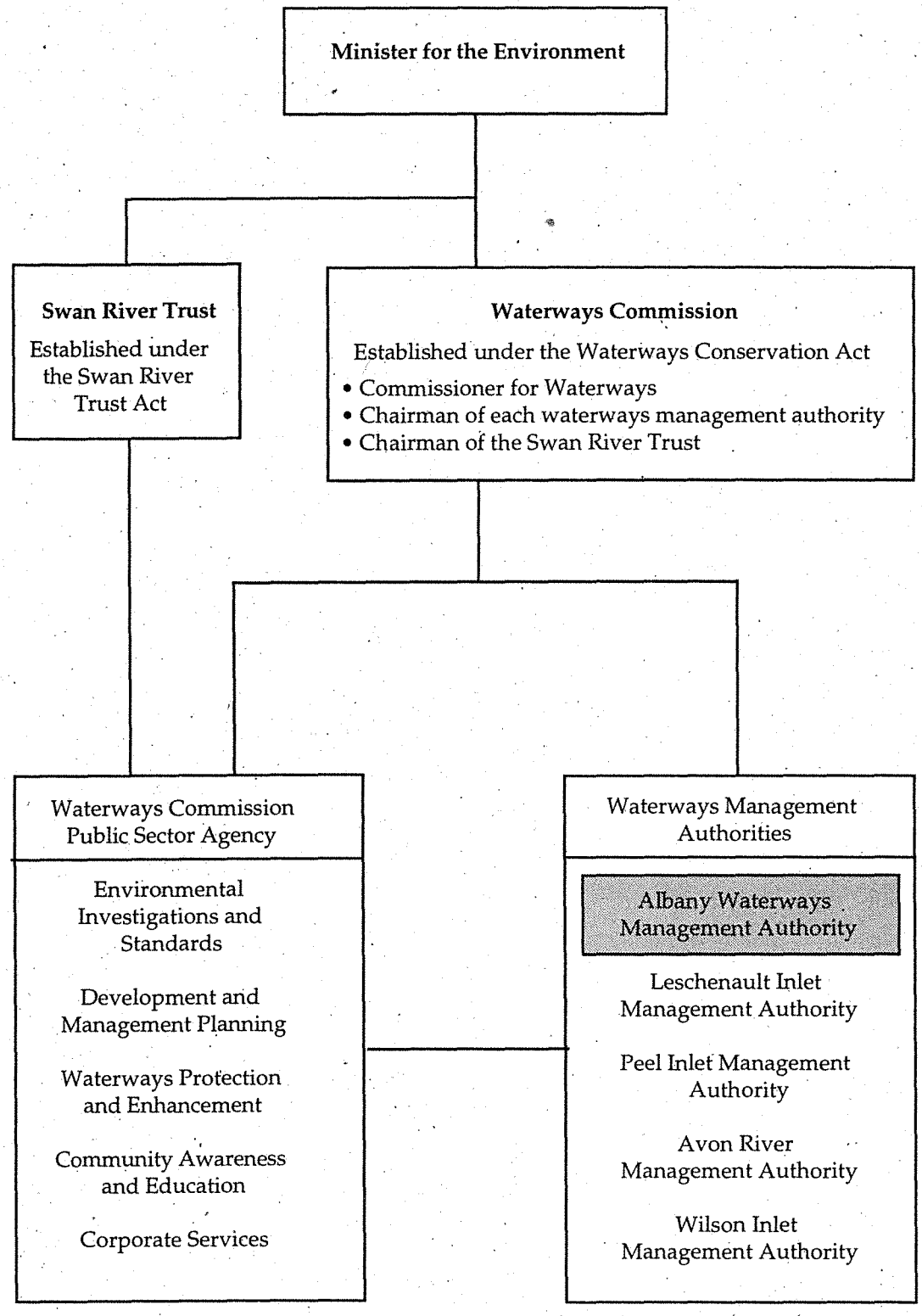
2.2.4 Waterway management functions

In addition to carrying out activities outlined in the above section, AWMA also:

- provides advice and disseminates knowledge on the conservation and good management of the Albany waterways.
- carries out works to improve the waterways environment, i.e. erosion control works, revegetation of river beds and banks, and provision of public facilities.

Figure 5: The Waterways Commission and its Waterways Management Authorities

Organisational Structure



- administers and coordinates the implementation of the EPA's recommendations to reduce pollutant input to the Albany harbours.
- conducts and/or coordinates relevant research and investigations in the area of waterways management.
- prepares and reviews a management programme for the management area to guide future planning and activities in the area.
- prepares management plans for local waterway areas in conjunction with local government.
- enters into agreements with organisations and landowners to improve management of the waterways and their foreshores.
- provides advice to decision making authorities on the impact of development on the waterways and their foreshores.

The Authority works closely with local government and other agencies involved in various activities relating to management of the Albany waterways. It aims to develop good cooperation between agencies for the benefit of the waterways.

2.3 Role of other organisations, agencies and groups

A number of other organisations, agencies and groups are responsible for various aspects of planning and management for the waterways and the catchments within the Albany Waterways Management Area.

The following information briefly describes the roles and responsibilities of these organisations, agencies and groups with a direct role in planning and management of the waterways. Those involved in the catchment area are also described, but only where their role may directly affect the condition of the waterways. Many other organisations, agencies and groups exist in the area that have a role in planning and management of natural resources. Due to their large number these could not all be described.

2.3.1 Integrated catchment management agencies

In 1987 the State Government adopted a policy on Integrated Catchment Management. The policy provides for the coordination and integration of planning and management on a river or groundwater catchment basis. The approach fostered by the policy is for the involvement of individuals, landowners and the community in the development of common objectives for the planning and management of land and water resources.

Since the adoption of the policy, a number of State government agencies and coordinating groups have been established to oversee and coordinate its implementation. This involves promoting cooperation between agencies and ensuring the community is involved in decision making.

Integrated Catchment Management Coordinating Group

The Integrated Catchment Management Policy Group was established on adoption of the Integrated Catchment Management Policy. This Policy Group was then restructured to become the Integrated Catchment Management Coordinating Group (ICMCG).

The group's main function is to implement the Integrated Catchment Management Policy by considering broad objectives and principles for catchment and waterway management on a Statewide basis, coordinating government actions in these areas and fostering community participation in management.

Office of Catchment Management

The Office of Catchment Management was established as the secretariat for the Integrated Catchment Management Coordinating Group. The office actively promotes integrated catchment management and the development of catchment plans, particularly in the south-west of the State.

Government Officers Technical Advisory Group

Government agency activity in integrated catchment management in the Albany Waterways Management Area is coordinated through the Government Officers Technical Advisory Group (GOTAG). The group

consists of technical staff from all the government agencies having a role in catchment and waterway management . The lead agency in the Albany harbours catchments is the Department of Agriculture, which has responsibilty for administering the GOTAG. The group provides technical advice to AWMA and provides a link between AWMA and the integrated catchment management process.

The group includes representatives from the AWMA, Department of Agriculture, Water Authority, Department of Planning and Urban Development, Department of Conservation and Land Management, the Shires of Albany and Plantagenet and the Town of Albany.

With increasing interest in the management of nearby Wilson Inlet and its catchment and the recent formation of the Wilson Inlet Management Authority, the GOTAG is being extended to also cover the Wilson Inlet catchment area. As a result a representative from the Shire of Denmark is to join the group to aid in coordinating management.

2.3.2 State government agencies

Department of Agriculture

As agriculture is the major land use in the Albany Waterways Management Area, the Western Australian Department of Agriculture plays a major role in management of the Albany harbours catchment.

The department's operations are diverse including extensive agricultural research and extension programmes to improve agricultural productivity and promote sustainable agriculture.

The department administers the Soil and Land Conservation Act 1945 - 1988. The Act provides for the Commissioner for Soil Conservation to be responsible for the prevention and mitigation of land degradation and the promotion of soil conservation.

Under this Act, the department has a statutory function to provide support to land conservation district committees. It is the department's policy to assist LCDCs to become self-directed bodies which develop and implement their own programmes.

The department has established the South Coast Estuaries Project group to deal with nutrient management in the catchments of estuaries on the south coast. The project group is in Albany and carries out research and extension work within the catchments of Oyster and Princess Royal Harbours.

Water Authority of Western Australia

The Water Authority of Western Australia (WAWA) is responsible for supplying water related services to the State including public water supply, sewerage, irrigation and major drainage networks. WAWA is also responsible for assessment of water resources, planning and management of their allocation, development, use and conservation for the continuing benefit of the community. As a major centre for drainage expertise in Western Australia, WAWA is responsible for formulating safe management practices for development on flood plains.

WAWA's major responsibilities in the Albany area are discussed below:

- **Domestic wastewater treatment** - WAWA is responsible for the disposal of all wastewaters from sewered areas in the Town of Albany.
- **Groundwater resources** - WAWA administers a large groundwater resource on the southern and western side of Princess Royal Harbour which supplies the water to Albany. Protection and allocation of this resource is of major importance to WAWA.
- **Monitoring** - WAWA monitors stream flow in most major rivers and drains entering the Albany harbours. WAWA is also responsible for maintaining agricultural drains including Taylors Drain,Robinson Estate Drain, Moreys Drain and Munster Hill Drain which drain into Princess Royal Harbour.
- **Pollution control** - Until recently WAWA has been involved in pollution control licensing of the foreshore industries including the licensing of the CSBP fertiliser manufacturing plant. This role has now been

transferred to AWMA with delegated powers for pollution control under the Environmental Protection Act. WAWA plays a role in pollution control within the catchment of the Albany harbours.

Department of Planning and Urban Development

The primary objective of the Department of Planning and Urban Development (DPUD) is to provide an effective urban and regional planning and development framework to guide decision making on land use, development and related matters for the benefit of present and future generations.

To fulfil that objective DPUD undertakes the following activities:

- Assists the government in integrating social, economic and environmental initiatives in planning.
- Provides a focus for community debate on land planning and development issues.
- Encourages public participation in the planning and development process to enable community needs and aspirations to be reconciled with appropriate land use patterns and development proposals.
- Undertakes and encourages new planning and development initiatives.

DPUD administers the following Acts and Regulations:

- Town Planning and Development Act 1928-1986
- State Planning Commission Act 1985
- Town Planning Regulations 1967
- State Planning Commission Regulations 1985

DPUD plays a part in planning and management in the Albany harbours catchments through:

- **Town planning schemes** - DPUD gives advice to the Minister for Planning on all new local authority town planning schemes and amendments to existing schemes.
- **Subdivision control** - DPUD has Statewide responsibility for subdivision control. Decisions on subdivision applications are made by seeking the advice of any relevant government agencies and the local authority. Agencies such as AWMA, the Water Authority of Western Australia, Department of Agriculture, Environmental Protection Authority and the Department of Conservation and Land Management are consulted.
- **Development policy** - DPUD has a programme of policy formulation to guide decision making. The policies relate to development control, subdivision, town planning schemes and strategic planning. DPUD also prepares guidelines on specific issues for public information.

Department of Land Administration

The role of the Department of Land Administration (DOLA) is to administer unvested (or vacant) Crown lands, gazette reserves, and produce maps and remote sensing information of the cadastral and physical features of all lands of Western Australia.

The department administers several Acts including:

- Land Act 1933
- Land Transfer Act 1893
- Registration of Deeds Act 1856

Under these Acts DOLA has no direct responsibility or concern for management of waters within the Albany waterways. Certain sections of the Land Act 1933, however, are relevant to the management of foreshore reserves and the beds of water courses. DOLA therefore has a clear involvement in the land adjacent to and covered by waterways .

DOLA also has responsibility for the Western Australian Land Information System Secretariat and map production in general which plays a significant supportive role in land management. The Western Australian Land Information System is the State's computer based land information database. An integrated land information system ensures that land information gathered by various agencies is readily

accessible and usable by land managers and land users.

Environmental Protection Authority

The Environmental Protection Authority (EPA) is established under the Environmental Protection Act 1986 for the prevention, control and abatement of environmental pollution, for conservation, preservation, protection, enhancement and management of the environment.

The EPA's major objective with respect to the Albany harbours is to ensure that their existing environmental values are maintained and enhanced. This means that a full complement of biophysical functions must be retained in the harbours and in their catchment.

If a decision making authority considers that a proposed development is likely to have a significant impact on the environment, it must refer the proposal to the EPA for environmental impact assessment. A proponent or any other person may also refer a proposal and the EPA can call proposals in. The EPA determines the type and level of environment assessment required. This may include informal assessment or formal assessment where the preparation of an environmental impact statement is required(i.e. Environmental Review and Management Programme(ERMP), Public Environment Review (PER) or Consultative Environmental Review (CER).

The EPA also has powers under its Act for the control, prevention and abatement of pollution on behalf of the Minister for the Environment. It issues licences, works approvals and notices. Certain pollution control powers have been delegated to the Water Authority of Western Australia and the Waterways Commission.

The EPA has played a major role in identifying problems facing the Albany harbours. The Authority carried out extensive research between 1987 and 1990 which raised awareness and prompted government action to remedy water quality degradation in the harbours. This management responsibility has now been passed on to AWMA. The EPA, however, still plays a major role in aiding AWMA and the Waterways Commission in achieving its objectives.

Department of Conservation and Land Management

The Department of Conservation and Land Management (CALM) has a primary responsibility 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 administers the Conservation and Land Management Act 1984 and the Wildlife Conservation Act 1950. It manages State forest, timber reserves, national parks and nature reserves and other lands vested in the Lands and Forests Commission and the National Parks and Nature Conservation Authority. CALM also undertakes the preparation of management plans for the land which it manages.

The Albany Waterways Management Area is covered by the Albany District of CALM with its headquarters located in Albany. Within this region, CALM manages a number of national parks and reserves. CALM has recently released its Regional Management Plan for the South Coast Region. The plan includes recommendations for management of lands within the Albany Waterways Management Area.

Great Southern Development Authority

The role of the Great Southern Development Authority (GSDA) is to encourage, promote, facilitate or assist economic or social development in the Great Southern Region. GSDA consults with State and Commonwealth agencies, local government authorities and statutory bodies. The authority coordinates 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 coordinating regional development.
- Provide local authorities with information on the findings of commissioned studies and other research.
- Promote investment and economic expansion in the Region.

GSDA is currently responsible for the implementation of the foreshore redevelopment project for central Albany.

Albany Port Authority

The Albany Port Authority is a corporate body established by the Albany Port Authority Act 1926 and proclaimed on 14 March 1950. The Authority is composed of five members, appointed by the Governor in Executive Council.

The Authority is responsible for control of the Albany Port. This includes planning, construction and maintenance of port facilities, provision of port services such as pilotage, moorings for ships, power and water supply and security services. The Authority is also responsible for the leasing of land within the Port of Albany.

The Port of Albany includes the waters of Princess Royal Harbour and King George Sound.

Department of Transport

The Department of Transport (DOT) (previously the Department of Marine and Harbours) has statutory responsibility relating to marine and river waters. The department's primary objective is to provide for the efficient and safe boating through provision of certain facilities and services.

DOT may construct, provide and maintain facilities and services on land and water to meet the needs of recreational and commercial boating, including jetties, moorings, launching ramps, navigation aids and marine craft.

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

Fisheries Department

The Fisheries Department is responsible for management of the fish resources of the Albany waterways 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.

Under the above legislation the Minister for Fisheries and the department are responsible for management of professional and recreational fisheries of the waterway. The department provides Fisheries inspectors which enforce the regulations under the Act, and carries out research on fish species often in conjunction with other State government departments or universities. Funding for research is usually supplied through the Fisheries Research and Development Fund.

The Fisheries Department is also responsible for the approval of aquaculture activities in the Albany waterways. The department has established the Inter-departmental Committee on Aquaculture (IDCA) to enable concerns of other State government departments to be considered.

2.3.3 Local government authorities

Five local government authorities (LGAs) are situated wholly or partly within the Albany Waterways Management Area. These include:

Town of Albany
Shire of Albany
Shire of Plantagenet
Shire of Cranbrook
Shire of Gnowangerup

These LGAs are responsible for local planning and development control, provision of recreation facilities, and management and maintenance of reserves where they have vesting. LGAs are encouraged to prepare town planning schemes and local rural strategies to plan for development and changes in land use within their area.

The Town Planning and Development Act 1928-1986 confers several important powers upon the LGAs which have a direct impact on the management of the Albany harbours and other waterways. Firstly, they can prepare and initiate changes to town planning schemes which control development along and in proximity to the waterways. Secondly, they approve and supervise residential and commercial developments which may impact on the harbours and finally they provide advice to the Department of Planning and Urban Development on the suitability of subdivision and amalgamation of land.

2.3.4 Land Conservation District Committees

A number of land conservation district committees (LCDCs) represent the rural communities within the catchment areas of the Albany harbours.The primary role of the committees is to develop cooperation among land users and agencies to implement sustainable land management systems and to solve land degradation problems. In the Albany catchment the committees play a vital role in the process of reducing nutrient loss to the harbours from rural sources.

The committees are formed under the Soil and Land Conservation Act and are advisory groups to the Commissioner for Soil Conservation. As a collection of land users, the committees provide an excellent avenue for land user input to the development of plans, management actions and research. The LCDCs consist of land user representatives, farmer groups such as the Western Australian Farmers Federation, Pastoralist and Graziers Association, a nominee of the Commissioner for Soil Conservation, and representatives from other government agencies actively involved in that part of the catchment.

Under the Soil and Land Conservation Act the Western Australian Department of Agriculture provides support to the land conservation district committees. In the Albany Waterways Management Area there are four land conservation district committees:

Manypeaks LCDC
Napier King LCDC
Stirling LCDC
Kalgan LCDC

Oyster Harbour Catchment Group

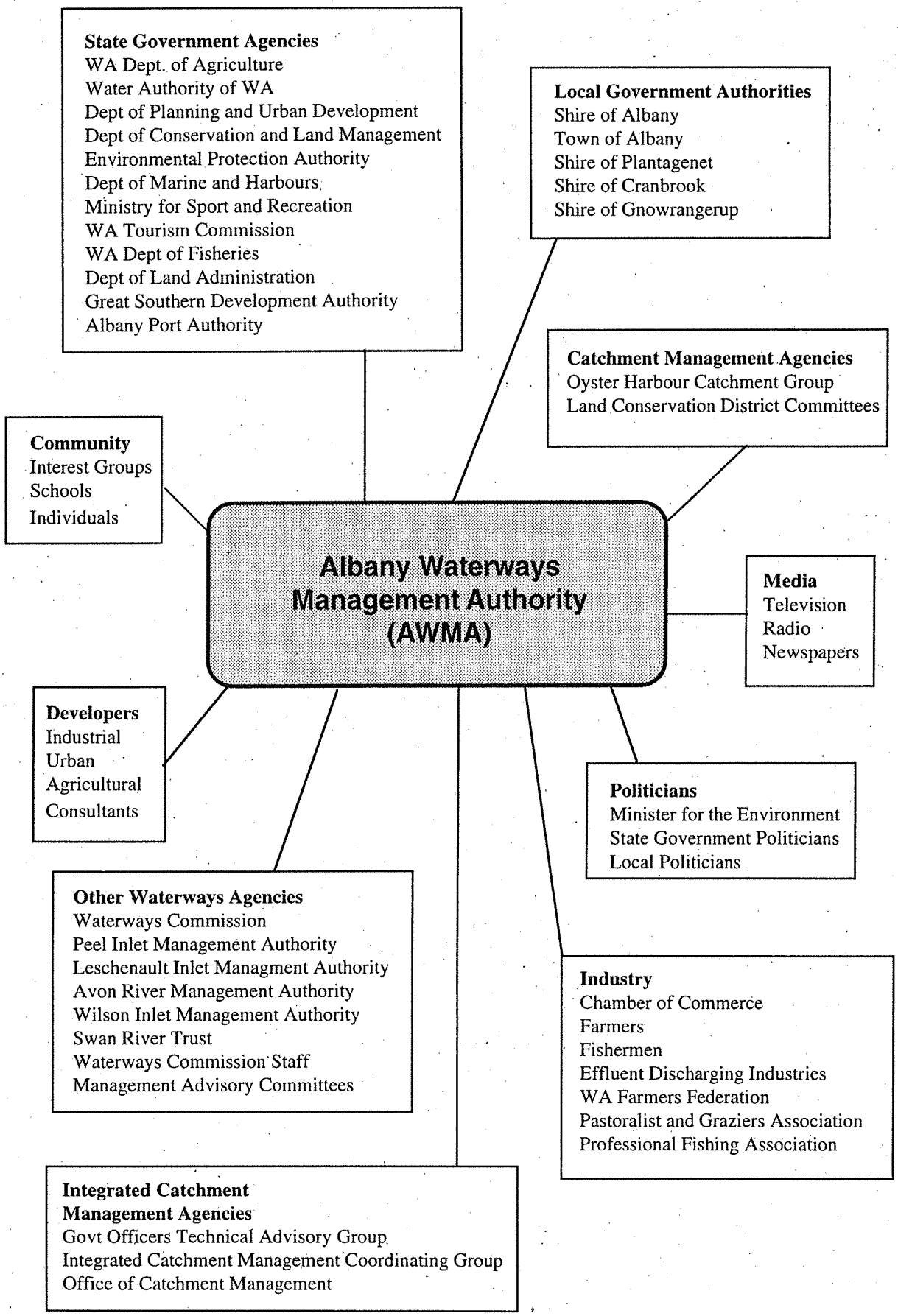
At the time AWMA was established, the four LCDCs decided to form the Oyster Harbour Catchment Group to ensure that catchment management was not hampered by lack of communication.

The catchment committee comprises two representatives from each of the four LCDCs, a representative from the Emu Point Progress Association, a National Landcare Programme funded project officer and a representative from the Department of Agriculture. Presently the catchment group has two members on AWMA which ensure clear coordination and communication between catchment and waterways management.

2.3.5 Community Groups

A large number of community groups exist within the Albany Waterways Management Area. Groups interested in conservation, recreation and agricultural issues supply local knowledge and expertise to State and local government agencies which is useful in waterways planning and management. They also provide an avenue through which the community can become involved in management issues and community views can be expressed.

Figure 6: Organisations, agencies and groups with which AWMA interacts



3. AWMA'S CORPORATE APPROACH

To better manage the Albany waterways AWMA has developed a corporate approach to management. The approach gives perspective to the Authority's activities and identifies a purpose for its existence. AWMA's corporate plan identifies this approach. The plan includes a mission statement, key objectives for the Authority and strategies to help it achieve its objectives. The corporate plan is regularly reviewed to ensure that objectives are in line with current issues facing the waterways. The current mission statement, objectives and strategies contained in AWMA's corporate plan are outline below:

AWMA's Mission

To maintain the waterways in their management area as functional, healthy systems, in order to facilitate sustainable uses, for the benefit of the whole community.

AWMA's Objectives

Objective 1

- Understand the Albany waterways and establish standards to maintain them as functioning healthy systems.

Strategies

- quantify the level of input of pollutants into the Albany waterways and determine their impacts.
- evaluate the impacts of the use of the waterways to develop standards for their sustainable use.
- review the health of the harbours to determine the most effective strategies for algae management.

Objective 2

- Plan for the conservation, enhancement and appropriate development of Albany's waterways.

Strategies

- incorporate the results of research and monitoring into a coordinated management programme for Albany's waterways.
- set and refine guidelines and policies to manage development affecting waterways.
- coordinate the activities of groups and agencies concerned with development and management in the catchment.
- Develop a major catchment and river rehabilitation programme.

Objective 3

- Protect and rehabilitate the Albany waterways and encourage their sustainable use.

Strategies

- harvest weed to prevent further degradation of the harbours (in response to the EPA Recommendations).
- minimise the input of pollutants from point sources.
- implement a rehabilitation and protection programme for the waterways and catchments.
- implement recommendations made in management plans for foreshore areas.

Objective 4

- Increase community awareness and involvement in the conservation and management of Albany's waterways.

Strategies

- produce and distribute reports to the community.
- promote sustainable land use practices.
- support community-based catchment groups.
- support land and water care education in schools.
- facilitate community involvement in land and water care activities.

3.1 Aim of the management programme

AWMA has identified an aim for the management programme which guides the direction of management for the Albany waterways. The aim recognises that the waterways are living systems which must be maintained. This means that a large range of biological and physical functions should be retained. It also recognises that improvements in the ecological health of the waterways, in particular the Albany harbours, are necessary.

The aim takes into account that the community wishes to use the waterways. It stresses that community uses should be evaluated in terms of their capacity to adversely affect the waterways and that land use practices and development should be compatible with the need to maintain the waterways as healthy functional systems.

The aim of the management programme is given below:

Aim

To improve and maintain the ecological health of the Albany harbours and associated waterways for the enjoyment of present and future generations by conserving, protecting and rehabilitating the waterways and their foreshores and by fostering appropriate development and land use practices which are compatible with the need to maintain the waterways as healthy functional systems'

3.2 Management issues and goals

AWMA has identified many issues that need to be addressed in management of the Albany waterways. These have been grouped under six broad headings which relate to the basic theme of the type of management required. A brief description of each issue is given below. A more detailed discussion of each issue is given in Part C of the programme.

The issues listed were identified after wide consultation with the community of the Albany area and evaluation of the condition of the waterways, their foreshores and catchment areas. Only those issues requiring current action have been addressed. Further issues may arise in the future. For this reason the programme will be kept under review (Refer Part E Section 3)

Goals for each issue are also listed below. These goals give an indication of what AWMA hopes to achieve in terms of addressing each issue. The goals also reflect the values of the community by highlighting the attributes of the waterways which are important.

3.2.1 Reducing nutrient inputs

Nutrient enrichment of the Albany Harbours has been identified as a major cause of the growth of excessive macroalgae in the harbours. The growth of this macroalgae is contributing to the decline in the density and coverage of seagrass communities in the harbours. The general health of the ecosystem is threatened by the excess input of nutrients.

Nutrient loads

An important part of managing the nutrients entering the harbours is to determine the amount of nutrients that can enter these systems without damage to their ecology. Review of the nutrient assimilative capacity of the harbours (the ability of a waterbody to disperse, dilute or absorb excess nutrients without long term damage to their ecosystems) identified by the EPA is also important.

Goal

- *To identify sources and loads of nutrients entering the Albany harbours and refine initial estimates of the level to which nutrient loads need to be reduced.*

Rural sources

Rural activities within the catchment area are contributing nutrients to the Albany harbours. Nutrient sources include phosphatic fertilisers used on agriculutral land, intensive animal industries such as piggeries and dairies, which generate large amounts of solid and liquid wastes generally containing large amounts of nutrients, and intensive horticulture involving fertiliser application These nutrients can reach the waterways via surface water runoff and groundwater flow.

Goal

- *To reduce nutrient loss to the Albany harbours from rural sources.*

Urban sources

Existing and future urban areas around the waterways and within the catchment have the potential to contribute nutrients via stormwater runoff and septic disposal. Nutrient point sources within the urban environment such as landfill sites, saleyards and recreational grounds where high levels of nutrients accumulate are also contributors.

Goal

- *To reduce nutrient loss to the Albany harbours from urban sources.*

Industrial sources

A number of industries are located on the shores of Princess Royal Harbour. Effluent from industrial processing is discharged directly to the harbour. These effluents can contain high levels of nutrients and other pollutants.

Goal

- *To reduce nutrient loss to the Albany harbours from industrial sources.*

3.2.2 Conservation of the environment

Human use of the waterways has the potential to impact on the natural functioning of waterways ecosystems. The special value of these ecosystems needs protection. Maintenance of a full complement of biophysical functions within the ecosystem is essential.

Water quality

Surface runoff and groundwater flow can carry a wide range of pollutants to the waterways. Pollution of a waterway to a point where water quality begins to deteriorate can alter the natural biological functioning of the waterway ecosystem. This in turn can reduce the community's enjoyment of the waterway by spoiling its appeal, restricting recreation and damaging economic resources such as fisheries.

Goal

- *To maintain and improve the overall water quality of the Albany waterways.*

Seagrass and macroalgae

Seagrass meadows are important to the ecological functioning of waterway systems because they provide shelter for many marine invertebrates and some fish species. The complex underground stem and root system of the seagrasses also aids in maintaining the stability of the waterway floor and as a result provides a stable habitat for many estuarine invertebrates. Studies have revealed that density and coverage of seagrass communities within the Albany harbours have declined substantially in the past fifteen years.

Goal

- *To improve the density and coverage of seagrass communities and to reduce accumulations of macroalgae in the Albany harbours.*

Foreshore areas

Foreshore vegetation plays an important role in the natural functioning of the waterway system. Fringing vegetation stabilises banks, reducing the chances of erosion, and by acting as a biofilter trapping nutrients and pollutants draining from surrounding land, also contributes to the assimilative capacity of the waterway. Foreshore areas also provide valuable habitat for waterbirds and other fauna. Maintenance and enhancement of this valuable resource is essential to the survival of the waterways environment.

Goal

- *To protect and enhance foreshore areas around the Albany waterways for continued enjoyment by the community and to maintain a healthy functioning system.*

Catchment vegetation

Clearing of vegetation within the Albany harbours catchments is promoting the movement of water within the catchment and therefore the movement of nutrients and other pollutants towards the waterways. The value of catchment vegetation for conservation and landscape reasons is important as well.

Goal

- *To increase the coverage of vegetation in the Albany harbours catchments.*

Fisheries

Fish populations are an important component of the waterways ecosystem. These valuable resources are highly dependent on waterway habitats such as the seagrass meadows. Commercial and recreational fishing in the Albany waterways is dependent on the maintenance of good water quality, sufficient habitats and breeding grounds.

Goal

- *To maintain the fishery of the Albany harbours and associated waterways for the benefit of the community by conserving fish species and habitats.*

Landscape

Waterway environments contain a variety of landscapes, both natural and modified, which require protection, as they often provide a visually attractive backdrop to the waterway, contain places of scientific or historic interest, or contain unique or unusual waterway ecosystems.

Goal

- *To maintain and protect both natural and modified landscapes which provide a visually attractive backdrop for the waterways.*

Floodprone land

AWMA's interest in the protection of floodprone land includes maintaining the natural process of flooding, but also extends to the protection of the ecosystems which exist on flood prone land. These ecosystems are valuable to the natural functioning of the waterways as they contribute to the assimilative capacity of the waterways.

Goal

- *To ensure the protection of the natural ecosystems which exist on floodprone land and to balance the natural process of flooding of foreshore land with the protection of property from damage.*

Cultural sites

Aboriginal and European sites exist around the Albany harbours and along the river foreshores. These need to be identified and protected to ensure preservation of the cultural integrity of the waterway environment.

Goal

- *To ensure sites of scientific, heritage and cultural importance on or around the waterways are identified, conserved and protected.*

3.2.3 Planning for the future

Waterways management focuses on balancing future development with the protection and enhancement of the waterway environment. Inherent in this is recognition of the need for future development on and around the waterways to be properly planned and coordinated so as to minimise the impact on the waterways environment.

Regional planning

In order to manage a waterway, appropriate planning and management in the catchment, including both the rural and urban components, is essential. Planning at a regional level which recognises this approach will go a long way to ensuring the health of the waterways in years to come.

Goal

- *To promote the integration of waterway protection and management into the regional planning framework.*

Local planning

Incorporation of waterway issues into local planning mechanisms such as town planning schemes, local rural strategies and development and land use control is important to ensure that use of the waterways and catchments is compatible with protection of the waterway environment.

Goal

- *To promote the integration of waterway planning and management into the local planning framework.*

Climate change

Expected changes in global climate in the next 30 to 40 years may result in sea level rises which may have serious implications for waterways management. Not only may properties close to the waterway margins be threatened with inundation but also foreshore areas vital to the natural functioning of the waterways environment may be lost.

Goal

- *To ensure development and protection of foreshore areas take into account the potential for sea level rise as a result of future climate change.*

3.2.4 Providing for community use

Waterways in their natural state are of great scenic and aesthetic value. They are significant tourist assets and can be enjoyed by the general community for recreational activities. As available leisure time increases, it is expected that their value for recreation also will increase. Waterway management must recognise that the community wishes to use the waterway environment, and promote its use in a manner which is compatible with the protection of the natural environment.

Recreation

The Albany waterways are used for a range of recreational activities. 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 opportunities. Planning must consider these desires and expectations, and then determine priorities and suggest areas capable of sustaining agreed uses.

Goal

- *To cater for a range of recreational opportunities which reflect the needs of the community and are compatible with the protection of the waterway environment.*

Tourism

The Albany waterways are important tourist attractions of the South Coast. It is essential that those elements of the waterway environment which are attractive to tourists are maintained and that tourist activities are developed in a mannner which is compatible with protection of the environment.

Goal

- *To ensure tourist activities are compatible with the protection of the waterway environment and to promote an understanding of the value of waterways within the tourist community.*

Public access

In any community people want to have access to the waterway environment for pleasure and recreation activities. Uncontrolled access may result in the trampling of foreshore vegetation, destruction of wildlife habitat and damage to the banks of the waterway.

Goal

- *To ensure the provision of public access to the waterways which is compatible with protection of the natural environment.*

3.2.5 Increasing concern for waterways

The community's awareness of the importance of protecting the waterways environment and its willingness to take ownership and responsibility for the waterways is instrumental to the success of waterways management. Involving the community in the management process, providing them with information and developing educational material are all important aspects of increasing the community's awareness.

Community involvement and information

The community can identify issues relating to waterways management and contribute to developing achievable solutions. They also have needs and aspirations that need to be identified and which can contribute to restoration of the waterways through appropriate use.

Goals

- *To ensure the community has an opportunity to participate in decision making and that planning and management reflects the needs and aspirations of the community.*
- *To keep the community informed on all matters affecting waterways planning and management.*

Education

Understanding how the waterways function and how they are affected by human activity helps to develop an appreciation of, and a desire to care for, the environment. The opportunity exists to increase this awareness by providing more opportunities for people to learn about the waterways and thus to appreciate their value.

Goal

- *To increase the community's awareness and understanding of the waterways environment and their appreciation of the value of waterways.*

3.2.6 Increasing our knowledge

Learning more about the way waterways ecosystems function and how community use can impact on the waterways environment can aid in future management. Management decisions have a greater chance of being successful if they are based on scientific understanding.

Research

Research is an important facet of waterways management as it improves the understanding of how the waterways ecosystem functions, where pollutants entering the system originate, how human activities impact on the system and what can be done to improve the system. Research provides a basis for informed management decisions.

Goal

- *To undertake research which will enhance knowledge and understanding of the ecological functioning of waterways and foreshores and assist in future management.*

Monitoring

Environmental monitoring is an important tool used in waterways management to identify changes and trends in the environmental condition of the waterways environment. Monitoring is the integral in preventing waterways damage as it identifies problems and provides an understanding of what is happening to the waterways.

Goal

- *To carry out environmental monitoring of the waterways environment to identify changes in its condition.*

3.3 Evaluating management

To ensure that waterways management is succeeding and the issues outlined above are being adequately addressed, AWMA needs to develop a form of evaluation for management initiatives. Evaluation must identify how the waterways are changing in response to management strategies and actions and therefore guide the direction of management.

In the past, monitoring of waterways has tended to focus on the measurement of chemical water quality variables to indicate changes in the health. This approach has been useful as it provides valuable information about the level of pollutants entering the waterways and the effect these pollutants have on water quality.

Many scientists are now arguing that water quality monitoring based on chemistry is inadequate. As a result monitoring is now beginning to focus on a range of ecosystem components including physical, chemical and biological variables. This allows not only the causes (e.g. high level of total posphorus) of a problem to be identified, but also the biological response (e.g. blue green algae bloom) the problem will produce to be identified. Both responses and causes need to be monitored in many instances and it is important that the choice of these variables are adeqately matched to the particular issue or problem being considered. The identification of a range of waterway health indicators allows flexibility and should provide a better indication of the health of an ecosystem (CSIRO 1992).

3.3.1 Waterway health indicators

Waterway health indicators or bioindicators are readily identifiable characteristics of a waterway environment that provide a measure of change in the condition of the environment. Depending on the nature of the indicator they may quantify:

- the magnitude of stress (e.g. pollution level, nutrient load)
- habitat characteristics (state of riverine vegetation, faunal populations)
- degree of exposure to stress (degree of contact a population has with a pollutant)
- ecological response to the exposure (how the ecosystem responds to stress e.g. fish deaths, seagrass decline etc)

Knowledge of the waterways environment suggests that there may be hundreds of potential health indicators. However for these indicators to be useful to management a core set needs to be developed. The Waterways Commission aims to identify health indicators which will be applicable to waterway ecosystems in the south-west of Western Australia. AWMA also needs to identify indicators which are specific to the Albany waterways (Refer Part C Section 2.1). It is desirable that health indicators should be:

- widely accepted to cover issues
- available over a period of time long enough to identify trends
- easily understood
- indicative of community values
- based on readily available data
- perceived as politically unbiased
- flexible in the face of changing community perceptions.

Indicators, if properly measured, can be used to detect trends and to show where and when management action is required. Thresholds need to be identified for the indicators, past which action will be initiated. These thresholds initially will be arbitrary, but will become less arbitrary with experience.

PART C: MEETING THE CHALLENGE

This part of the management programme deals in detail with the various issues facing the Albany waterways identified in Part B Section 3. Each issue is considered individually and an accompanying action plan developed. The action plans outline the tasks that need to be undertaken to address each issue. The actions presented are of a general nature and guided by general principles of waterway management.

Key players involved in implementation of the actions are provided alongside each action. Where two or more players have been identified, the agency highlighted is responsible for initiating implementation and liaising with other agencies or groups listed to carry out the task given. A foldout list of abbreviations of all players listed is provided at the back of the document for easy reference.

1. REDUCING NUTRIENT INPUTS

Nutrient enrichment of waterways in the south-west of Western Australia is an increasing problem. Human activities such as fertiliser application to farm land, urban stormwater runoff and discharge from industry are resulting in the input of excessive quantities of nutrients to our waterways. Nutrient enriched conditions can cause increased production of algae and other aquatic plants sometimes reaching nuisance proportions.

Investigations into the nutrient status and environmental condition of the Albany harbours followed a decline in the density and coverage of seagrass communities in the harbours. Initial decline of these communities has been attributed to smothering of seagrasses by epiphytic algae (Mills 1987). The recent proliferation of fast growing macroalgae within the harbours has also contibuted to the further decline of these communities (Refer Part C Section 2.2). The major cause of the proliferation of the macroalgae is considered be the high nutrient availability in the water column and from the sediments (Mills 1987).

Although many nutrients are essential elements for plant growth, current evidence suggests that phosphorus controls the growth of algae in the Albany harbours. High levels of nitrogen entering the system are also considered to be crucial to the growth of algae. Thus control of phosphorus and nitrogen loadings to the harbours is considered the key to longterm management of the excessive algal growth and seagrass decline of these waterbodies. While it is not feasible to prevent all nutrients from entering the waterways it is important to take reasonable and responsible steps to ensure that nutrient loads are minimised.

Nutrients entering Princess Royal Harbour are primarily from industrial and urban sources. Creeks and drains from agricultural land to the west also contribute to nutrient loads. Most of the nutrient load entering Oyster Harbour is from broad scale use of phosphatic fertilisers. Nutrients leached from urban sources such as septic tanks and effluent from small urban wastewater treatment plants also contribute.

Nutrient sources are of two types: point sources which can be attributed to specific locations or land uses such as industries or piggeries, which discharge wastes into drains or directly into waterways, and diffuse sources which enter the waterways from a wide area. These latter sources include agricultural land within the catchments. Nutrient losses from point sources are usually quite easy to control with the use of waste disposal technologies, however nutrient losses from diffuse sources tend to be harder to control. More detail about sources of nutrients entering the harbours is provided in Sections 1.2,1.3 and 1.4.

1.1 Nutrient loads

Goal

To identify sources and loads of nutrients entering the Albany harbours and refine initial estimates of the level to which nutrient loads need to be reduced.

The Environmental Protection Authority conducted extensive research into the nutrient status and associated environmental problems of the Albany harbours between 1988 and 1989. The studies carried out provided estimates of nutrient loads to both harbours for 1980, 1988 and 1989. The studies also estimated the nutrient assimilative capacities of the harbours and determined target nutrient loads. The nutrient assimilative capacity is the ability of a waterbody to disperse, dilute or absorb certain excess nutrients without long term damage to its biological systems.

Princess Royal Harbour was found to be able to assimilate a maximum of 7 tonnes of total phosphorus and 54 tonnes of total nitrogen whilst still maintaining algal densities in the harbour at acceptable levels. Oyster Harbour on the other hand is a more complex system with nutrient loads highly dependent on river flow from the King and Kalgan Rivers. As a result the nutrient assimilative capacity of Oyster Harbour is likely to be considerably higher in years of above average rainfall. In fact when identifying the assimilative capacity for Oyster Harbour it was assumed to be double that of below average rainfall years. The studies concluded that the annual assimilative capacity for Oyster Harbour was

in the range of 7 to 14 tonnes of total phosphorus and 54 to 108 tonnes of total nitrogen depending on annual runoff from its catchment (EPA 1990 a).

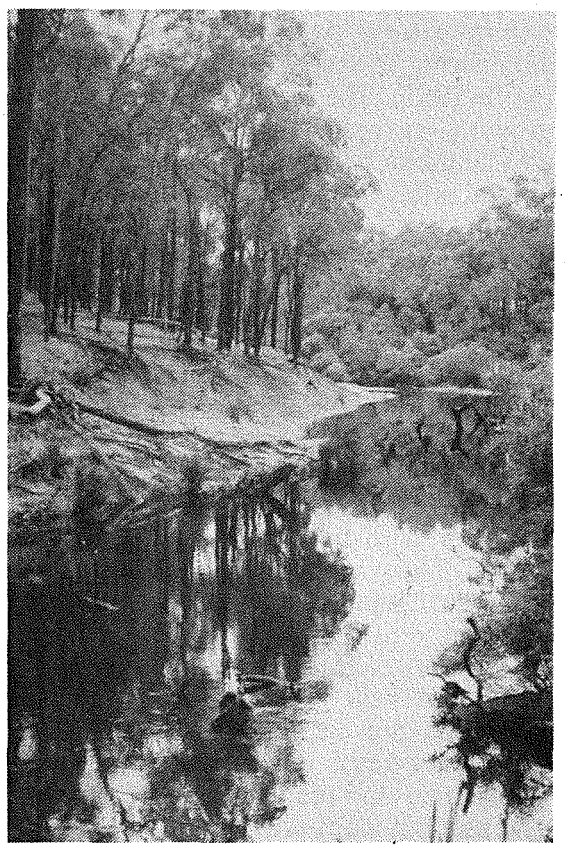
AWMA coordinates an overall monitoring programme to measure or estimate pollutant loads into the harbours. The foreshore industries are responsible for their own monitoring and report their results to AWMA on a monthly or quarterly basis. The Town and Shire of Albany monitor representative urban catchments to estimate overall loads. AWMA, WAWA and the Department of Agriculture work together to monitor rural inputs from rivers, major creeks and drains. Community monitoring is also conducted by school groups and LCDCs within the catchments.

Results from monitoring indicate that there have been reductions in the overall phosphorus load to Princess Royal Harbour. This can be attributed primarily to a considerable reduction in the phosphorus load coming from the CSBP and Farmers Ltd fertiliser plant, previously a major nutrient contributor, following commissioning of a large lime dosing plant in mid 1991. Whilst the reduction in nutrient input is encouraging, a greater reduction is needed to meet the target set by the EPA.

In contrast, phosphorus loads to Oyster Harbour have continued to exceed the EPA target. This contrast can be attributed to differences in the nature of nutrient inputs to the harbours. Nutrient inputs to Princess Royal Harbour are generally from point sources which can be controlled by waste management techniques. Inputs to Oyster Harbour on the other hand are diffuse in nature, originating from a large agricultural catchment area. Reducing nutrients from this area is a much more complex task and involves long term management strategies.

Management of nutrient loads to the Albany harbours is an integral part of preventing further degradation of the harbours' waters. Surveys of seagrass communities (Refer Section 2.2) indicate that both harbours are still in a very fragile condition and highlight the need for continued reductions in external nutrient loads. Specific nutrient assimilative capacities for the harbours have given an indication of the levels of reduction that are required. However, future management will require not only the continued reduction of nutrient inputs but also further research to properly understand the functioning of the harbours. This will involve on-going review of the assimilative capacities and the required target loads.

Studies carried out by the Environmental Protection Authority identified a range of management activities for reducing nutrient inputs. The implementation of these activities has begun and has already resulted in encouraging reductions. Future nutrient management will involve the continuation of these management activities and the continued support and cooperation of all organisations involved.



LCDCs and other community groups carry out monitoring of nutrient inputs to the Albany harbours from rivers, creeks and drains in the catchments.

Nutrient loads -action plan

Strategies	Actions	Key Players	Implementation
1. Ensure all significant sources of nutrients entering the Albany harbours are monitored.	1.1 Coordinate an overall monitoring programme to measure significant nutrient inputs to the Albany Harbours. Include the following components in this programme: •self monitoring by foreshore industries •representative monitoring of urban catchments by the Shire and Town of Albany •monitoring of urban point sources by the Shire and Town of Albany •joint monitoring of rural catchments by DAWA/ WAWA and AWMA •community involvement in monitoring of urban and rural catchments. Review monitoring arrangements to ensure they are efficient and effective.	AWMA, LGAs, DAWA, WAWA, IND, COM	High priority Ongoing action already in progress Regular review of programme required
	1.2 Collate monitoring results and produce an annual audit of nutrient loads to the harbours. Identify nutrient hot spots in the catchments from this information.	AWMA, LGAs, DAWA, WAWA, IND, COM	High priority Annual project already in progress
2. Carry out investigations to gain a better understanding of the effect of nutrient enrichment on the Albany harbours.	2.1 Develop and utilise a model to refine initial estimates of nutrient assimilative capacity and target nutrient loads for the Albany harbours.	AWMA	High Priority Oneoff project requiring regular review

Outcomes

- **A better understanding of levels of nutrients entering the Albany harbours and of the location of nutrient hot spots in the catchment.**
- **A better understanding of the nutrient dynamics of the Albany harbours so that appropriate management strategies can be pursued.**

1.2 Rural nutrient sources

Goal

To reduce nutrient loss to the Albany harbours from rural sources.

Agriculture in the Albany harbours catchments consists mainly of broad scale grazing in the southern regions with increased cropping in the northern regions. A small number of intensive agricultural activities including piggeries, dairies, abattoirs, saleyards and feedlots occur near regional centres. Cattle and sheep are the main livestock of the region. Farm management practices are predominantly traditional. For many farmers this has generally included fertiliser application regardless of soil nutrient status and farm management with little regard for off-site effects.

The EPA recommended that the Department of Agriculture evaluate current information to identify high phosphorus source areas within the catchments and prepare a strategy for reducing of rural nutrient sources.

Target loads for rural nutrient inputs to the Albany harbours were also identified by the Environmental Protection Authority in studies carried out in 1988 and 1989. These are shown in the following table.

Target Loads for Rural Nutrient Inputs

	Nitrogen (tonnes)	Phosphorus (tonnes)
Princess Royal Harbour	< 13.5	< 4.6
Oyster Harbour	< 107.9	< 13.9

As a result the department conducted surveys of the nutrient status of soils and farming practices of the Albany harbours catchments during 1988 and 1989 and later in 1993. Surveys in 1988 and 1989 revealed that more than 50% of the soils in the catchments did not require phosphorus application for at least 12 months, however nearly all soils received phosphorus. This represented a significant over use of fertiliser and a potential major source of nutrient input to the waterways. A large percentage of the soils were also found to be naturally acidic and could benefit from the application of lime which would aid in reducing phosphorus loss.

The recent survey conducted in 1993, however, showed that the proportion of soils with a high phosphorus status had fallen over the pst five years. Although the use of phosphatic ferlilisers may have been in part influenced by recent economic trends, this result is encouraging and indicates that farming practices are changing.

With a view to developing and promoting the adoption of appropriate land management techniques and catchment planning, the Department of Agriculture through its South Coast Estuaries Project Group has established a Catchment Landcare Centre in Albany. The centre focuses on nutrient investigations in the Albany harbours catchments and provides information, advice and assistance to farmers on catchment farm planning and sustainable land management practices to reduce nutrient flow from rural sources.

Rural point sources contribute to nutrient enrichment of the harbours. Intensive animal industries generate large amounts of solid and liquid waste, generally containing large amounts of nutrients. Intensive horticulture also often involves large amounts of nutrients being applied to the soil. Depending on the soil type, these nutrients can enter water courses in surface water flow and groundwater eventually reaching the waterways.

The EPA has developed a set of codes of practice for these types of agricultural pursuits. They are designed to alert intensive agricultural producers to their obligations with respect to environmental protection. They set out guidelines for the siting of these activities in terms of soil characteristics and methods of waste treatment and disposal which minimise the export of nutrients to the waterways.

Rural nutrient sources - action plan

Strategies	Actions	Key Players	Implementation
3. Minimise nutrient loss from rural diffuse sources in the Albany harbours catchments.	3.1 Support and promote DAWA's strategies for reducing nutrient loss from rural diffuse sources including: •a soil testing programme to determine fertiliser needs for crops and pastures •the appropriate application of nutrients to agricultural soils •an increase in the use of water in the catchment •an increase in vegetation cover in the catchment •the use of farm planning to improve land management practices •the promotion of alternative land uses or soil treatments where soils have a low nutrient retention capacity •revegetation of streamlines on rural properties.	**DAWA**, LCDCs, OHCG, AWMA, LOs	High priority Ongoing action requiring regular review
	3.2 Liaise with the rural community to promote the concept of good land management for cleaner waterways.	**DAWA**, AWMA	High priority Ongoing action
	3.3 Provide advice to planning authorities on the suitability of land use proposals in the catchment with regard to nutrient loss to the waterways.	**DAWA**, AWMA, LGAs, DPUD	High priority Ongoing action
4. Minimise nutrient loss from rural point sources in the Albany harbours catchments.	4.1 Assess effluent management methods for existing and proposed point sources such as dairies, piggeries and intensive horticulture and provide advice on methods to minimise nutrient loss.	**LGAs**, DAWA, AWMA	High priority Oneoff project
	4.2 Support the EPA's codes of practice and DAWA's environmental management guidelines for animal based industries including piggeries, poultry farms,rabbit farms, cattle feedlots and stock holding yards.	**LGAs**, AWMA, EPA, DAWA,	Medium priority Ongoing Action

4. Minimise nutrient loss from rural point sources in the Albany harbours catchments. (Continued)	4.3 Develop a set of guidelines for the operation of nutrient intensive agricultural activities in order to minimise nutrient loss from these sources. Encourage the inclusion of these guidelines for nutrient intensive agriculture in local rural strategies.	**DAWA**, AWMA, LGAs	Medium priority One-off project requiring review.
5. Promote and support catchment planning in the Albany harbours catchments.	5.1 Develop guidelines for catchment groups and land conservation district committees to aid in the preparation of catchment plans. Incorporate the consideration of issues relating to waterway management into these guidelines.	**DAWA**, LCDCs, OHCG, LGAs, AWMA	Medium priority One-off project requiring review.
	5.2 Provide information to catchment groups and land conservation district committees on the quality of water draining from their land to enable them to assess the performance of management strategies.	**DAWA**, AWMA, LCDCs, OHCG	Medium priority Ongoing action
	5.3 Liaise with catchment management groups and land conservation district committees to emphasise the need to plan for nutrient loss to the waterways and suitable management strategies to reduce that loss.	**DAWA**, AWMA, LCDCs, OHCG	Medium priority Ongoing action

Outcomes

- **Significantly reduced nutrient loss from rural land in the Albany harbours catchments**
- **Coordinated planning of rural activities in the catchment area**

1.3 Urban nutrient sources

Goal

To reduce nutrient loss to the Albany harbours from urban sources.

Existing urban or residential areas in Albany are concentrated on the northern side of Princess Royal Harbour. Little Grove and Frenchman Bay on the southern side of the harbour also support growing urban areas. The localities of Lower King, Bayonet Head and Emu Point are situated adjacent to Oyster Harbour. Various urban areas including the town of Mount Barker and Kendenup are also located throughout the catchment area.

There is a need to provide for further urban areas in Albany. The Town and Shire of Albany have identified areas for urban expansion around Albany including Yakamia, Bayonet Head, Middleton Beach, Lockyer and Frenchman Bay. The Department of Planning and Urban Development has recently prepared a strategy for residential expansion for Albany to 2021. A major attribute of the strategy is the proposal for buffers between all urban areas and waterways within the study area.

Planning and management of urban areas needs to include appropriate measures to ensure that nutrient export is minimised. Issues to consider are sewage and stormwater disposal and the use of fertilisers for garden and park maintenance. The estimated discharge per household per year of sewage is 3-4 kg of phosphorus and 18 kg of nitrogen (Whelan et al. 1979). Septic systems have the potential to leach phosphorus and nitrogen into the groundwater system and into the waterways. The degree of leaching which occurs depends on the height of the water table, soil type and design and maintenance of the system itself.

Currently, most of the urban townsite of Albany is sewered, however unsewered areas around the harbours include Emu Point, Bayonet Head, Lower King, Little Grove and Millpara. A number of towns within the catchment area also remain unsewered. Sewering all these areas would be expensive. Accordingly priorities need to be established for providing for sewerage as finances become available.

In recent years, alternative domestic and commercial effluent disposal techniques have been developed. A number of these have been approved by the Health Department of Western Australia. When used either alone or in conjunction with the use of amended soils with high phosphorus retention capabilities, these systems reduce nutrient loss to groundwater. They should be used in preference to conventional septic tanks, in certain circumstances.

Where an area is sewered, the location of the treatment plant is also an important consideration. The Albany wastewater treatment plant with its outfall at King Point was identified by the EPA as a major contributor to the urban nutrient loading of the harbours. A new wastewater treatment plant, using land irrigation techniques, has recently been approved by the EPA and is currently being constructed. This plant is expected to significantly reduce nutrient inputs to the harbours from urban sources. A small wastewater treatment plant also exists at Mount Barker. Ensuring that effluent disposal from this plant does not increase nutrient loads to the harbours and associated river systems is also important.

Stormwater drainage and disposal has the potential to contribute to urban nutrient loads. Where possible stormwater should be disposed of on-site, however, it is not considered practical to eliminate all stormwater runoff to the waterways. The correct design and maintenance of stormwater disposal systems and the sensible use of fertilisers on gardens and parklands will assist in reducing nutrient losses to the waterways.

A number of nutrient point sources have also been identified in urban areas. Point sources within the Town of Albany include Hanrahan Road Tip, old tip sites (Lake Eyre and Lake Seppings) and recreational grounds (North Road). Those identified in the Shire of Albany include the liquid waste disposal site and the Albany Regional Cattle Saleyards. Local government and AWMA are currently undertaking an assessment of nutrient output from these sites and identifying ways of reducing nutrient losses.

Urban nutrient sources - action plan

Strategies	Actions	Key Players	Implementation
6. Minimise nutrient loss from **existing** urban diffuse sources in the Albany harbours catchments.	6.1 Support the appropriate prioritisation and implementation of backlog sewerage for urban areas within the Albany harbours catchments.	**WAWA**, LGAs ,AWMA	Medium priority Ongoing action
	6.2 Prepare public information for residents to encourage significant reduction of nutrient loss from their properties. Include the following issues: • sensible applications of fertilisers on gardens • water sensitive garden maintenance • use and disposal of detergents • maintenance of septic tanks • alternative systems available when upgrading	**LGAs,** AWMA	Low Priority One-off project requiring review
7. Minimise nutrient loss from **existing** urban point sources in the Albany harbours catchments.	7.1 Assess effluent disposal and treatment methods for existing urban point sources and provide advice on measures to minimise nutrient loss.	**LGAs**, AWMA	Medium priority One-off project requiring review
8. Minimise nutrient loss from **future** urban areas in the Albany harbours catchments.	8.1 Provide advice to planning authorities on future urban developments and their potential nutrient input to the waterways.	**AWMA**, LGAs,DPUD	Medium priority Ongoing action
	8.2 Promote the inclusion of water sensitive urban design into planning for new residential development.	**AWMA**, LGAs, WAWA	Medium priority Ongoing action
	8.3 Develop guidelines for developers and planning authorities to reduce nutrient loss from urban development.	**AWMA**, LGAs, WAWA	Medium priority One-off project requiring review

8. Minimise nutrient loss from **future** urbarn areas in the Albany harbours catchments. (Continued)	8.4 Develop coordinated policies for stormwater disposal and domestic effluent disposal within the Albany Waterways Management Area.	**AWMA**, LGAs, WAWA	High priority One-off project requiring review
	8.5 Promote the use of alternative wastewater treatment in preference to septic tanks in locations where the water table is high or in close proximity to the waterways.	**AWMA**, LGAs, WAWA	Medium priority Ongoing action

Outcomes

- **Significantly reduced nutrient loss from urban land in the Albany harbours catchments.**

1.4 Industrial nutrient sources

Goal

To reduce nutrient loss to the Albany harbours from industrial sources.

Waste material discharged from industries can contain high levels of nutrients and other pollutants. These wastes can be directly discharged to waterways through discharge outfalls or enter the waterways via runoff and groundwater from industrial areas.

Direct industrial discharge should only be allowed if connection to sewerage is unavailable, or if the discharge will not threaten the stormwater system or the waterway. New industries should be located so that they can be connected to sewerage.

The Environmental Protection Act 1986 provides Statewide pollution control powers which covers water pollution. In Albany, the water pollution control component of industrial licensing and monitoring has been delegated from the EPA to AWMA. Under this delegation, industrial discharge is controlled through licence, with conditions governing the discharge of specific substances and amounts including nutrients.

AWMA currently manages a number of industrial discharge licences under the Environmental Protection Act. These currently include two industries located on the shores of Princess Royal Harbour, which discharge directly to its waters and one located to the west of Albany which discharges into a major drainage network which eventually enters Princess Royal Harbour. The Albany Port Authority is also licensed under the same Act for loading and unloading of vessels within the Albany Port. An oyster farm and processing plant operating at Emu Point is also licensed by AWMA to discharge to the waters of Oyster Harbour.

Two industries which have made significant contributions to the pollution of Princess Royal Harbour in recent years, a seasonal abattoir and fish processing factory, have ceased operating over the last 18 months.

AWMA ensures that industries comply with licence conditions by assessing monitoring results provided by industry and carrying out random inspections and monitoring of industrial discharges.

CSBP, which manufactures fertiliser materials and discharges via a large stormwater drain, has over the last two years developed and implemented a strategy to reduce nutrient loss via surface and groundwater flows. The overall strategy has been very successful with results in 1992 showing a reduction in phosphorus loss of 97% since 1988. The other two industries discharge directly into the waters of Princess Royal Harbour. Southern Processors Pty Ltd processes a range of vegetables and Albany Woollen Mills dyes wool and synthetic yarns. In 1992, Albany Woollen Mills became the first of these industries to meet the phosphorus and nitrogen target loads set by the EPA (Refer Appendix 1). The company also installed new effluent monitoring equipment to accurately measure discharge volumes.

The State Government has recently conducted a review of the effluent and treatment options available to the industries in Albany in order to achieve the EPA's target concentrations and loads. Following this review the State Government adopted an Industrial Control Strategy to reduce nutrient input from all of the industries which discharge to the Albany harbours. The Strategy focuses on the reduction of the phosphorus input to the harbours and provides cost effective waste treatment options for its reduction. The outcome of the strategy will be closely monitored by AWMA and reviewed in three years.

Other small industries are located around Albany and within the catchment area. These are not at this time licensed, as they are considered not to have a significant impact on the waterway. However, industrial areas where light industry is concentrated may have a significant cumulative nutrient input to the waterways. Effluent treatment and disposal methods for these industries need to be assessed and upgraded where necessary to minimise nutrient loss.

New industrial areas should be designed to minimise nutrient loss. This may include drainage design, requirements for site maintenance and the use of certain technologies as a condition of development approval.

Industrial nutrient sources - action plan

Strategies	Actions	Key Players	Implementation
9. Minimise nutrient loss from existing industries in the Albany harbours catchments.	9.1 Manage the water pollution components of industrial licences with delegated authority under the Environmental Protection Act 1985 including: •receiving and assessing industry monitoring reports •spot monitoring of industrial discharge •setting appropriate licence conditions •liaising closely with foreshore industries to improve process methods and waste treatment in order to further reduce nutrient losses.	**AWMA,** EPA, IND, APA	High priority Ongoing action
	9.2 Assess effluent disposal methods and treatment strategies for industrial operations not licensed under the Environmental Protection Act 1985 and provide advice on measures to reduce nutrient loss.	**LGAs**, AWMA	Medium priority One-off project requiring review
10. Minimise nutrient loss from future industry and industrial areas.	10.1 Ensure that all new industrial developments which produce liquid effluent are connected to reticulated sewerage, or incorporate effluent management systems approved by EPA, WAWA, HD and AWMA.	**AWMA**, WAWA, EPA, HD	High priority Ongoing action
	10.2 Provide advice to planning authorities on the location and design of new industrial areas with particular regard to nutrient loss from these activities.	**AWMA**, LGAs, DPUD	Medium priority Ongoing action
	10.3 Work towards the future phasing out of all industrial discharge to the waterways.	**AWMA,** EPA, WAWA	High priority Ongoing action

Outcomes

- **Significantly reduced nutrient loss from industrial sources in the Albany harbours catchments.**

2. CONSERVATION OF THE ENVIRONMENT

Waterways have always been a focus for human settlement and recreation. The waters are used for transport, recreation and development of port and boating facilities. The foreshore areas also are a focus for residential, tourist and industrial development. In the past, waterways were often used as convenient dumping grounds for sewage, rubbish and industrial wastes. The wider catchment also supports land uses such as agriculture, forestry and urban development.

All these activities can impact on the natural functioning of the waterways ecosystem. This includes a wide variety of physical and biological components with complex interactions. Any modification to the natural balance of this system may set off a chain of interactions which are ultimately made visible by changes to the aquatic life of the system or by changes to the physical nature of foreshore areas, for example erosion and accretion.

The unique value of the waterways environment needs to be conserved and the waterways viewed as an area of special and distinctive environmental significance. Maintenance of a full complement of biophysical functions is of the utmost importance. AWMA encourages the use of the Albany waterways environment in a manner which is compatible with its protection while conserving viable representative samples of the natural ecosystem.

2.1 Water quality

Goal

To maintain and improve the overall water quality of the Albany waterways.

Waste discharges, accidental spills, urban and agricultural runoff and groundwater flow can carry a wide range of pollutants to the waterways. Pollution of a waterway to a point where water quality begins to deteriorate can alter the natural biological functioning of the waterway ecosystem. This in turn can reduce the community's enjoyment of the waterway by spoiling its appeal, restricting recreation and damaging economic uses such as fisheries.

Maintaining water quality at an acceptable level depends on the development of criteria, objectives and standards. These tools identify the level to which water quality must be maintained to allow natural ecosystem functioning to continue and the community to continue to use the waterway environment.

The first step in preventing waterway damage from pollution is to identify the problems. An important way to detect pollution in its early stages is to watch out for any changes in water quality. Water quality monitoring programmes are carried out to gather information on the current condition of the waterways and pick up any changes over time. Monitoring programmes provide an indication of pollution problems and an understanding of what is happening to the waterways - information which is vital to future management. The identification of health indicators for a waterway will also aid in determining changes in the health of the ecosystem and potential water quality problems. The concept of health indicators is further discussed in Part B Section 3.3.

An extensive monitoring programme to identify sources and loads of nutrients into the Albany harbours (Refer Part C Section 1.1) is already being coordinated by AWMA. A comprehensive monitoring programme for the waters of the Albany harbours is required to identify changes in water quality within these waterbodies. This programme should eventually focus not only on nutrients but also on other pollutants which may be entering the harbours.

Although nutrient enrichment is the greatest threat to the maintenance of the water quality of the Albany waterways (Part C Section 1), pollution of the waterways from toxins including pesticides, heavy metals and other industrial pollutants is also a potential problem.

Toxic contamination of Princess Royal Harbour was identified in 1983. The sediments and biota of the western end of the harbour were found to be contaminated with lead and mercury well in excess of the National Health and Medical Research Council's maximum permissible levels. The main source of the problem was discovered

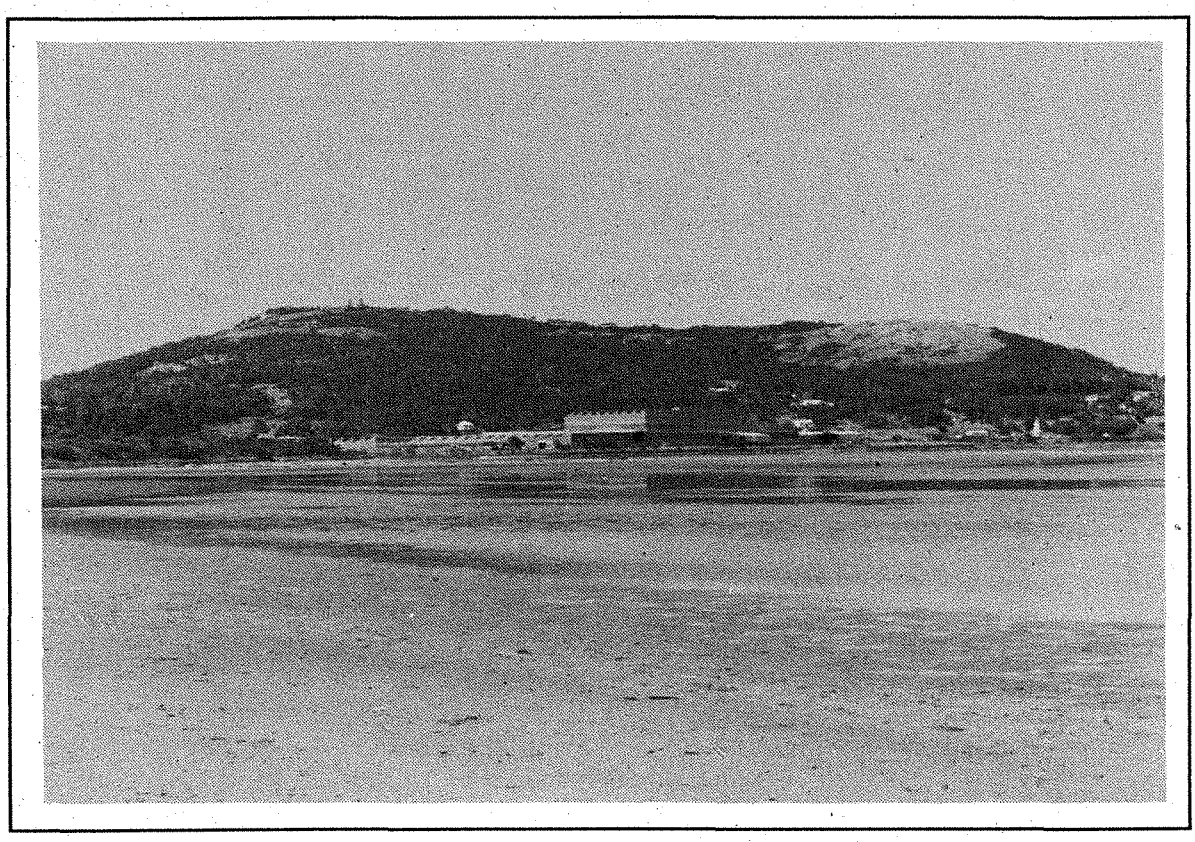
to be industrial effluent discharged by CSBP fertiliser works.

In response to these findings all forms of fishing, including the taking of molluscs, were banned from the whole of the western end of Princess Royal Harbour. The ban was effected under the Fisheries Act in 1984 and was strictly enforced by Fisheries inspectors in Albany. Although direct discharge ceased in 1984, mercury levels in certain fish species remained above the health limit for a number of years and the western end of the harbour remained closed to fishing until mid 1992.

During the years that the ban was in existence CSBP in conjunction with EPA and AWMA monitored the sediments and biota of the harbour.

This monitoring should continue to be conducted to ensure that mercury and lead levels remain below maximum permissible levels.

Spillages of petrol, oil and hazardous chemicals into the waterways or drainage networks is also a potential problem when considering the maintenance of water quality. The control and clean up of these spills involves a number of agencies. Poor communications and coordination at these times can result in unnecessary delays in cleanup operations and pollution of the waterways. There is need for a contingency plan to be developed to ensure clean up is efficient.



Effluent discharged from industry has the potential to degrade water quality in the harbours.

Water quality - action plan

Strategies	Actions	Key Players	Implementation
11. Monitor water quality of the major waterways within the Albany Waterways Management Area.	11.1 Develop a comprehensive water quality monitoring programme to identify changes in nutrient levels and other pollutants within the Albany waterways.	**AWMA**	Medium priority One-off project requiring review
	11.2 Support the FD, EPA and CSBP in the monitoring of sediments and biota of Princess Royal Harbour for heavy metal contamination to ensure levels remain acceptable.	**FD**, EPA,CSBP,AWMA	Medium priority Ongoing action requiring review
12. Identify the level to which water quality needs to be maintained to support natural ecosystem functioning and community use.	12.1 Develop water quality criteria, objectives and standards for the Albany waterways.	**AWMA**	Medium priority One-off project requiring review
	12.2 Develop health indicators for the Albany waterways to identify changes in the ecological health of the waterways ecosystem and to measure the success of management strategies employed.	**AWMA**	High priority One-off project requiring review
13. Maintain and improve the water quality in the Albany waterways.	13.1 Provide advice to planning authorities on the impact of existing and proposed developments on the water quality of the Albany waterways.	**AWMA,** LGAs, DPUD	High Priority Ongoing action
	13.2 Develop a contingency plan for dealing with pollution of the waterways from accidental spills and discharges.	**AWMA**, DOT, APA	Medium priority One-off project requiring review
	Refer to actions for reducing nutrient input	-	-

Outcomes

- **Maintenance of a high level of water quality in the Albany waterways**
- **Early identification of water quality problems arising in the Albany waterways.**

2.2 Seagrass and macroalgae

Goal

To improve the density and coverage of seagrass communities and to reduce accumulations of macroalgae in the Albany harbours.

Seagrasses are marine flowering plants (angiosperms) found in coastal rivers, estuaries and protected coastal embayments. Seagrass meadows are important to the ecological functioning of estuarine systems because they provide shelter for many marine invertebrates and some fish species. The complex root system of the seagrasses also aids in maintaining the stability of the estuary floor and as a result provides a stable habitat for molluscs, worms and other invertebrates found in the estuarine sediments.

Seagrasses are also extremely important to the productivity of the estuarine system. The decomposition of seagrass leaves produces a large amount of organic matter which adds to the formation of detritus, a major source of food for a variety of invertebrates which serve as food source for fish of commercial and recreational value. A loss in seagrass cover therefore can result in a severe depletion of dependent animal populations.

In the Albany harbours three common species of seagrass are found, namely *Posidonia australis, Posidonia sinuosa and Amphibolis antarctica.* Surveys undertaken in 1981 and 1984 of the marine communities of Princess Royal Harbour and Oyster Harbour highlighted the extensive decline of seagrass. These surveys concluded that initial decline of the seagrass communities prior to 1981 could most likely be attributed to smothering by epiphytic algae. Accumulation of macroalgae within the harbours after this time had also contributed to the further decine of these communities (Mills 1987).

Studies carried out by the Environmental Protection Authority in 1988 and 1989 found that both harbours were enriched with nutrients (Part C Section 1) and that this had led to the massive growth of macroalgae. The macroalgae were found to have caused a reduction in the light supply available to healthy seagrass meadows and was causing their continuing decline. The studies revealed that 80% and 90% of seagrass cover in Oyster Harbour and Princess Royal Harbour respectively had been lost since 1962 when seagrass meadows were considered to be in pristine condition. In 1992 a survey was conducted by the Waterways Commission to determine whether any further decline in seagrass or increase in macroalgae had occurred. The survey included mapping the distribution and density of seagrass and macroalgae within both harbours.

Figure 7 overleaf summarises the changes in seagrass and macroalgae biomass between 1962 and 1993 in both the harbours. The graphs show that seagrass biomass in Princess Royal Harbour decreased from about 10 000 tonnes in 1962 to less than 2000 tonnes in 1981. This decline continued to 1988 when less than 500 tonnes remained. Data for 1991 and 1992 shows that in terms of biomass and distribution, little has changed and the viability of the seagrass remains precarious today. The situation in Oyster Harbour is the same, with less than 200 tonnes of the original 5000 tonnes remaining.

The macroalgae, *Cladophora*, which increased dramatically in abundance between 1981 and 1984 and then declined after this period, remained in high levels in both harbours at the time of the 1992 survey. In the case of Princess Royal Harbour, the 1992 monitoring revealed a major increase in macroalgae abundance in the previous year in the order of 50%. Another macroalgae species *Chaetomorpha* has also now appeared in large quantities towards the south-eastern end of Princess Royal Harbour. Although surveying has not been undertaken in 1993, it has been observed that accumulations of macroalgae in Oyster Harbour have disappeared between 1992 and 1993. Macroalage still remians in Princess Royal Harbour however is considered to be in a degraded state.

Information collected over the years indicates that the harbours are still very fragile and it will take many years for large natural ecosystems like these to fully recover. Ongoing investigations into the seasonal growth patterns of both plant communities is required to fully understand the functioning of the waterbodies and hence

improve their health.

In 1990 the Environmental Protection Authority made a number of recommendations to remedy the problems facing the harbours (Refer Appendix 1). In regard to seagrass and macroalgae the general objectives were to reduce nutrient loading to the harbours (Refer C: Section 1), and remove the macroalgae smothering the seagrass communities. Removal of macroalgal accumulations was recommended.

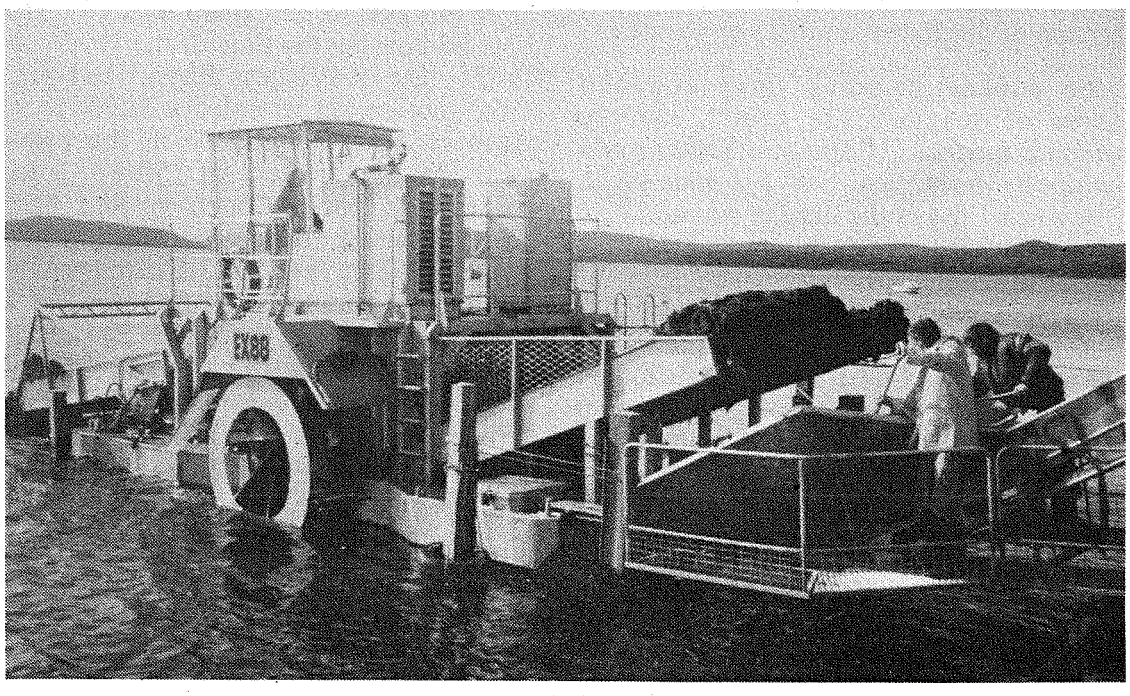
The Waterways Commission began trials on algae harvesting in Princess Royal Harbour in November 1990. Since that time considerable knowledge has been gained in type and design of equipment, techniques for the best operation of equipment.

Removal of the large accumulations of algae is expected to significantly reduce the pool of nutrients bound up in the algae itself and allow oxygenation of the sediments thereby minimising the release of nutrients from the sediments. Although this should reduce levels of nutrients, it is only considered to be an interim measure. The long term solution will also include substantially reducing the levels of nutrients entering both the harbours from external sources.

Currently most of the macroalgae is being deposited at the Hanrahan Road landfill site. A smaller quantity is being removed by private trucks direct from the barge off-loading conveyor operating in the harbour and through delivery to landowners by AWMA.

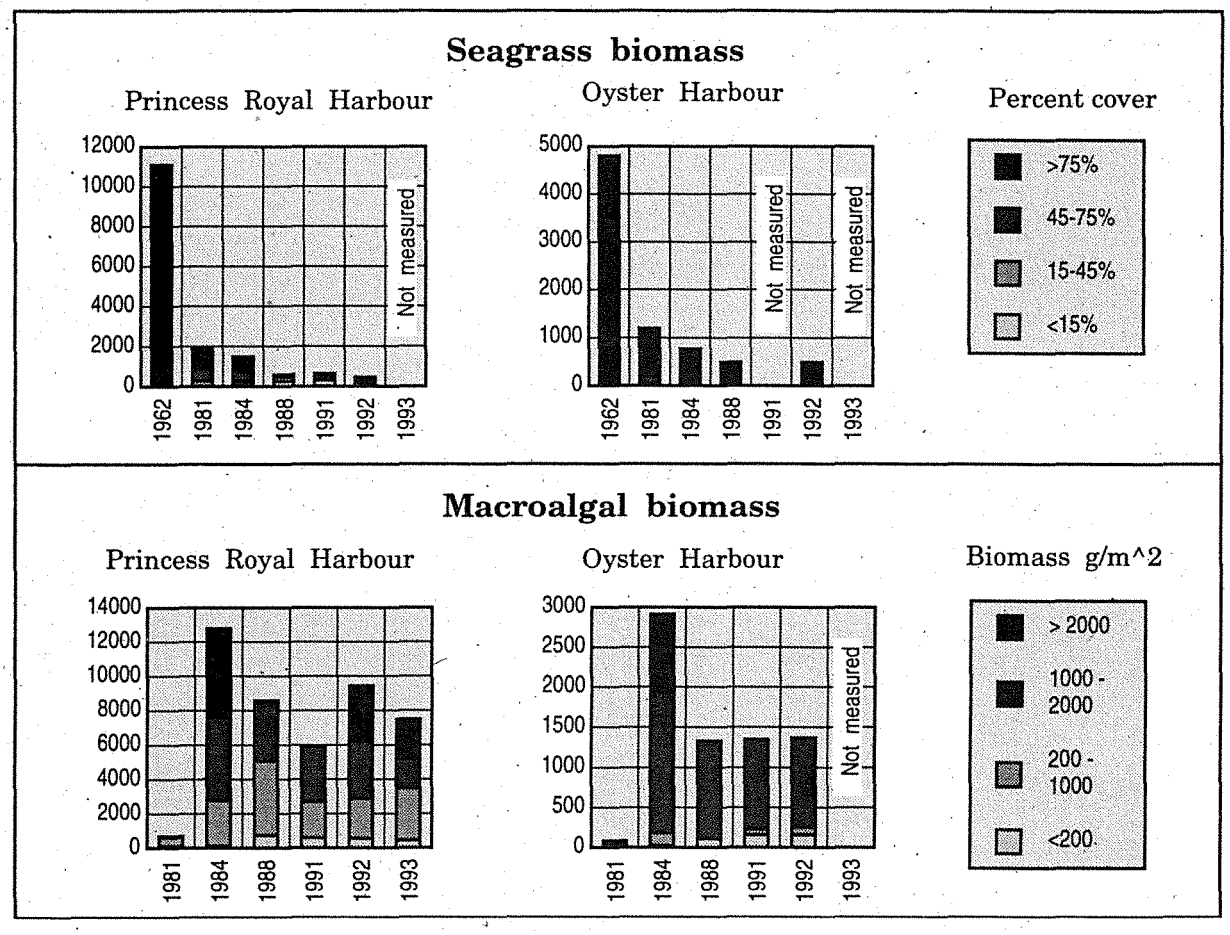
Macroalgae is also removed from the landfill site as part of a free pick up service for the community. Research into use of *Cladophora* as a fertiliser or soil conditioner is also currently being carried out by the Waterways Commission. Investigations need to continue to determine if commercial opportunities exist for the use of the algae for these purposes.

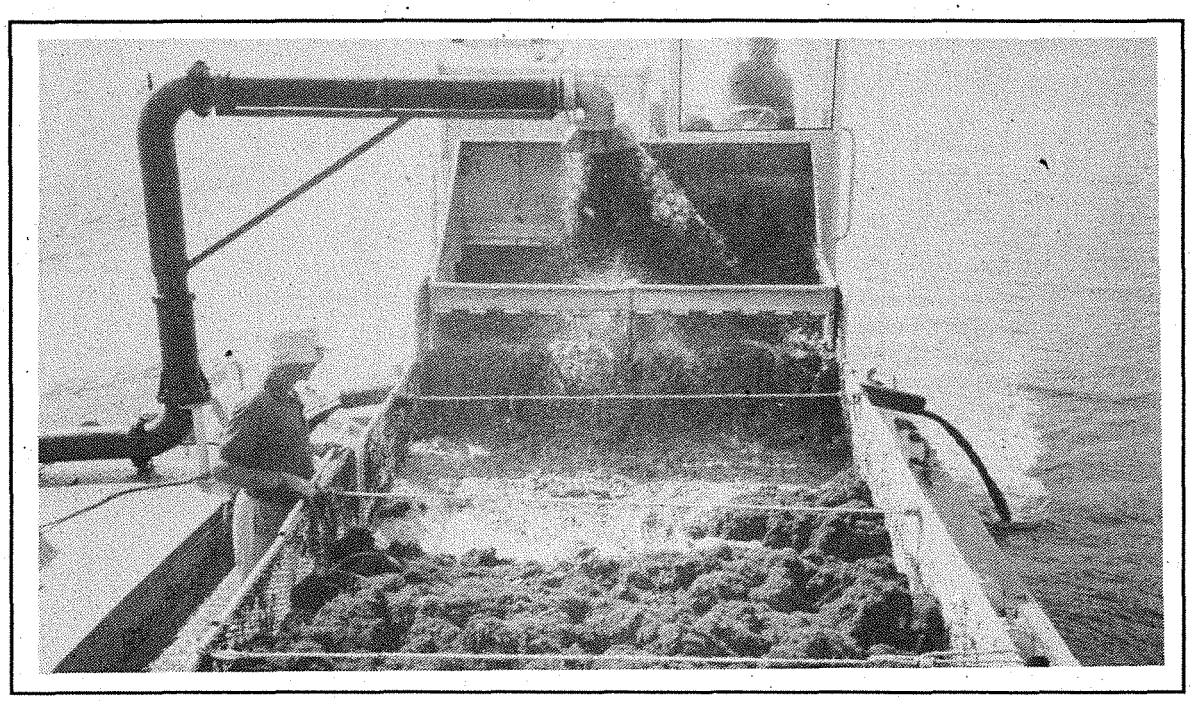
While harvesting has a major beneficial impact on Princess Royal Harbour by removing accumulations of macroalgae which are smothering the seagrass, there are a number of minor potential environmental impacts. These include the removal of a small amount of seagrass during the harvesting operations, disturbance to sediments on the harbour floor, and the removal of commercially viable fish species and disturbance to their breeding areas. Management of the harvesting operations must aim to achieve the maximum removal rate with the minimum environmental impact.



Algae harvesters are used to remove accumulations of macroalgae from Princess Royal Harbour.

Figure 7: Changes in seagrass and macroalgae biomass in the Albany harbours between 1962 and 1993





Algae is transfered from the harvesters to barges out in the harbour and then offloaded at Princess Royal Sailing Club.

Seagrass and macroalgae - action plan

Strategies	Actions	Key Players	Implementation
14. Monitor seagrass and macroalgae communities in the Albany Harbours for change in density and coverage.	14.1 Regularly carry out surveys of seagrass and macroalgae. Map changes and report on current status.	AWMA	High priority Ongoing action
15. Remove macroalgae accumulations from the harbours as quickly as possible.	15.1 Remove macroalgae using mechanical harvesters. Prioritise removal locations according to annual macroalgae surveys and carry out ongoing investigations into harvester effectiveness and efficiency.	AWMA	High priority Ongoing action
	15.2 Monitor harvesting operations for environmental impact. Refine harvester design to minimise environmental impacts where necessary.	AWMA	High priority Ongoing action
16. Dispose of harvested macroalgae in an environmentally acceptable manner.	16.1 Investigate various macroalgal disposal options. Implement cost effective and environmentally acceptable disposal methods.	AWMA	Medium priority Oneoff project requiring review
17. Improve knowledge about seagrass and macroalgae communities.	17.1 Investigate the seasonal and other cyclical variations in growth patterns of seagrass and macroalgae.	AWMA	Medium priority Ongoing action
18. Reduce nutrient inputs to the Albany harbours to reduce growth of further macroalgae.	Refer to actions for reducing nutrient inputs	-	-

Outcomes

- **An improved understanding of the biological functioning of the ecosystem of the Albany Harbours.**
- **An improvment in the environmental health of the Albany Harbours**

2.3 Foreshore areas

Goal

To protect and enhance foreshore areas around the waterways for continued enjoyment by the community and to maintain a healthy functioning ecosystem.

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

Foreshore vegetation in particular plays an important role in the natural functioning of the waterway system. Fringing vegetation stabilises banks reducing the chances of erosion and traps nutrients and pollutants draining from surrounding land. Foreshore areas also provide valuable habitat for waterbirds and other fauna. Maintenance and enhancement of this valuable resource is essential to the survival of the waterways environment.

Management of foreshore land is subject to a number of problems. Uncontrolled access can cause accelerated erosion of foreshore areas and destruction of important foreshore vegetation. Inappropriate use including burning off, stock use and vehicular use of foreshores can also cause problems.

To manage this resource a detailed assessment of foreshore land to determine its condition is required. This should include an assessment of the following:

- areas subject to erosion;
- the condition and conservation value of vegetation;
- areas where weed infestations exist;
- areas important to waterbirds and other fauna;
- provision and need for public access and access for particular uses such as commercial fishing;
- areas where stock have access;
- recreational use.

In areas where foreshore vegetation is degraded regeneration and revegetation techniques should be employed. Regeneration of the natural foreshore vegetation is preferable, however in areas where vegetation is severely degraded there may be a need for replanting of local species. Erosion control techniques should also be employed where appropriate.

Foreshore areas contain land of different ownership status including vacant Crown land, Crown reserves and land in private ownership. This can often result in inconsistencies in management.

Privately owned foreshore land can be properly managed for the purposes of conservation and waterway and foreshore protection through management agreements for these purposes. These agreements need only be simple and may involve the fencing off and exclusion of stock from foreshore areas.

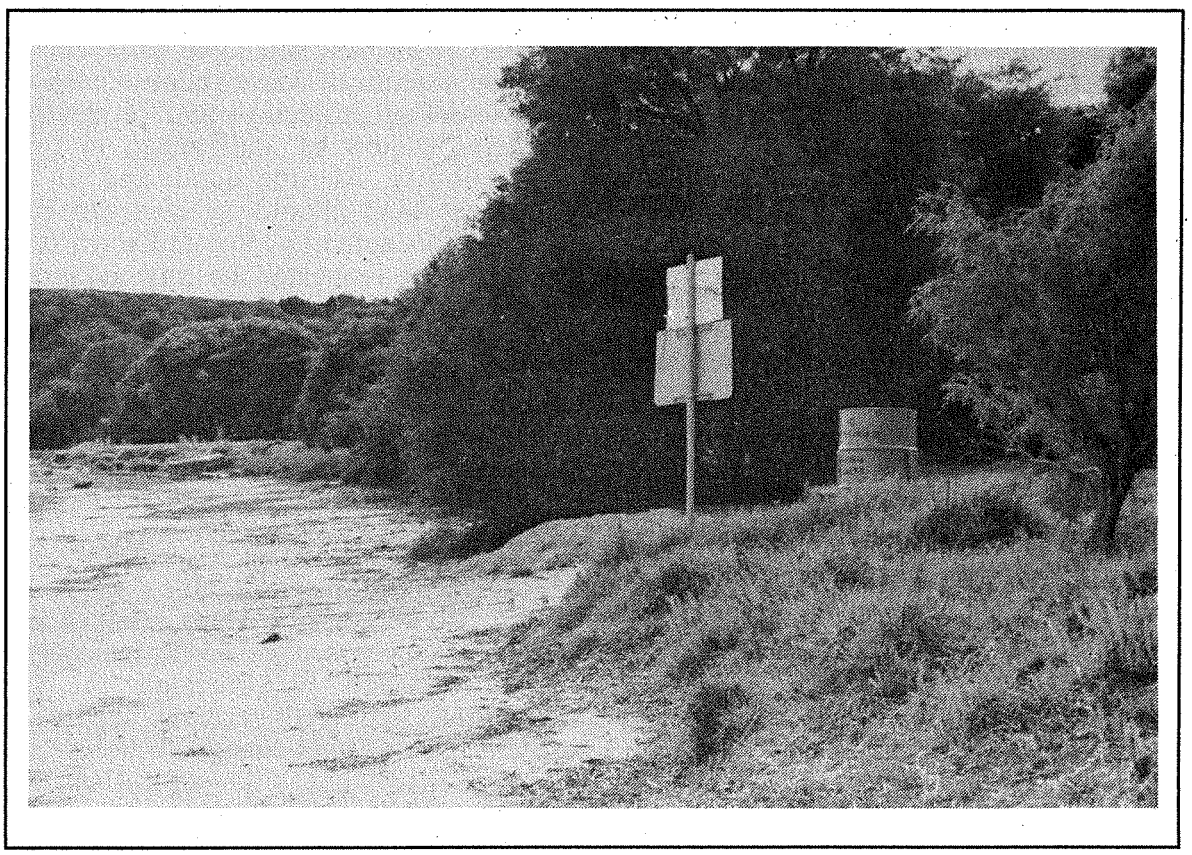
Vacant Crown land should be assessed for its value in terms of conservation, foreshore and waterway protection and recreation. Agencies should be approached to take responsibility for the land and if in agreement land should be reserved and vested in that authority. Vacant Crown land which is not requested by any authority should be vested in the local government authority or the Waterways Commission (with management responsibility delegated to AWMA). The authority then has the option of managing the land itself if funds are available or entering into a lease agreement with adjacent or nearby landowners.

Management of reserves along the river should also be assessed. Many reserves are inappropriately vested and hence unmanaged or mismanaged. A decision on the appropriate vesting of reserves should be made and the vesting changed if necessary. Change of vesting will depend on the willingness of the appropriate authority to take the vesting and the available funding for management.

AWMA's objective is to enable the public to enjoy access to foreshore areas, and to protect environmentally sensitive areas. Purchasing foreshore land from private ownership is expensive. However foreshore land may be made available for reservation through the subdivision process. This involves land being ceded free of cost to the Crown as a condition of subdivision under Section 20A of the Town Planning and Development Act.

At the time of subdivision an assessment of foreshore land and its suitability for reservation should be made by the Department of Planning and Urban Development. Authorities concerned with the protection and enhancement of waterway and foreshore areas provide advice at this time. The assessment should consider factors such as the nature of the area, the suitability for recreation, appropriate vesting and funding to manage the reserve.

The Waterways Commission's current Foreshore Management Policy is designed to provide a uniform approach to the establishment, planning and development of foreshore reserves. The policy covers aspects such as the acquisition of appropriate foreshore reserves around the waterways, the preparation of management plans for foreshore areas, protection, conservation and enhancement of foreshore areas, public access to waterways and funding for foreshore reserves around the waterways.



Foreshore areas are important to waterways functioning and also provide an important recreational resource for the community.

Foreshore areas - action plan

Strategies	Actions	Key Players	Implementation
19. Identify foreshore areas within the Albany Waterways Management Area requiring conservation and rehabilitation.	19.1 Assess the condition of foreshore areas around the Albany harbours and along the King and Kalgan Rivers. Include in this assessment consideration of the following issues: • erosion • vegetation condition • public access • use for recreational activities • stock access	AWMA	Medium priority One-off project requiring review
	19.2 Encourage the assessment of the condition of foreshore areas in private ownership by landowners and LCDCs.	AWMA, LCDCs, OHCG, LOs	Medium priority One-off project requiring review
20. Make arrangements for the protection of foreshore areas which are of high conservation value or which contain intact foreshore vegetation.	20.1 Evaluate foreshore areas for establishment and vesting as reserves for the purposes of conservation of flora and fauna or waterways protection.	AWMA, DOLA, CALM, LOs	Medium priority One-off project requiring review
	20.2 Develop management agreements with landowners for the conservation and protection of foreshore areas in private ownership where appropriate.	AWMA, LGAs, LOs	Medium priority Ongoing action
21. Carry out rehabilitation works in degraded foreshore areas within the Albany Waterways Management Area.	21.1 Develop a coordinated long term rehabilitation programme for degraded foreshore areas including the following management strategies •foreshore stabilisation •direction of public access and recreation activities into nodes •modification of recreational activities where necessary to avoid damage to banks •exclusion of stock from foreshore areas •re-establishment of foreshore vegetation •weed control	AWMA, LGAs, LCDCs, OHCG	Medium priority One-off project requiring review.

21. Carry out rehabilitation works in degraded foreshore areas within the Albany Waterways Management Area. (Continued)	21.2 Conduct rehabilitation works under joint arrangements with landowners, LCDCs and local government authorities.	**AWMA**, LGAs, LCDCs, OHCG, LOs	Medium priority Ongoing action
	21.3 Determine effective techniques for rehabilitating degraded foreshore areas. Develop a list of plant species suitable for revegetation of foreshore areas.	**AWMA**, LGAs, LCDCs, OHCG	Medium priority One-off project requiring review.
	21.4 Work with LCDCs and catchment groups to promote the revegetation, fencing and exclusion of stock from foreshore areas in private ownership. Provide advice on methods of revegetation and suitable plant species.	**AWMA**, LCDCs, OHCG, LOs	Medium priority Ongoing action
22. Ensure the protection of foreshore areas adjacent to future development.	22.1 Support the acquisition of foreshore reserves through the process of subdivision in accordance with Section 20A of the Town Planning and Development Act.	**AWMA**, LGAs, DPUD, DEV	Medium priority Ongoing action
	22.2 Ensure the boundary between private property and foreshore reserves is clearly defined and that the development of private property does not intrude onto the foreshore reserve.	**AWMA**, LGAS, DEV	Medium priority Ongoing action
	22.3 Require the preparation of foreshore management plans by developers for foreshore areas affected by developments near waterways.	**AWMA**, LGAS, DPUD DEV	Medium priority Ongoing action
	22.4 Limit commercial development in foreshore areas to tourist accommodation, restaurant operations and those developments requiring a water frontage (e.g. marine sales and maintenance operations, canoe and boat hire operations).	**AWMA**, LGAs, DPUD, DEV	Medium priority Ongoing action
	22.5 Where revenue is raised from commercial developments on foreshore land require the contribution of moneys for the upkeep of foreshore reserves and waterways management.	**AWMA**, LGAs, DPUD, DEV	Medium priority Ongoing action

Outcomes

- **Conservation of foreshore areas as an integral part of waterways functioning.**
- **Maintenance of a natural vegetation buffer between nutrient sources and the waterways.**
- **Conservation of representative plant communities around the waterways.**

2.4 Catchment vegetation

Goal

To increase the coverage of vegetation in the Albany harbours catchments.

The catchments of the Albany harbours have been extensively cleared of vegetation for agricultural purposes. The Department of Agriculture has estimated the average percentage of area cleared within the catchments of Princess Royal Harbour and Oyster Harbour to be 35% and 72% respectively. A large percentage of this cleared land is also in private ownership with remaining vegetated areas in large reserves, primarily in the Stirling Ranges and the Porongorup Ranges. The percentage of land cleared in each subcatchment is provided in Table 1 and the location of these subcatchments is provided in Map 3.

Extensive clearing has generated an excess of water in the landscape. Drainage of land to enable agriculture to be carried out promotes the movement of water and the movement of nutrients and other pollutants from the land to the waterways. Re-establishment of vegetation in the catchment, especially along streamlines, will not only serve as a trapping mechanism for nutrients and other pollutants flushed from the catchment, but will also provide wildlife habitats and visually pleasing areas for the community to enjoy.

Currently the Department of Agriculture has responsibility for the assessment of applications for clearing of vegetation under the Soil and Land Conservation Act. Under the Act landowners intending to clear one hectare or more must give the Department of Agriculture a 'Notice of Intention to Clear'. The Department's assessment of applications is carried out according to guidelines developed for clearing on the South Coast.

To reduce the chance of nutrient-rich runoff entering a waterbody, the guidelines stipulate that a buffer strip of natural vegetation should be left along each side of inlets, rivers and creeks. The guidelines also suggest that clearing not be permitted in areas that are susceptible to land degradation where problems such as wind and water erosion, high salinity and water logging exist.

With the same aim the Waterways Commission is currently developing the concept of the Waterways Protection Precinct (Refer Part A Section 5). This precinct defines the area which is of critical importance in maintaining the waterways ecosystem. This includes defining an area of vegetation which needs to be protected or rehabilitated along the major waterways. The importance of vegetation to the waterway ecosystem will vary from area to area depending on the nature of the vegetation, landform, habitats it provides and many other factors. Consequently the width of vegetation required to be protected will vary also. Any guidelines for clearing of vegetation within the catchment, especially along water courses, should reflect the approach taken in establishing the Waterways Protection Precinct and focus on ecosystem requirements.

Retention and rehabilitation of existing remnant vegetation in the catchment should be encouraged. This would serve not only to prevent further degradation of land and water resources but also to protect conservation, landscape and heritage values. Management should focus on developing catchment targets for the establishment of deep rooted perennial plants, preferably local indigenous species but also high water using and suitable exotic species.

Table 1: Percentage of subcatchments cleared in catchments of the Albany harbours

Catchment	Subcatchment	Total area (ha)	% of catchment cleared	% of private land cleared
Princess Royal Harbour	Robinson Drain	689	91	96
	CSBP	675	85	96
	Albany Town	472	49	76
	PRH	6515	23	46
	Total	**8351**	**35**	**61**
Oyster Harbour	King	16805	97	98
	Millbrook	16224	94	94
	Upper Kalgan	202719	66	89
	Lower Kalgan	41852	88	91
	North Oyster	8683	70	77
	Chelgiup	5055	85	85
	Willyung	3404	90	97
	Johnston Creek	6193	51	71
	Yakamia	2133	82	96
	Albany Town	1024	?	?
	Total	**304092**	**72**	**90**

Source: Western Australian Department of Agriculture (1991) Draft Strategy for Reducing the Nutrient Load from Rural Sources to Albany Harbours.

Revegetation of the Albany harbours catchments will aid in preventing further degradation of land and water resources.

Catchment vegetation - action plan

Strategies	Actions	Key Players	Implementation
23. Identify existing remnant vegetation in the Albany harbours catchments.	23.1 Support the mapping of remnant vegetation within the Albany harbours catchments.	**DAWA**, CALM, DOLA, LGAs, BFB, AWMA	Medium priority One-off project requiring review
	23.2 Determine management responsibility for remnant vegetation in the Albany harbours catchments.	**DAWA**, CALM, DOLA, LGAs, BFB, AWMA	Medium priority One-off project requiring review
24. Conserve and enhance vegetation within the Albany harbours catchments.	24.1 Support and promote the protection of existing remnant vegetation within the catchment.	**DAWA**, CALM, AWMA LCDCs, OHCG, LOs,	High priority Ongoing action
	24.2 Assist in the development of a strategy for revegetation of the Albany harbours catchments.	**DAWA**, LCDCs, OHCG, LOs, CALM, AWMA	Medium priority One-off project requiring review
	24.3 Support LCDCs, DAWA, OHCG, and landowners to increase vegetation cover in the Albany harbours catchments.	**DAWA**, LCDCs, OHCG, LOs, CALM, AWMA	Medium priority Ongoing action
	24.4 Support full implementation of the catchment clearing guidelines for the South Coast and follow up of compliance with conditions.	**DAWA**, LCDCs, OHCG, LOs, CALM, AWMA	High priority Ongoing action
	24.5 Support the development of tree based industries in the Albany harbours catchments.	**DAWA**, LCDCs, OHCG, LOs, CALM, AWMA	Medium priority Ongoing action
	24.6 Support the integration of revegetation of farm land into farm planning.	**DAWA**, LCDCs, OHCG, LOs, CALM, AWMA	High priority Ongoing action

Outcomes

- **An increase in vegetation cover in the Albany harbours catchments**
- **An increase in water utilisation on rural land**
- **A decrease in water loss from rural land and consequent reduction in erosion**
- **A reduction in soil bound nutrient loss from rural land.**

2.5 Fisheries

Goal

To maintain the fishery of the Albany harbours and associated waterways for the benefit of the community by conserving fish species and habitats.

Professional fishing is carried out in both Princess Royal Harbour and Oyster Harbour as well as in King George Sound. The principal fish product is pilchards which are netted in King George Sound and Princess Royal Harbour. Pilchards are processed for pet food and angling bait in Albany. Other important commercial fish species include cobbler, leatherjacket, Australian herring and Australian salmon.

Large oyster and abalone farms have been proposed for Albany in Princess and Oyster Harbours. It is also anticipated that a land based abalone industry and hatchery will be developed at Frenchman Bay.

Recreational fishing is also an important leisure activity for the people of Albany. The town jetty and other access points around the harbours provide important places where this activity can be undertaken subject to Government regulations.

Fishery management is the responsibility of the Fisheries Department. The department provides specialist advice on the fishery resource to management bodies such as AWMA. AWMA in turn provides advice on the impact commercial fisheries may have on the waterway environment. One particular issue of importance to AWMA is the impact of commercial fishing operations, especially aquaculture, on the seagrass communities of Princess Royal Harbour and Oyster Harbour.

The impact of recreational fishing on the waterway is also of concern. Educational information designed for this user group should be developed to ensure these impacts are minimised. This should include a guide to locations suitable for recreational fishing, and information on protecting fish stocks and the waterway environment.

Continuation of commercial and recreational fishing in the Albany waterways is dependent on the maintenance of good water quality, sufficient habitats and breeding grounds. AWMA's role as waterway manager is therefore vital to the maintenance of this resource.

Fisheries - action plan

Strategies	Actions	Key Players	Implementation
25. Minimise the impact of fishing activities on the ecological functioning of the waterway.	25.1 Liaise with the Fisheries Department to protect breeding areas and fish habitat.	AWMA, FD	Medium priority Ongoing action
	25.2 Seek referral of all aquaculture proposals and provide advice to the Fisheries Department on the impact of these proposals on the waterway environment having particular regard for the impact on seagrass communities, nutrient enrichment and the introduction of toxic organisms.	AWMA, FD	High priority Ongoing action
	25.3 Liaise with the Fisheries Department to prepare educational material on the conservation of the fishery resource.	AWMA, FD	Low priority Ongoing action
	25.4 Encourage research to be undertaken on species taken by commercial and recreational fishing and the impact of water quality changes on fish stock.	AWMA, FD	Medium priority Ongoing action

Outcomes

- **A sustainable and healthy fishery resource in the Albany waterways**
- **Recreational fishing able to be enjoyed by the community**
- **A sustainable professional fishing industry.**

2.6 Landscape

Goal

To maintain and protect both natural and modified landscapes which provide a visually attractive backdrop for the waterways.

Waterway environments contain a variety of landscapes, both natural and modified, which require protection as they often provide a visually attractive backdrop to the waterway, contain places of scientific or historic interest, or contain unique or unusual waterway ecosystems.

AWMA is responsible under Section 24(4)(a) of the Waterways Conservation Act 1976 to have regard for the natural beauty and amenity of the Albany Waterways Management Area. Local government also has a key role in landscape protection through its town planning scheme.

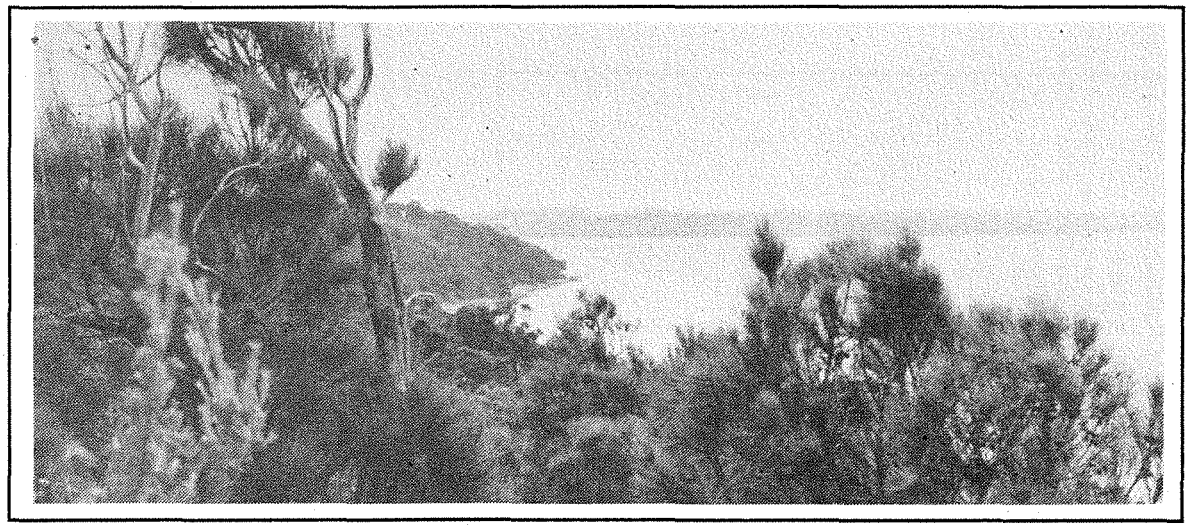
The Albany area has a distinctive character. The sweeping views from many areas around Princess Royal and Oyster Harbours give the area a majestic feel. This character is a major attraction to residents and visitors to the Albany area.

To maintain this unique character important landscape features and significant views to and from the waterway should be maintained and enhanced. Many areas within the Albany Waterways Management Area, both in the river and harbour environments, provide unique landscapes which require protection. Protection of these areas is closely linked with the protection of foreshore areas for the purposes of protecting foreshore vegetation, provision of public access and appropriate use of foreshore areas (Refer Part C: Section 2.3).

The Department of Planning and Urban Development has carried out a preliminary assessment of landscape values in the Albany area. Whilst this assessment does not focus specifically on the waterway environment it does provide useful guidelines for landscape protection. A detailed landscape study to identify landscape features and significant views to and from the waterways is needed to enable their protection.

Control of inappropriate land uses is warranted in order to protect the foreshore, retain its aesthetic attractivenes and prevent undesirable developments which may detract from the amenity of the foreshore. Inappropriate development such as advertising and illegal development such as filling mar the landscape. Any high rise developments sited too close to the waterway also have the potential to adversely affect it. Development around the waterways should blend in with the natural waterway landscape taking account of factors such as scale, height, colours and materials.

The formulation of a policy or set of guidelines by local government authorities outlining acceptable standards and site criteria is one way of ensuring that development around the waterways is compatible with the waterway landscape.



Significant views to and from the waterways should be protected and enhanced.

Landscape - action plan

Strategies	Actions	Key Players	Implementation
26. Protect high valued landscapes through appropriate land use and development mechanisms.	26.1 Carry out a landscape study for the Albany waterways. Include in this study the identification of landscape attributes and suitable means of protection.	**AWMA**, LGAs	Low priority One-off project requiring review
	26.2 Ensure landscaping plans implemented by local government and developers are consistent with AWMA's overall landscape plan.	**AWMA**, LGAs, DEV	Low priority Ongoing action as required.
	26.3 Encourage LGAs to protect landscape values through town planning scahemes and local rural strategies.	**AWMA**, LGAs	Medium priority Ongoing action
	26.4 Provide advice to planning authorities on the impact of development on the landscape of the Albany waterways.	**AWMA**, LGAs, DPUD	Medium priority Ongoing action

Outcomes

- **Protection of important landscapes around the Albany waterways.**
- **A visually attractive waterways environment.**

2.7 Floodprone land

Goal

To ensure the protection of the natural ecosystems which exist on floodprone land and to balance the natural process of flooding of foreshore land with the protection of property from damage.

Low lying lands adjacent to waterways are often subject to flooding. This is a natural occurrence, however development of foreshore areas has the potential to disrupt this natural process. Inundation of areas which do not usually experience flooding and consequent damage to property may result. Modification of land use in the catchment area and the increased movement of water also has the potential to add to this problem.

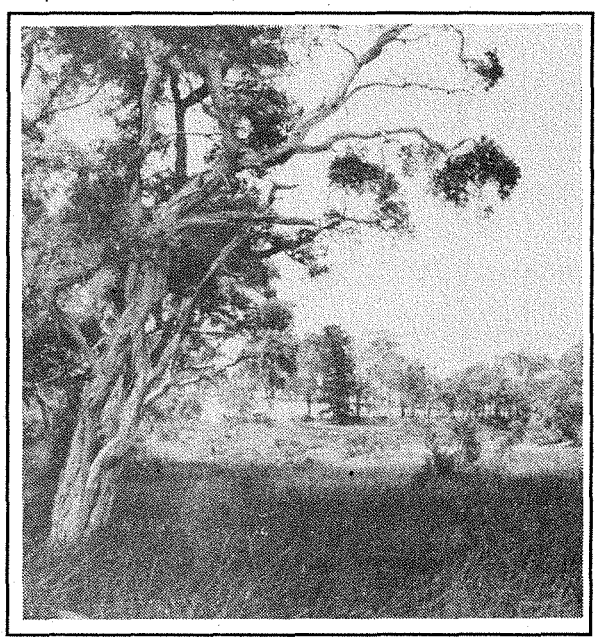
AWMA's interest in the protection of floodprone land includes maintaining the natural process of flooding, but also extends to the protection of the ecosystems which exist on flood prone land. These ecosystems are valuable to the natural functioning of the waterways as they contribute to the assimilative capacity of the waterways.

The flood plain and its associated vegetation are an important part of the waterways environment. This area provides the interface between the aquatic and terrestrial environments. Vegetation in this area stabilises the waterway edges and provides important wildlife habitat. It also plays a part in absorbing nutrients and other pollutants being flushed from the catchment area and therefore contributes to the overall assimilative capacity of the ecosystem. Filling or development of these areas can result in the clearing of vegetation and the resulting loss of wildlife habitat and the further nutrient enrichment of adjacent waterways. It is therefore important that development proposals on floodprone land incorporate consideration of the ecological importance of the area.

In many areas where flooding is a problem, flood studies which identify the heights and routes of flood waters and develop management strategies for the future development of floodprone land have been undertaken. To date the Albany area has not been considered a priority for such a study. Future development of urban areas in the Albany region especially in the lower reaches of the King and Kalgan Rivers however may increase the need for such a study.

The primary agency responsible for flood plain management is the Water Authority of Western Australia. This is the only agency with the resources and expertise to adequately address the issue. Under current arrangements, the Water Authority of Western Australia acts as a consultant and advises planning authorities on matters affecting the passage of flood waters. The final decision on planning and development proposals is made by the planning authorities.

The object of flood plain management is to ensure the wise use of floodprone land to minimise flood risk, damage and hazard. Effective management depends on cooperation and coordination between public authorities at all levels of government.



Flood prone land forms the interface between the aquatic and terrestrial environments

Floodprone land - action plan

Strategies	Actions	Key Players	Implementation
27. Minimise the impact of development around the waterways on the natural process of flooding.	27.1 Encourage WAWA to carry out a flood study of the Albany waterways and prepare flood maps identifying the floodway, flood fringe and flood plain for use by planning authorities when assessing the impact of planning proposals.	**WAWA**, AWMA, LGAs, DPUD	Low priority One -off project requiring review
	27.2 Ensure all planning proposals in close proximity to the waterways are referred to WAWA for advice on the impact proposals may have on flooding.	**AWMA**, WAWA, LGAs, DPUD	Low priority Ongoing action
	27.3 Develop a policy for development of floodprone land taking into account potential impacts on the natural process of flooding and the ecological functioning of this land.	**WAWA**, AWMA, LGAs, DPUD	Medium priority Ongoing action
28. Minimise the impact of development on the ecological values of floodprone land.	28.1 Identify areas where filling of floodprone land may result in the loss of important flora and fauna and ensure planning authorities are aware of the significance of these areas.	**AWMA**, LGAs, DPUD	Medium priority Oneoff project requiring review

Outcomes

- **Maintenance of the natural process of flooding**
- **Protection of vegetation and wildlife habitats on floodprone land**

2.8 Cultural sites

Goal

To ensure sites of scientific, heritage and cultural importance on or around the waterways are identified, conserved and protected.

There are a number of Aboriginal sites which are in close proximity to or part of the Albany waterways. Waterways are often of mythological significance and this means that any direct impact on them is likely to be of concern to Aboriginal people. All sites are protected by the Aboriginal Heritage Act 1972-1980 and should not be disturbed without the consent of the Minister for Aboriginal Affairs.

The Albany area, in particular the northern shore of Princess Royal Harbour, has been a focus for European settlement since the early 1800s. A number of sites around the waterways are either listed or registered with the State's Register of Heritage Places or National Estate Register. These sites are protected under the Heritage of Western Australia Act 1990 or the Australian Heritage Commission Act 1975 respectively. Under the State legislation the Heritage Council of Western Australia provides advice to planning authorities on heritage values.

In processing planning proposals adjacent to waterways, all impacts on the physical, biological and cultural environment should be considered including the impact of development on European and Aboriginal sites.

Information on Aboriginal sites is confidential and kept at the Aboriginal Sites Department of the Western Australian Museum. By referring all development proposals and management actions to this department, disturbances to any places of Aboriginal heritage can be avoided.

Information on European sites is generally more easily accessible. However, 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 the Register of Heritage Places or the National Estate Register.

Cultural sites - action plan

Strategies	Actions	Key Players	Implementation
29. Minimise the impact of development around the waterways on the Aboriginal and European heritage values.	29.1. Consult with the Department of Aboriginal Sites, WA Museum, to determine if planning proposals or management actions on or adjacent to the waterways will have adverse impact on Aboriginal sites.	**AWMA,** LGAs, DPUD, WAM	Low priority Ongoing action
	29.2. Consult with the Heritage Council of Western Australia to determine if planning proposals or management actions on or adjacent to the waterways will have adverse impact on European heritage values.	**AWMA,** LGAs, DPUD, HCWA	Low priority Ongoing action
30. Identify and protect important European historic sites on or around the waterways.	30.1 Encourage the incorporation of European historic sites into recreation and tourist planning for the waterways.	**LGAs,** AWMA,WATC, MSR	Low priority Ongoing action
	30.2 Encourage the development of historic attractions around the waterways where educational information can be provided to raise public awareness of the history of the Albany area.	**LGAs,** AWMA,WATC, MSR	Low priority Ongoing action
	30.3 Encourage the listing or registration of significant European historic sites with the State's Register of Heritage Places or the National Estate Register to ensure their future protection.	**AWMA,** LGAs, HCWA, AHC	Low priority Ongoing action

Outcomes

- **Protection of significant cultural sites around the waterways environment.**

3. PLANNING FOR THE FUTURE

The Town of Albany is a regional centre which services a large rural hinterland. Growth of the town is producing the need to provide further urban areas both within the town site and in other locations around the Albany harbours. In addition, pressures within the catchment area, including an increase in hobby farming activities and changes in land use in response to economic and environmental influences, are increasing.

Waterways management focuses on balancing future development with the protection and enhancement of the waterway environment. Inherent in this is the necessity for future development on and around the waterways to be properly planned and coordinated so as to minimise the impact on the waterways environment. Planning may include encouraging intensive development in certain designated areas, while totally prohibiting development in others. It may also include the appropriate design of development to minimise impact.

AWMA's objective is to encourage a situation whereby future regional and local planning practice seeks to protect the Albany waterways and their associated environments from the impacts of development.

3.1 Regional planning

Goal

To promote the integration of waterway protection and management into the regional planning framework.

In order to manage a waterway, appropriate planning and management in the catchment including both the rural and urban components is essential. Planning at a regional level which recognises this will go a long way to ensuring the health of the waterways in years to come.

Currently regional planning in Western Australia is coordinated by the Department of Planning and Urban Development (DPUD). The primary objective of the department is to provide an effective regional planning and development framework to guide decision making on land use, development and related matters for the benefit of present and future generations. To achieve this objective the department supplies staff, finance and resources for the preparation of regional planning documents.

DPUD is currently preparing the Albany Regional Planning Study. When the study is complete it will provide a regional strategy to guide private land use and development, local government and other government activity in the immediate areas surrounding Albany. It is planned that the strategy will be flexible allowing it to be subject to ongoing assessment, review and modification.The overall planning study contains five major components:

- a public participation programme
- a regional profile
- an issues, opportunities and constraints paper
- a regional rural strategy
- a structure plan for urban development in the Shire and Town of Albany.

The Regional Profile released in May 1991 forms part of the planning study by providing information for development of the Regional Planning Strategy. It also provides an information base for residents, small businesses, farmers, industry, government agencies, educators, environmentalists, the tourist industry and all other interests in the area.

The Regional Rural Strategy forms the rural component of the Regional Planning Strategy. It contains rural policies and a plan of preferred predominant land uses which will guide local authorities preparing local rural strategies and considering land use changes, and will assist government agencies in planning for rural service provision. The structure plan or Residential Expansion Strategy for Albany addresses the future needs for urban expansion in Albany.

The overall planning study provides an opportunity to develop strategic decisions and policies which assist in waterway management. AWMA's interest in regional planning focuses on the impact planning decisions may have on the waterway. This may involve land use changes or development proposals which include direct discharge to the waterways, use of foreshore land or use of the waterways.

Regional planning - action plan

Strategies	Actions	Key Players	Implementation
31. Include consideration of waterways protection in regional planning decisions.	31.1 Provide advice to DPUD in regard to waterway conservation needs during preparation of the regional planning strategies.	**AWMA**, DPUD, GSDA	Medium priority One-off project
	31.2 Ensure that AWMA is consulted by DPUD on proposed amendments to the Albany Regional Planning Strategy which affect waterways.	**DPUD**, AWMA, GSDA	Medium priority Ongoing action
32. Support and utilise regional strategic planning mechanisms for the protection of the waterways environment.	32.1 Support and assist in the implementation of the Albany Regional Planning Strategy.	**AWMA**, DPUD, GSDA	Medium priority Ongoing action
	32.2 Ensure the AWMA Management Programme and other plans developed for the area are consistent with the Albany Regional Planning Strategy.	**AWMA**, DPUD, GSDA	Medium priority Ongoing action

Outcomes

- **Consideration of waterway protection in regional land use and development decision making.**
- **Protection of areas important to waterways conservation.**
- **Coordination of planning throughout the region particularly from a waterways management perspective.**

3.2 Local Planning

Goal

To promote the integration of waterway planning and management into the local planning framework.

Five local government authorities (LGAs) are situated wholly or partly within the Albany harbours catchment. These include:

Town of Albany
Shire of Albany
Shire of Plantagenet
Shire of Cranbrook
Shire of Gnowangerup

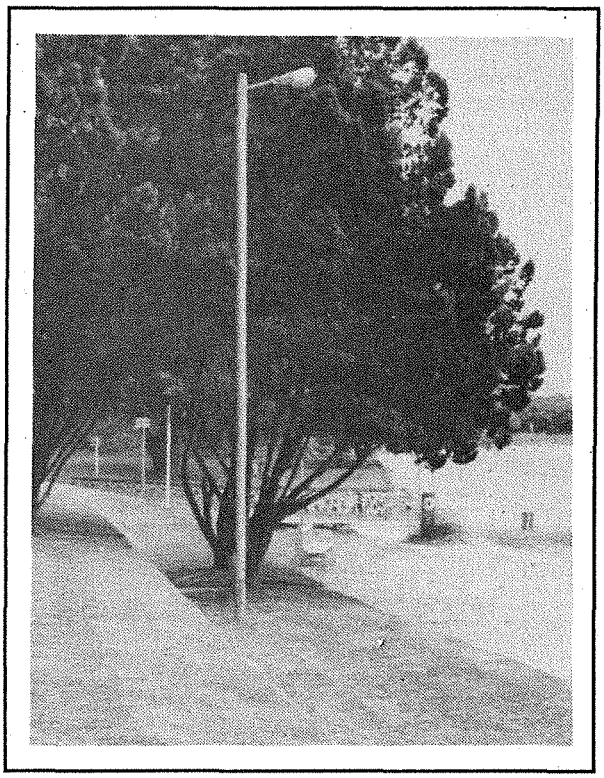
These LGAs are responsible for local planning and development control, provision of recreation facilities, and management and maintenance of reserves of which they are the vesting body. LGAs are encouraged to prepare town planning schemes and local rural strategies to plan for development and changes in land use within their area.

All local government authorities in the area have current town planning schemes and the Shire of Albany is also currently preparing a Local Rural Strategy for the Shire.

The Town Planning and Development Act 1928-1986 confers several important powers upon the LGAs which have a direct impact on the management of the Albany waterways. Firstly they can prepare and initiate changes to town planning schemes which control development along and in proximity to the waterways. Secondly they approve and supervise residential and commercial developments which may impact on the harbours and finally they provide advice to the Department of Planning and Urban Development on the suitability of subdivision and amalgamation of land in proximity to the harbours.

Under Section 36 of the Waterways Conservation Act AWMA has the power to request the referral of town planning schemes and planning proposals which may impact on the waterways for its consideration. This includes proposals being considered by the Department of Planning and Urban Development and local government authorities. AWMA may make recommendations to planning authorites in regard to nutrient management, foreshore management, public access, landscape protection, conservation and other issues relevant to waterways management.

Through town planning schemes local government has a vital and positive role to play in the protection and good management of the Albany waterways. In the review and preparation of town planning schemes it is hoped that provision will be made for the development of policies or the inclusion of conditions to ensure protection of the waterways and foreshores. One of AWMA's roles is to encourage this approach.



The provision of adequate public access to foreshore areas is an issue which can be addressed through local planning mechanisms.

Local planning - action plan

Strategies	Actions	Key Players	Implementation
33. Include consideration of waterways protection in local planning decisions.	33.1 Develop and implement a system for planning proposals which may impact on the waterways to be referred to AWMA for advice.	AWMA, LGAs, DPUD	High priority One-off project requiring review
	33.2 Provide advice to local planning authorities on planning proposals referred to AWMA.	AWMA, LGAs, DPUD	High priority Ongoing action
	33.3 Ensure the nature of advice provided to planning authorities is such that it is relevant and structured in a manner which can easily be incorporated into the planning approval system.	AWMA, LGAs, DPUD	High priorityOngoing Action
	33.4 Establish a system to monitor acceptance and implementation of AWMA conditions on planning proposals.	AWMA, LGAs, DPUD	Medium priority One-off project requiring review
	33.5 Develop sets of guidelines for developers on particular waterway issues for consideration in design and planning of development proposals.	AWMA	Medium priority Various one off projects requiring review
34. Support and utilise local strategic planning mechanisms for the protection of the waterway environment.	34.1 Actively participate in the preparation, development and review of town planning schemes and local rural strategies, structure plans and other local planning mechanisms to ensure adequate consideration of waterways issues.	AWMA LGAs	High priority Ongoing action
	34.2 Develop guidelines for the protection and enhancement of waterways for consideration in the preparation of Town planning schemes and Local rural strategies.	AWMA	High priority One-off project requiring r~view

35. Keep local planning authorities informed on issues affecting the waterways and how management strategies can be incorporated into local planning.	35.1 Provide local government authorities with waterways information on or immediately following publication (e.g. reports, policies, leaflets etc).	**AWMA**	Medium priority Ongoing action
	35.2 Conduct yearly seminars for relevant local government officers on issues relating to waterways management.	**AWMA**	Medium priority Ongoing action

Outcomes

- **Consideration of waterways protection in local planning.**
- **Increased awareness in the local government arena of the need for waterways protection.**

3.3 Climate Change

Goal

To ensure development and protection of foreshore areas takes into account the potential for sea level rise as a result of future climate change.

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 rise in sea level associated with the expected climate change may have serious implications for waterways management. Not only may properties close to the waterway margins be threatened with inundation but also foreshore areas vital to the natural functioning of the waterways environment may be lost.

In November 1990 the Western Australian Government released the Western Australian Greenhouse Strategy. The goal of the strategy was to ensure that the community of Western Australia is informed about, and within the context of sustainable development is able to respond to, the consequences of a changing global atmosphere.

One recommendation made by the strategy was to develop and implement planning and building regulations for areas prone to erosion and flooding. This recommendation was especially relevant to coastal and waterway areas where sea level rises may have an impact on the activities carried out in foreshore areas and the biological functioning of these ecosystems.

To support this strategy AWMA needs to take into account the potential for sea level rise when providing advice on the impact of development on the waterways. This issue should have particular relevance when assessing the width and shape of foreshore reserves. Reserves should include enough land to ensure that an adequate buffer is maintained between development and the waterway should sea level rise.

Climate change - action plan

Strategies	Actions	Key Players	Implementation
36. Include consideration of climate change in decision making in regard to waterways management and protection.	36.1 Support the State Government's Greenhouse Strategy, particularly in regard to recommendations made about sea level rise.	**AWMA**, WAWA	Low priority Ongoing action
	36.2 Include consideration of possible sea level rise when providing advice on the impact of development around the waterways.	**AWMA**, WAWA, LGAs, DPUD	Low priority Ongoing action
	36.3 Take into consideration the rise in sea level when assessing the width and shape of foreshore reserves to ensure the protection of a sufficient amount of foreshore area should sea levels rise.	**AWMA**, WAWA, DOLA	Medium priority Ongoing Aation
	36.4 Ensure that foreshore facilities and structures are adequately designed and located to accommodate possible sea level rise.	**AWMA**, LGAs, DOT, WAWA, APA	Medium priority Ongoing action

Outcomes

- **Protection of foreshore areas from possible sea level rise.**
- **Minimal damage to foreshore facilities as a result of possible sea level rise.**

4. PROVIDING FOR COMMUNITY USE

Waterways in their natural state are of great scenic and aesthetic value. They are significant tourist assets and can be enjoyed by the general community for recreational activities. As available leisure time increases, it is expected that their value as recreational assets will also increase. The proximity of the Albany waterways to the town of Albany accentuates this trend as urban dwellers seek convenient areas for their recreational pursuits.

Waterway management must recognise that the community wishes to use the waterway environment, and promote its use in a manner which is compatible with the protection of the natural environment. In doing this AWMA acknowledges the intrinsic value of the waterway environment to recreational and tourist users, and the limited capacity of the waterway environment to provide these opportunities for an increasing population.

4.1 Recreation

Goal

To cater for a range of recreational opportunities which reflect the needs of the community and are compatible with the protection of the waterway environment.

In 1990 the CSIRO carried out a survey to determine community attitudes to water quality and the recreational use of the Albany harbours. This survey provided valuable information on the level and nature of recreational use of the harbour waters and foreshores.

Results of the survey showed that approximately 50% of surveyed residents used the harbours for recreation activities. A statistically higher proportion of surveyed residents was also seen to use Oyster Harbour for recreational activities in comparison to Princess Royal Harbour .

The survey showed that activities carried out on the harbours included picnicking, walking, swimming, fishing, boating, exercising, cycling, diving, and water skiing.

AWMA's role in planning and management for recreational use of the Albany waterways and their associated foreshore areas is threefold. Firstly AWMA aims to promote a wide range of recreational opportunities which are satisfying to users. Secondly AWMA supports waterway recreation and provides assistance in the provision of facilities by local government authorities and other groups and thirdly AWMA aims to ensure that recreational activities are compatible with the protection of the waterway environment by suggesting areas capable of sustaining agreed uses.

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 waterway's capability to provide for their recreation opportunities. Planning must consider these desires and expectations, and then determine priorities and suggest areas capable of sustaining agreed uses.

As the waterways are a limited resource, consideration should be given to providing alternative sites outside the waterways for some activities to reduce the impact of human activity. For this reason it is essential for AWMA to take an active interest in the provision of recreational opportunities and facilities in areas such as Frenchman Bay and Middleton Beach.

Trends in recreational participation and new activities are important in determining the provision of opportunities and facilities. Trends in use and participation should be monitored in an effort to provide for new recreational activities as well as to determine possible environmental impacts and conflict with other users.

Recreational activities should generally be directed into recreation nodes where appropriate facilities and site development can occur. 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 environment.

Recreation - action plan

Strategies	Actions	Key Players	Implementation
37. Monitor trends in recreational use of the waterways and associated foreshores and identify the need for further recreational facilities.	37.1 Carry out assessments of recreational use through survey, observation, and public comment.	**AWMA**, LGAs, MSR, APA	Low priority Ongoing Action
	37.2 Investigate approaches by recreational groups regarding the need for further recreational opportunities and facilities.	**AWMA**, LGAs, MSR, APA	Low priority Ongoing Action
	37.3 Liaise with local government authorities to provide recreational facilities where necessary.	**AWMA**, LGAs, MSR, APA	Low priority Ongoing action
	37.4 Investigate and report on the impact of existing recreational activities on the waterway environment. Develop management strategies to minimise impact.	**AWMA**, LGAs, MSR, APA	Low priority One-off project requiring review
38. Encourage recreational activities and facilities which are compatible with the protection of the waterways environment.	38.1 Assess proposed recreational activities for their impact on the waterway environment.	**AWMA**, LGAs, MSR, APA	Low priority Ongoing action
	38.2 Prepare a list of activities considered appropriate and inappropriate for the waterways environment.	**AWMA**, LGAs, MSR, APA	Low priority One-off project requiring review
	38.3 Liaise with local government authorities and recreation groups to support appropriate recreational activities.	**AWMA**, LGAs, MSR, APA	Low priority Ongoing action
	38.4 Advise on the location of further recreational facilities to avoid environmentally sensitive areas.	**AWMA**, LGAs, MSR, APA	Low priority Ongoing action
	38.5 Encourage the development of information leaflets on recreational use for the protection of the waterways.	**AWMA**, LGAs, MSR, APA	Low priority One-off project requiring review

39. Ensure adequate and appropriate foreshore areas for recreational activities.	39.1 Assess subdivisions for their impact on recreational use of the foreshores.	**AWMA**, DPUD, LGAs, APA	Medium priority Ongoing action
	39.2 Request suitable public open space in foreshore areas adjacent to subdivisions.	**AWMA**, DPUD, LGAs, APA	Medium priority Ongoing action
	39.3 Identify suitable foreshore areas to be developed for recreational purposes.	**AWMA**, DPUD, LGAs, APA	Medium priority One-off project
40. Ensure adequate management and maintenance of foreshore recreation areas and facilities.	40.1 Investigate appropriate vesting for areas which accommodate foreshore recreation.	**AWMA**, DOLA, LGAs	Medium priority One-off project
	40.2 Develop management plans for recreation areas in conjunction with local government or other vesting agencies.	**AWMA**, LGAs	Medium priority Ongoing action
	40.3 Encourage developers to contribute to the cost of management of adjacent foreshore recreation areas.	**AWMA**, LGAs, DOLA, DEV	Medium priority Ongoing action
	40.4 Develop a strategy for upgrading and maintaining boat ramps and boating channels around the Albany harbours	**DOT**, AWMA, LGAs	Medium priority One-off project

Outcomes

- **An increase in recreational opportunities and facilities around the waterways.**
- **Minimal impact on the waterways environment from recreational activities.**
- **Adequate and suitable foreshore areas and facilities developed and managed for recreational purposes.**

4.2 Tourism

Goal

To ensure that tourist activities are compatible with the protection of the waterway environment and to promote an understanding of the value of waterways within the tourist community.

In 1985 the Department of Regional Development and the North West, the Western Australian Tourism Commission, the Albany Tomorrow Strategy Group and local government authorities in the Great Southern Region commissioned the Great Southern Tourism and Recreation Study. The aim of the study was to develop an integrated strategy to enhance the contribution of tourism and recreation towards the economic and social development of the Great Southern Region. This would ensure that tourism and recreation was placed in perspective into the overall development of the region.

The Strategy concluded that the major tourist and recreational attractions of the region are considered to be its natural resources, especially the coastline and the beaches. Swimming and fishing were found to be major recreational activities for visitor and residents alike. The Strategy also identified the waterways of the region as valuable tourist attractions, both scenic and recreational. However the hinterland of the region was considered to have little to offer in regard to scenic attractions with the exception of the Stirling and Porongorup Ranges.

Community attitudes and perceptions of the tourism/recreation industry were also surveyed. Some important points which arose include:

- The natural and historical resources are the greatest tourism and recreational resources of the region. It is essential that appropriate land use planning and management be implemented for the entire region and a resource register be established.
- Public awareness of the environment is an essential element and information boards, literature, displays, signs, nature trails and organised participation should be properly coordinated and promoted.
- Access within the region is very difficult without a car and therefore opportunities are greatly restricted for young people, pensioners, etc on a low budget.

The Great Southern Region Tourism Development Taskforce and the Western Australian Tourist Commission have recently produced a Tourist Development Implementation Strategy for the Great Southern Region which includes recommendations for the Albany area. The report identifies a number of opportunities and potential tourism projects. It also identifies responsibility, priority and possible funding sources for each of these opportunities.

The Strategy makes a number of recommendations which directly affect Oyster Harbour and Princess Royal Harbour and their associated foreshores. These include a recommendation to prepare a management plan for each of the harbours. AWMA has been given responsibility for the preparation of these plans. Other recommendations relating to the area included the preparation of tourist development plans for the Frenchman Bay locality, Middleton Beach and Emu Point, and the coastal area of Albany.

It is essential that those elements of the waterway environment which are attractive to tourists are maintained. This has been recognised by the Strategy for the Great Southern Region, a major initiative being to prepare plans to protect the natural features which attract tourist traffic.

Tourism - action plan

Strategies	Actions	Key Players	Implementation
41. Encourage and support tourist facilities and activities which are compatible with the protection of the waterways environment.	41.1 Assess tourist development proposals for their impact on the waterways. Advise planning authorities of these impacts and suggest amendments and management strategies where appropriate.	**AWMA**,WATC, GSDA, LGAs	Medium priority Ongoing action
	41.2 Prepare interpretive information about the waterways to assist tourists in their understanding and enjoyment of the waterways.	**AWMA**, WATC, GSDA, LGAs	Medium priority One-off project requiring review
	41.3 Support tourist activities and facilities which provide educational material about the waterways.	**AWMA**, WATC, GSDA, LGAs	Medium priority Ongoing action
42. Support planning for future tourist facilities and activities.	42.1 Support the Great Southern Tourism and Recreation Strategy and implement recommendations regarding the waterways made in the Tourist Development Implementation Strategy for the Great Southern Region.	**AWMA**, WATC, GSDA, LGAs	Medium priority Ongoing action
	42.2 Liaise with the WA Tourist Commission and the Great Southern Development Authority to ensure waterway issues are taken into account when preparing tourism strategies.	AWMA, WATC, GSDA, LGAs	Medium priority Ongoing action
	42.3 Support the identification of areas which could be developed as attractive tourist locations without damage to waterways. Liaise with developers and tourist promoters to develop these areas.	**AWMA**, WATC, GSDA, LGAs	Medium priority Ongoing action

Outcomes

- **Tourism opportunities around the waterways which are environmentally acceptable.**
- **Visitors to the Albany Region will have a greater understanding of the importance and appropriate use of waterways.**
- **Development of environmentally sustainable tourist activities.**

4.3 Public access

Goal

Ensure the provision of public access to the waterways which is compatible with protection of the natural environment.

In any community people want to have access to the waterway environment for pleasure and recreation activities. The approach of waterways management is to ensure that public access to the waterways is maintained whilst protecting the waterways environment and the rights of private landowners.

A relatively high level of public access already exists around the Albany harbours. However this access is not always adequately controlled or directed. Uncontrolled access may result in the trampling of foreshore vegetation, destruction of wildlife habitat and damage to the banks of the waterway. Another problem also arises, especially along upstream areas of the King River, where public access is limited by privately owned land with high water mark titles or inaccessible narrow foreshore reserves or vacant Crown land.

To manage public access around the waterways the level of public access required by the community must first be determined. This can be through survey and the monitoring of usage of foreshore areas. Priorities also need to be determined so that public access is provided where it is most needed by the community.

Reserves and vacant Crown land around the waterways provide potential access nodes, and suitable sites which could be developed for public access. Site identification should take into account protection of the natural environment as it may not always be desirable to provide public access particularly where environmentally sensitive foreshore areas or conservation areas are at risk. Control of access in these areas may be necessary.

The development of heritage and nature trails for walking, cycling, driving or canoeing, which follow a route taking in points of interest, can improve access to and develop an awareness of the natural and cultural elements of the waterway environment.

Dual use paths provide linear access to foreshore areas for both pedestrians and cyclists. Local government authorities are generally responsible for the planning and development of dual use paths in their municipalities. AWMA needs to have input to the siting and design of any planned paths to ensure protection of the waterway environment. The Waterways Commission, in association with the EPA, SPC (now DPUD) and Bikewest, developed 'Environmental Guidelines for Dual Use Paths' (1988). These guidelines should be followed when addressing the issues of siting and construction of these facilities.

In some areas it may be appropriate to provide public access to privately owned land. This may occur where unique landscape features or vantage points exist. When reservation of these areas is not possible, management agreements with landowners may achieve the desired result. If subdivision of these areas occurs reservation to provide public access should be considered. Reservation of foreshore land through the process of subdivision is further discussed in Part C Section 2.3.

Public access - action plan

Strategies	Actions	Key Players	Implementation
43. Ensure the provision of public access to the waterways.	43.1 In conjunction with LGAs carry out surveys to determine the level and type of public access required by the local community and visitors.	AWMA,LGAs	Medium priority Ongoing action
	43.2 Determine priorities for the provision of public access around the waterways.	AWMA,LGAs	Medium priority One-off project requiring review
	43.3 Encourage the acquisition of adequate foreshore reserves through the process of subdivision in order to provide public access to the waterways.	AWMA,LGAs, DOLA	High priority Ongoing action
	43.4 Investigate the feasibility of entering into agreements with private landowners to allow public access to the waterways through private property where appropriate.	AWMA,LGAs	Medium priority Ongoing action
	43.5 Liaise with local government authorities and other vesting bodies to upgrade public access to foreshore areas.	AWMA,LGAs	Medium priority Ongoing action
	43.6 Liaise with local government authorities to provide dual use paths at suitable locations around the waterways. Design all dual use paths according to the State Government's 'Environmental Guidelines for Dual Use Paths'.	AWMA,LGAs	Medium priority Ongoing action

44. Ensure public access is compatible with the protection of the waterway environment.	44.1 Restrict public access or design appropriate public accessways to protect environmentally sensitive foreshore areas.	**AWMA**, LGAs	Medium priority Ongoing action
	44.2 Identify suitable areas to develop as public access nodes. Develop management plans for these areas.	**AWMA**, LGAs	Medium priority One-off project requiring review
	44.3 Discourage vehicular access along foreshore areas.	**AWMA**, LGAs	Medium priority Ongoing action
	44.4 Monitor foreshore areas for problems with public access and liaise with local government to develop strategies to manage these problems.	**AWMA**, LGAs	Medium priority Ongoing action
	44.5 In conjunction with local government authorities, identify areas around the waterways suitable for designated uses including horse riding and swimming and dog exercise. Provide access in identified areas for these purposes.	**AWMA**, LGAs	Medium priority One-off project requiring review

Outcomes

- **Increased public access to the waterways to allow enjoyment of the waterways environment.**
- **Appropriately designed public access to reduce impact on the waterways environment.**

5. INCREASING CONCERN FOR WATERWAYS

The community of the Albany Region has been instrumental in increasing awareness that urgent action is required to restore and maintain the Albany waterways, particularly the Albany harbours. The high value the community places on the waterways as a natural asset and the recent growing awareness of the fragility of this environment was also the major impetus for the establishment of AWMA in 1990.

AWMA provides a strong vehicle for close interaction and coordination with both local government and the community. Through its objectives the Authority wishes to promote a form of management which has strong community involvement and provides a free flow of information. AWMA considers that the community's role in management and protection of the waterways is vital to its success.

5.1 Community involvement and information

Goals

To ensure the community has an opportunity to participate in decision making and that planning and management reflects the needs and aspirations of the community.

To keep the community informed on all matters affecting waterways planning and management.

The community's involvement in waterways management is threefold. Firstly the community can identify issues relating to waterway management and contribute to developing achievable solutions. This is due to the community's wealth of local knowledge and historical observations of changes to the waterways. Secondly the community has needs and aspirations in regard to the management of waterways which must be identified. This will ensure management reflects what the community wants and that management of resources is equitable and appropriate. Thirdly, the community can contribute to restoration of the waterways in day to day housekeeping and appropriate use of the waterway environment.

Community groups in the catchment and in the urban environment are currently carrying out a great deal of good work in the areas of catchment and waterways management. The work of these groups is important to achieving the goals of waterways management and AWMA needs to make every effort to aid these groups in their endeavours. This aid may be in the form of technical advice or assistance in the preparation of funding applications for projects.

Currently the community has a number of avenues through which to become involved in waterways planning and management. These are outlined below:

Membership of AWMA

Under Section 14(3) of the Waterways Conservation Act, membership of a waterways management authority shall be selected from amongst persons resident in the local community. It is also considered that a balance between community representatives and local government and State government representatives is most workable and that community representatives should cover a broad spectrum of interest groups such as industry, conservation, recreation , fishing etc. The Chairman of an authority should also be a community representative.

Management programme preparation

The Waterways Conservation Act requires that a waterways management authority prepare a management programme to guide its operations. The Act also specifies that public comment should be sought towards the preparation of this programme from members of the community. This comment is gained through consultation and then release of a draft document and an invitation to prepare written submissions on the content of the document. Public comment on management plans prepared for specific foreshore areas is also sought in a similar fashion.

Development approval

The community has the opportunity to comment on proposed developments on and around the waterway through submission to AWMA or the EPA. Submission can also be made to local government authorities on amendments to local government town planning schemes. Under Section 38 of the Waterways Conservation Act any person or body may refer to AWMA any matter which gives rise to concern as a possible cause of pollution affecting the waterways. AWMA is required to consider the matter and may report to the relevant Minister.

Direct involvement

Many community groups exist in the Albany area which may wish to become directly involved in waterways management. AWMA should keep an up to date record of these groups and involve them through consultation on specific issues and involvement in rehabilitation projects where possible.

Integral to the success of community involvement in waterways planning and management is the provision of simple and readily understood information about the state of the waterways, the operations of AWMA and any planning and management initiatives being undertaken. A properly designed public information campaign can serve to raise the level of public debate, increase community awareness, promote appropriate use of waterways and at the same time make it possible for ordinary people to make worthwhile contributions to the process.

AWMA provides public information to the community via a number of mechanisms. These include an annual 'Report to the Community' presentation, displays, talks, publications, media releases and answering public enquires. It is important that any information produced is suited to its audience and that information is aimed at all age groups and types of users.

Community involvement and information - action plan

Strategies	Actions	Key Players	Implementation
45. Provide infommation about AWMA's operations, the state of the waterways and planning and management matters to the community.	45.1 Prepare a public information and promotion plan which includes: •release of media statements on matters of community concern. •preparation of an annual report to the community on the activities of AWMA and the state of the waterways. •preparation of leaflets and other material on issues of concern to the community. •attendance at community events e.g Albany Show, Mount Barker Show •delivery of talks to schools and communit~ groups on matters relating to waterways protection	AWMA	High priority One-off project requiring review
46. Determine community attitudes, aspirations and needs and incorporate into management and planning..	46.1 Carry out surveys on specific issues to determine community needs.	AWMA	Medium priority Ongoing action
	46.2 Conduct public workshops and meetings to discuss issues of concern to the community.	AWMA	Medium priority Ongoing action
	46.3 Promote and facilitate community advisory committees for issues of specific concern to the community.	AWMA	Medium priority Ongoing action

47. Involve and consult the community in planning and management decisions made in regard to waterways protection	47.1 Maintain a list of all interested parties (community groups, individuals, local government, State Government) and seek their support and participation.	**AWMA**	Medium priority One-off project requiring review
	47.2 Support and aid catchment based community groups in their activities in the area of land and water care.	**AWMA**, DAWA, LCDCs, OHCG	High prioroity Ongoing action
	47.3 Invite the community to make comment on management programmes, plans and policies.	**AWMA**	High prioroity Ongoing action
	47.4 Use accessible public media (radio, television, State, local and community newspapers) to advertise activities, meetings and opportunities for public comment.	**AWMA**	High prioroity Ongoing action
	47.5 Advertise and invite expressions of interest fron. the community for representation on AWMA.	**AWMA**	High prioroity Ongoing action
	47.6 Develop a public record of all management and planning proposals being considered by AWMA.	**AWMA**	Medium priority One-off project requiring review
	47.7 Consider and act on any matters brought to the attention of AWMA by the community	**AWMA**	High prioroity Ongoing action

Outcomes

- **Planning and management of the waterways will reflect community concerns**
- **The community will have an increased awareness of the waterways, will accept responsibility for management and contribute to solutions**
- **Greater direct involvement of the community in planning and management of the waterways environment**
- **Fostering and support of locally based community catchment groups**

5.2 Education

Goal

To increase the community's awareness and understanding of the waterways environment and their appreciation of the value of waterways.

Increasingly, it is necessary for people to be made aware of the environment and their responsibility to care for it. Understanding how the waterways function and how they are affected by human activity helps to develop an appreciation of, and a desire to care for, the environment.

Environmental awareness about the Albany waterways has increased in recent years and people are developing an even greater demand for information about their condition and functioning. Given this current interest, the opportunity exists to increase this awareness by providing more opportunities for people to learn about the waterways and thus to appreciate their value.

It is AWMA's aim to provide a variety of educational materials. Examples of types of material for different audiences are outlined below:

Schools

Children are often naturally interested in the environment and are a good mechanism for educating future generations. Educational packages for schools which provide curriculum linked information and promote an understanding of waterways at an early age are an excellent educational tool. As children usually respond best in practical hands-on situations, programmes such as the Ribbons of Blue water quality monitoring programme are also extremely useful. When developing education programmes it is important to ensure that information is accessible and interesting to teachers as well as children.

General public

A resource book is being prepared to provide an overall resource inventory of the Albany waterways. This book will be a good educational tool and will be available to the public at various outlets around Albany and within the catchments. Should particular issues around the waterways become of concern, AWMA may produce topic sheets of information from the resource book to distribute to the community. AWMA will undertake to update the resource book wherever possible. Information on the condition of the waterways will also be made available to the community for educational purposes.

User groups

It is desirable to increase awareness of the value of waterways in people who use the waterways and associated foreshore areas so that they will feel responsible and motivated to use the waterways in a manner which is compatible with their protection and conservation. It may be necessary to prepare specific information aimed at these groups. This information would be most useful in leaflet form which can be easily distributed. Examples of groups which may require specific information include foreshore landowners, recreation groups, environmental groups, industry, tourists and farmers.

Education - action plan

Strategies	Actions	Key Players	Implementation
48. Provide educational material to user gro~lps to promote desirable use of waterways.	48.1 Prepare leaflets on various issues pertinent to waterways management. Examples include: Foreshore usage/ Development along waterways/ The development process and development approvals/ Recreational use of the waterways/ Land use and the waterways/ Waterbirds habitat and protection/ Industry and the waterways/ What the householder can do for the waterways.	**AWMA**	High priority Various one-off projects
49. Provide information for schools about the waterways.	49.1 Encourage and assist in the preparation of a coordinated education programme which: • is linked to the education curriculum • includes practical hands-on activities • includes information which is accessible and interesting to teachers and children • is aimed at varying age groups. 49.2 Continue and expand the Ribbons of Blue programme for the Albany waterways.	**AWMA,** DAWA, SCHs, LCDCs **AWMA**	High priority One-off project requiring review Medium priority Ongoing action
50. Collect information about waterways for educational purposes.	50.1 Prepare an Albany Resource Book containing a collection of resource information about the waterways. 50.2 Prepare topic sheets on selected resource information from the resource book.	**AWMA** **AWMA**	High priority One-off project requiring review Medium priority Various one-off projects

Outcomes

- **Increased public awareness of waterways**
- **Long term appropriate use of the waterways**
- **Educated community which takes responsibility for care of the waterways.**

6. INCREASING OUR KNOWLEDGE

6.1 Research

Goal

> ***To undertake research to enhance knowledge and understanding of the ecological functioning of waterways and foreshores to assist in future management.***

Under Section 25 of the Waterways Conservation Act AWMA has a responsibility to conduct or promote relevant research or to enter into projects for research purposes.

Research is an important facet of waterways management as it improves the understanding of how the waterways ecosystem functions, where pollutants entering the system originate, how human activities impact on the system and what can be done to improve the system. Research provides a basis for informed management decisions.

Research needs for the Albany waterways currently focus on the issues of nutrient enrichment and seagrass decline. Solutions to these problems are of the highest priority.

Recommended research includes investigations into the nutrient dynamics of the waterways (Refer Part C Section 1) and surveys to determine changes in seagrass coverage (Refer Part C Section 2.2). Other investigations required include assessments of the current condition of foreshore areas and methods of rehabilitation for these areas (Refer Part C Section 2.3).

The Waterways Commission provides technical support for AWMA and carries out much of the research on behalf of the Authority. Often research projects are carried out in conjunction with local government authorities and other State government agencies. As AWMA's budget for research is limited it needs to explore all research funding sources including various State and Federal funding schemes. Community interest groups or individuals interested in research as a hobby should also be utilised and supported by AWMA.

Coordination of research undertaken on the waterway environment is important to make the best use of available funds. The Government Officers Technical Advisory Group (GOTAG) is a good forum for ensuring that research undertaken by AWMA and other agencies does not overlap and that priorities are determined with all parties involved. Research groups within the Waterways Commission and in conjunction with other appropriate research agencies and institutions are currently being established and serve a similar purpose. AWMA should participate in these groups.

Knowledge gained from research needs to be distributed to other agencies and the general community. Reports of findings should be produced and circulated to relevant libraries and agencies. Regular reports to GOTAG on research progress and findings are also important. AWMA currently prepares an annual report to the community outlining its activities. This report should provide a summary of research conducted.

Research - action plan

Strategies	Actions	Key Players	Implementation
51. Carry out research necessary for the planning and management of the Albany harbours.	51.1 Conduct research which will improve the knowledge of the ecological functioning of the waterway environment.	AWMA	Medium priority Ongoing action
	51.2 Collect resource information necessary to make informed management decisions.	AWMA	Medium priority Ongoing action
	51.3 Conduct research in conjunction with local government, State government agencies and community groups where appropriate.	AWMA, LGAs, State govt agencies, CGs	Medium priority Ongoing action
	51.4 Utilise all funding mechanisms available to obtain necessary funds to conduct research.	AWMA	Medium priority Ongoing action
52. Ensure the coordination of research undertaken for the Albany waterways.	52.1 Participate in internal and external research committees to determine research priorities.	AWMA	Medium priority Ongoing action
	52.2 Participate in the GOTAG to ensure coordination of research.	AWMA	Medium priority Ongoing action
53. Exchange research information with other relevant organisations and individuals.	53.1 Distribute research findings to relevant organisations on completion.	AWMA	Medium priority Ongoing action
	53.2 Provide regular reports to the GOTAG on research progress and findings.	AWMA	Medium priority Ongoing action
	53.3 Provide a summary of research progress and findings in an annual report to the community.	AWMA	Medium priority Ongoing action

Outcomes

- **Improved knowledge of the waterways environment**
- **Informed waterways planning and management**

6.2 Monitoring

Goal

To carry out environmental monitoring of the waterways environment to identify changes in its condition.

Environmental monitoring is an important tool used in waterways management to identify changes and trends in the condition of the waterways environment. Monitoring is the initial stage in preventing waterways damage as it identifies problems and provides an understanding of what is happening to the waterways.

Health criteria or standards need to be established to define the level of management required for the components of the Albany waterways environment. Monitoring of these components will help to provide information so that standards can be met and waterways continue to be a healthy functioning system.

Environmental monitoring in the waterways environment in the past has concentrated on water quality. This has provided valuable information about the level of pollutants entering the waterways and the need for management. The approach is now moving towards also monitoring other components of the waterways environment which will indicate changes in the ecological health of the system. This may include monitoring changes, for example, in aquatic and foreshore vegetation, and aquatic fauna populations. AWMA needs to identify the components of the ecosystem which will provide suitable health indicators and develop appropriate monitoring programmes.

Monitoring is only useful to the waterways management process if it is effective and efficient. Information collected needs to provide managers with useful information as quickly as possible so that decisions can be based on up to date information. Improvements in monitoring techniques and equipment, data handing and reporting are occurring regularly within the scientific community. To ensure monitoring activities are as effective and efficient as possible AWMA needs to keep in touch with these changes and implement any improvements.

One useful method of environmental monitoring is make use of the local community to keep an eye out for changes occurring in the waterways environment. People who live near or regularly use the harbours or rivers can be appointed as honorary inspectors under the Waterways Conservation Act. These inspectors would operate on a volunteer basis and would be provided with information by AWMA on what to look for.

Results of environmental monitoring, as with research findings, should be shared with other agencies and the community. This will promote a better understanding of the waterways environment and the basis for management decisions. Methods of distributing these results are discussed in Part C Section 5.

Monitoring - action plan

Strategies	Actions	Key Players	Implementation
54. Carry out effective and efficient environmental monitoring necessary for planning and management of the Albany waterways.	54.1 Conduct environmental monitoring to identify changes in the condition of the Albany waterways.	**AWMA**, DAWA, OHCG	Medium priority Ongoing action
	54.2 Regularly review monitoring programmes to ensure they are efficient and effective. Include in this review consideration of the need for and design of the programmes.	**AWMA**, DAWA, OHCG	Medium priority Ongoing action
	54.3 Appoint members of the local community who live near or use the waterways as Honourary Inspectors under the Waterways Conservation Act to keep an eye out for changes in the waterways environment.	**AWMA**, WWC	Medium priority Ongoing action
	54.4 Carry out investigations into monitoring techniques and equipment to enable more efficient and effective data collection.	**AWMA**	Medium priority Ongoing action
	54.5 Carry out investigations into methods of data handling,and reporting to enable more efficient and effective data analysis.	**AWMA**	Medium priority Ongoing action
55. Exchange monitoring results with other relevant organisations and individuals.	55.1 Distribute monitoring results to relevant organisations on completion.	**AWMA**	Medium priority Ongoing action
	55.2 Provide regular reports to GOTAG on monitoring results.	**AWMA**	Medium priority Ongoing action
	55.3 Provide a summary of monitoring results in an annual report to the community.	**AWMA**	Medium priority Ongoing action

Outcomes

- **Efficient and effective environmental monitoring**
- **Early identification of environmental changes within the Albany waterways**

PART D:

MANAGEMENT OF LOCAL AREAS

This section of the management programme deals with planning, development and use of specific areas of the Albany waterways and their foreshores. For easy consideration of waterway areas five management units have been selected. The four major units include Princess Royal Harbour, Oyster Harbour, Kalgan River and King River illustrated on Maps 4 - 7. These are the major waterways within the Albany Waterways Management Area and the focus of AWMA's management activities (Part B Section 1).

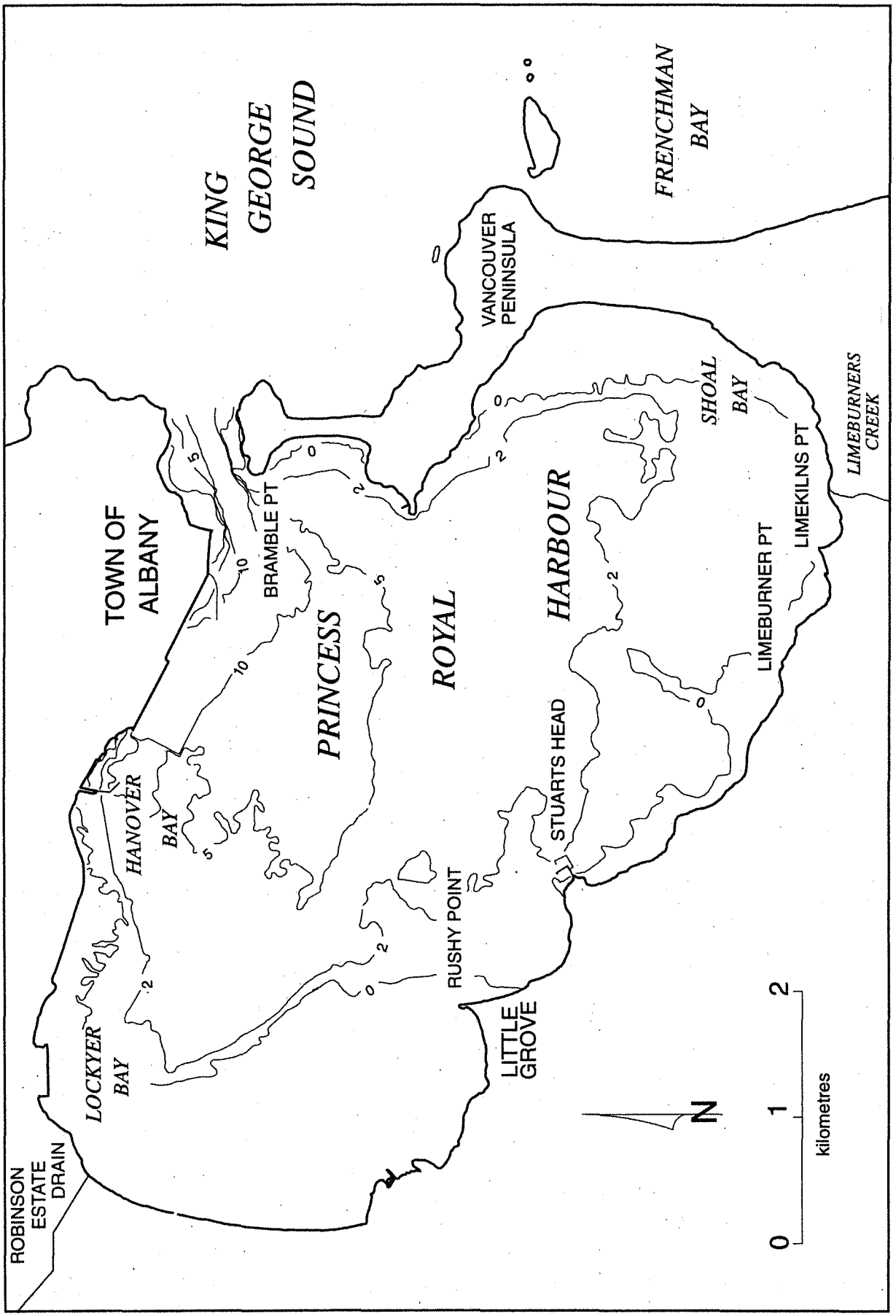
The fifth unit comprises the many tributaries of rivers entering the harbours. Management of these areas is important to the overall management of the Albany waterways, however as many tributaries exist on privately owned land AWMA will seek to identify mechanisms through which effective management can be undertaken. AWMA's role in these areas is therefore different to its role in the major waterway areas.

In the following discussion the five management units are considered separately taking account of development, human use and conservation issues which affect the future management of these areas. Management actions for each area are provided following this discussion. These actions are broad in nature providing a basis for future management with maximum flexibility for implementation. As management actions for both the harbour environment and the river environment are similar in nature, management actions for these areas have been grouped together.

Detailed studies of the river and harbour environments are currently being carried out. These studies will include an assessment of all foreshore areas to identify the condition of foreshore vegetation, need for rehabilitation, opportunities for access and recreation, landownership status and many other planning and management considerations. Detailed recommendations for management of specific foreshore areas will also be prepared on completion of these studies.

The Waterways Protection Precinct (Refer Part A Section 5) will also be identified for these areas. The precinct defines the area which is of critical importance in protecting the waterway ecosystem. AWMA will seek to limit the extent and type of environmental change within this precinct as a means of protecting the waterway environment.

MAP 4: PRINCESS ROYAL HARBOUR



1. PRINCESS ROYAL HARBOUR

(SEE MAP 4)

Princess Royal Harbour is an almost land locked marine embayment. The harbour is approximately 8 km long and 4 km wide and oriented in a north-west south-east direction. The total area of the harbour is approximately 29 square kilometres. The town of Albany is situated on the harbour's north shore.

Vancouver Peninsula stretches along the eastern boundary of the harbour protecting much of its waters from the exposed King George Sound and Southern Ocean. The Peninsula consists of a tombol linking two granite outcrops which provide a dominant landscape feature for the area. Frenchman Bay is located on the King George Sound side of Vancouver Peninsula and is an important recreational area for the Albany Region. A large recreation reserve also covers most of Vancouver Peninsula. Subdivision of land for residential purposes is occurring on the Frenchman Bay side of the Peninsula. Increasing pressure on foreshore areas adjacent to this subdivision is evident.

Torndirrup National Park stretches along the coastal area to the south of the harbour. The park is managed by the Department of Conservation and Land Management (CALM) according to interim management guidelines. A management plan for the park is not considered a high priority but will be prepared in the near future by CALM. The park provides a large expanse of natural vegetation which is an important conservation resource and when viewed from the town of Albany provides an attractive backdrop to the harbour.

Due to the nature of the landforms in the Albany area, the demand for access to the harbour areas for recreational purposes is considered relatively low in comparison to other waterway environments. The nearby coastal areas including Frenchman Bay and Middleton Beach provide a more pleasing environment for the community to undertake recreational activities. These areas together with Torndirrup National Park relieve pressure on the usage of the harbour environment. As Albany grows, these areas will become more important and AWMA will need to be involved in their management and development.

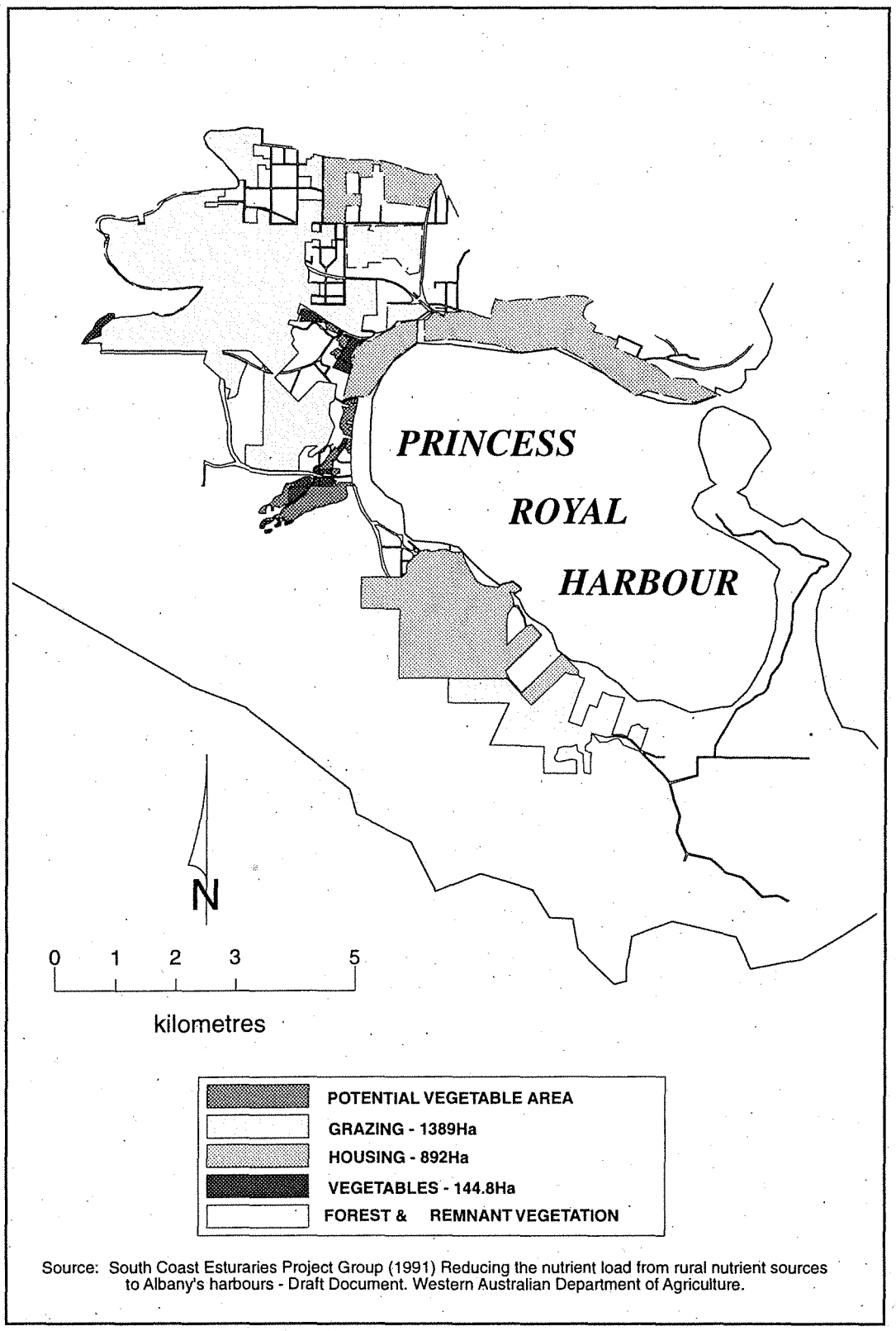
The southern and western shores of Princess Royal Harbour and extending south to the coast comprise the Albany Groundwater Area under the Rights in Water and Irrigation Act 1914. This authorises the licence and therefore control of private groundwater abstraction in the area. A large proportion of this groundwater area is also proclaimed as the South Coast Water Reserve under the Country Areas Water Supply Act 1947 to facilitate protection of groundwater quality. The Water Authority of Western Australia is currently developing a strategy for the protection of this resource which will discuss acceptable development and land use in the area.

Limeburners Creek enters the harbour on its southern shore. The creek drains the groundwater recharge area within the South Coast Water Reserve. A large reserve managed by the Water Authority of Western Australia covers the discharge point of this creek to the harbour. Foreshore vegetation has been retained in this area and public access is restricted.

Land to the west of Limeburners Creek has been subdivided and is zoned residential. A major residential area now exists at Little Grove. This area is currently unsewered and is serviced by septic tanks. This area presents some concern for the water quality of the harbour as nutrients from septic tanks may be carried by groundwater to the harbour waters adding to the nutrient problems of the harbours.

Little Grove also supports the only yacht club in the Albany area. This provides a base for algae harvesting operations carried out by AWMA. The yacht club is also a major recreational resource for the area. The club provides launching ramp facilities, however these are confined to club members and severely restricted by parking facilities. The Shire of Albany in conjunction with AWMA have identified the need for a further launching facility in this area and after careful assessment of potential sites have found a site along The Esplanade in reserve 614 to be the most suitable. A management plan is currently being prepared for this area and engineering investigations for the launching ramp are continuing.

FIGURE 8 : LANDUSE WITHIN THE PRINCESS ROYAL HARBOUR CATCHMENT



Source: South Coast Esturaries Project Group (1991) Reducing the nutrient load from rural nutrient sources to Albany's harbours - Draft Document. Western Australian Department of Agriculture.

The mud flats of Princess Royal Harbour support large populations of migratory wading birds. The shallows on the eastern shores of the harbour provide roosting areas when strong winds are blowing in late summer. This area is relatively secluded and disturbance is not a problem. In contrast another important habitat is located at Rushy Point on the south-west shore of the harbour. Wading birds are particularly vulnerable in this area as habitat destruction by trail bikes and off road vehicles is occurring. A means of protection for this area to reduce habitat destruction is required.

The western end of Princess Royal Harbour also contains extensive mud flats which provide an important fish habitat and breeding area. Numerous cobbler nests can be seen in the harbour sediments at low tide. This area was closed to fishing until mid 1992 due to heavy metal contamination in the sediments and the biota (Refer to Part C Section 2.1). The eastern shore of the harbour also provides shallow areas which are important habitat and breeding areas for juvenile fish.

To the west of Princess Royal Harbour is a large agricultural region including the Robinson Estate and Marbellup-Elleker areas. These areas are mostly cleared of vegetation and used for vegetable growing and beef farming. The high water table and fertile soils of this area make it highly suitable for these activities. Robinson Drain drains this area discharging to the waters of Princess Royal Harbour. The waters of Princess Royal Harbour also receive effluent from a number of industries located adjacent to the north shore of the harbour.

The town of Albany is located on the northern shore of Princess Royal Harbour. The existence of a natural harbour was the main reason for the town's establishment. Much of the town site is elevated above the harbour providing outstanding views over the harbour and King George Sound. Many granite outcrops are found in this area including Mount Elphinstone, Mount Melville, and Mount Clarence. A concentration of residential and commercial activities associated with the central business district of Albany are found here. Numerous areas of historical significance are located within the townsite.

A redevelopment plan for the foreshore fronting Princess Royal Harbour in central Albany has been prepared and is being implemented. The project includes a relocation of Princess Royal Drive, removal of the Westrail marshalling yards, shunting lines and workshops and the development of the central foreshore area for tourist, recreational and commercial purposes.

The Port of Albany is situated to the east of the main townsite of Albany. The port has three landbacked berths with a total length of 608 metres. Products such as wheat, barley, oats and lupins are exported and fertiliser materials and petroleum products are imported. Unloading of these products has the potential to impact on the water quality of the harbour. The entrance to Princess Royal Harbour from King George Sound is via a narrow channel on the eastern side of the harbour. A channel has been dredged through this entrance to allow ships visiting the Port of Albany to enter the harbour.

2. OYSTER HARBOUR (SEE MAP 5)

Oyster Harbour is located to the north-east of the town of Albany. The harbour is roughly rectangular in shape and approximately 5 km long and 3 km wide. Its total area is approximately 16 square kilometres. The King and the Kalgan Rivers enter the harbour on its northern shore providing the major freshwater input to the harbour.

An entrance channel less than 200 m wide joins Oyster Harbour to King George Sound at Emu Point. Emu Point peninsula forms the eastern end of a beach ridgeplain between King George Sound and Lake Seppings. The sandy spit is unstable and work has been undertaken to stabilise the Point. It is likely that further work will be required to stabilise the area in the long term.

Emu Point supports a residential area which stretches across the point linking the shores of Oyster Harbour with Middleton Beach. This is an important recreation/tourism area providing tourist accommodation, recreation facilities and swimming beaches. Emu Point is currently unsewered and is a probable source of nutrients to the harbour.

To the north of Emu Point a marina has been excavated in the harbour shore incorporating a ramp and slipyard. This facility is used primarily by commercial fishing boats. Fish processing operations are also carried out here as well as a recently developed oyster farm. Management of marina operations is important to maintaining the water quality of the harbour.

Lake Seppings Nature Reserve is located to the east of Emu Point. A drainage line running from the lake enters Oyster Harbour just north of the marina. Yakamia Creek enters the harbour to the north draining an area of farmland and urban development to the west. A wide swampy area exists where the two water courses enter the harbour. This area forms an extensive sedge swamp which is inundated at high tide. A large flora reserve for the protection of a *boronia* species and vested in the Town of Albany is also located here behind the swampland.

The mud flats of Oyster Harbour provide habitat for migratory wading birds as do those of Princess Royal Harbour. Areas where these habitats are particularly vulnerable have been identified and include the creek draining from Lake Seppings into Oyster Harbour and an area to the south of Lower King Bridge on the western shore of the harbour. Destruction of habitat by trail bikes and other vehicles is evident in these areas. The eastern side of the harbour also provides a protected roosting area for wader birds, especially in the summer months. This area is less accessible and therefore less vulnerable to destruction through human activity.

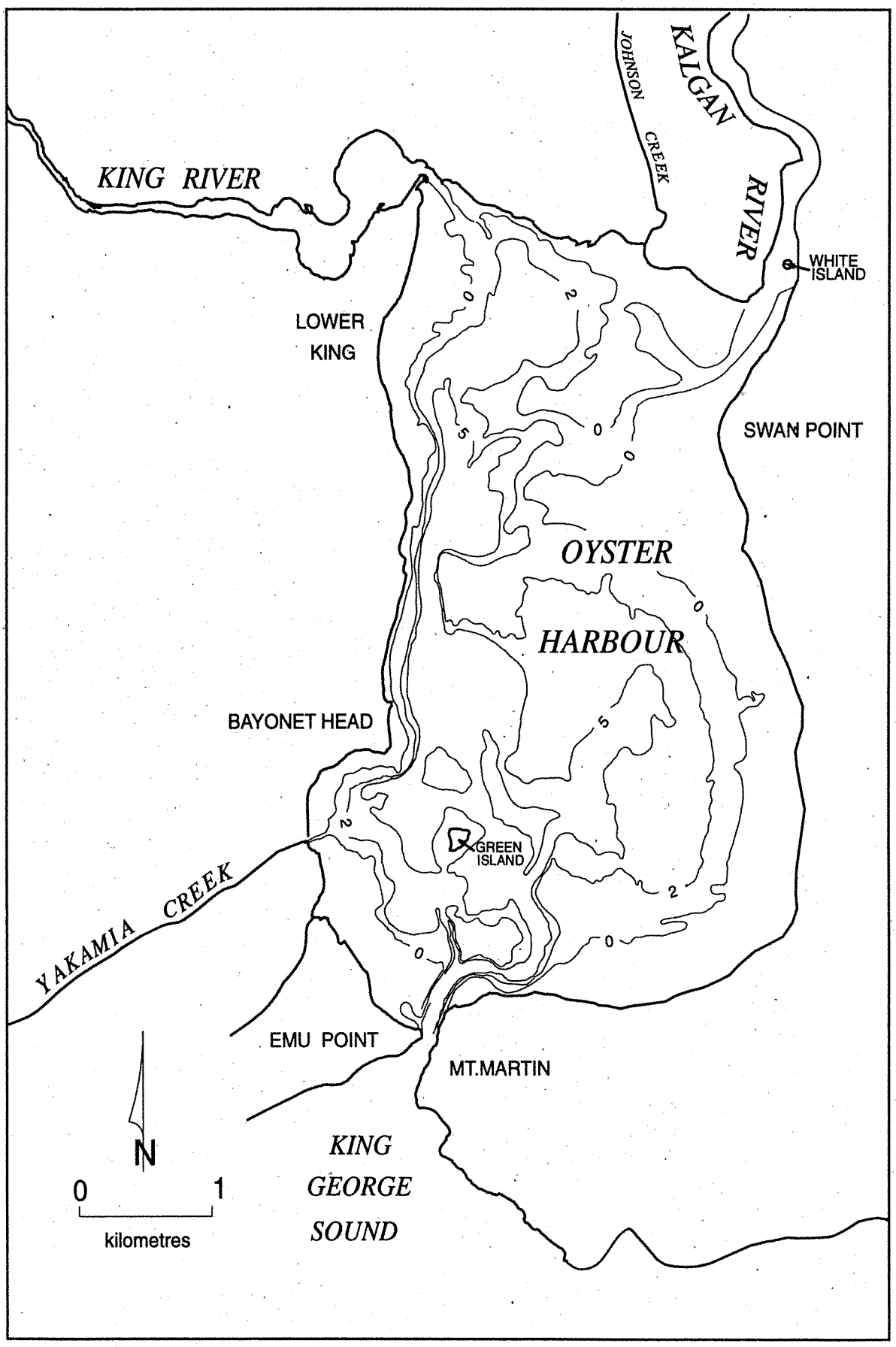
Bayonet Head is a prominent headland situated on the western shore north of Yakamia Creek and is an expanding residential area. The headland provides outstanding views over the harbour and a lookout is located here for this purpose. The Shire of Albany is currently considering a structure plan prepared for the area between Bayonet Head and Lower King.

The residential area of Lower King is situated on the western shore of the harbour to the south of the King River. As with Emu Point, Lower King is unsewered. The majority of the foreshore stretching from Yakamia Creek up to the Lower King Bridge on the north-west corner of the harbour exists as vacant Crown land. Many of these areas are mismanaged and are coming under increasing pressure from adjacent subdivision.

The Lower King Bridge crosses the King River at the river mouth. On the north-eastern side of the bridge is a recreation reserve. A picnic area, boat ramp, BBQ and toilet facility are located here. Tourist accommodation is also provided back from the foreshore area. Vehicle use of the beach is evident in this area.

Subdivision of land is occurring on the north shore of the harbour between the King and Kalgan Rivers. A special rural subdivision has been developed here increasing the need for access to foreshore areas. An anthropological reserve protected under the Aboriginal Heritage Act is located offshore from this subdivision. The reserve marks the location of historic Aboriginal fish traps. A tourist trail along which the traps can be viewed and providing educational material has been developed on the foreshore area. Protection of this site from uncontrolled access is important.

MAP 5: OYSTER HARBOUR

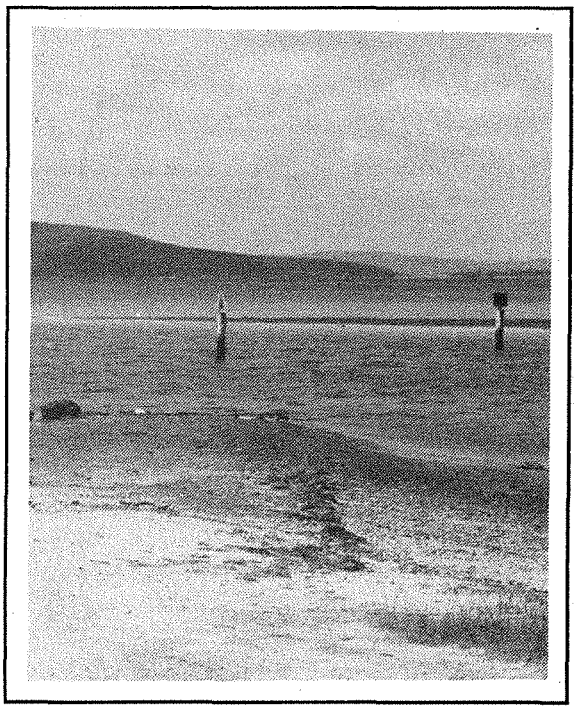


Also located on this northern shore is Johnston Creek. The creek drains farmland to the north. Kalgan River enters Oyster Harbour on the harbour's north-east corner. A boat mooring area is located at its mouth. Just north of the bridge is a recreation reserve providing a caravan park, picnic area and boating facilities. Canoe hire is available at this site.

The eastern shore of the harbour is primarily private property with pressure for the development of farmlets on the slopes of Mount Mason. Much of the northern area has been cleared for agricultural purposes. Little access to foreshore areas is available on this shore of the harbour and with increasing subdivision of land occurring the demand for access and recreation use of foreshore areas is expected to increase. A recreation reserve has been set aside on the harbour side of one major subdivision to provide for this demand. Access to the reserve is difficult and the foreshore margin still remains as vacant Crown land.

An unvested national park extending eastward almost to Taylors Inlet stretches down to the water's edge in the south-east corner of the harbour. This area is still vegetated and contains several species of rare flora and fauna. The vegetated slopes of Mount Martin opposite Emu Point are vested in the Town of Albany for recreation purposes. The South Coast Region Management Plan 1992-2002 developed by CALM recommends the incorporation of this recreation reserve into the national park and the vesting of the park with the National Parks and Nature Conservation Authority.

Foreshore areas within the national park and recreation reserve are relatively inaccessible. Tracks into the area opposite Emu Point are only accessible by 4WD and are very rough. However, access to the beach and granite rocks is available by boat across the channel. This area when viewed from Emu Point provides an attractive backdrop to the harbour.



A recreation reserve on the eastern side of Lower King Bridge provides boating access to Oyster Harbour.

3. KALGAN RIVER

(SEE MAP 6)

The Kalgan River enters Oyster Harbour on its north-eastern corner. The river system is the largest in the area with its northern tributary, the Young River, rising inland on the southern face of the Stirling Ranges. The Kalgan River is approximately 110 km in length.

The river winds from its mouth at the north eastern corner of Oyster Harbour to the Upper Kalgan Bridge. A steep rock fall under the bridge separates the downstream section of the river from a 1 km long pool upstream. The 9 km section downstream of the bridge is tidal and traverses a narrow rocky valley with steep tree clad slopes. This tidal section of the river is 20-30 m wide for the first kilometre widening to 100 m about 3 km from the mouth of the river and then to 250 m at the Lower Kalgan Bridge.

Swamps and sandy shallows exist at the mouth of the river and upstream for a short distance. Boats can be launched at a point about 3 km north of the Lower Kalgan Bridge, along a gravel road on the east bank. A water ski club operates in a gazetted ski area from this location. Degradation of foreshore areas is occurring from spectator crowds,boat wash and launching. A rowing club and caravan park also exist in a Crown reserve just north of the Lower Kalgan Bridge.

The river winds through agricultural land for most of its length, however the steep banks of the river are mostly still well vegetated. Initial vegetation surveys carried out by AWMA indicate that about a third of the river between Oyster Harbour and the Stirling Ranges is well vegetated with a large number of native plant species and only a few introduced species. Although there are points of severe erosion in such areas, the river valley is generally in a healthy condition.

Unfortunately, weed invasion, livestock grazing, trampling and frequent fires are degrading most of the river's length over the other two thirds of the river and erosion and subsidence is becoming an increasing problem. In the upper section of the river salinity is a major problem killing off large stands of trees, shrubs and sedges. In many places the less salt tolerant vegetation is being replaced with salt tolerant trees and salt marsh species.

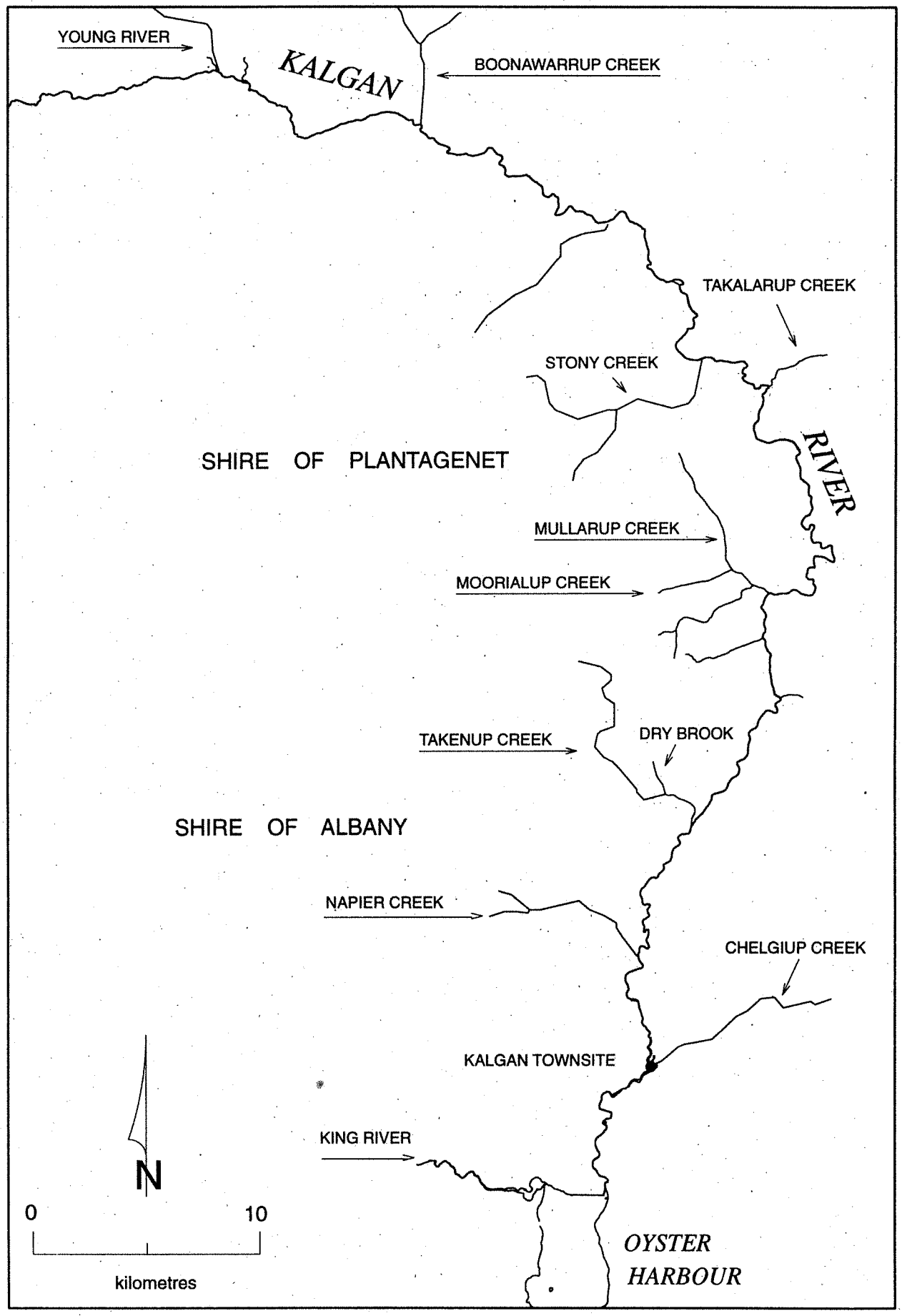
A shallow gorge is located along the lower part of the river just south of the Porongorup Range. It is about 6 km long and contains areas of pristine vegetation, exposed granite domes and cascades. The gorge is an area of high aesthetic value.

Foreshore areas are primarily in private ownership on the eastern bank to the Upper Kalgan Bridge. A foreshore reserve extends along much of the western bank where subdivision has occurred. Upstream of the Upper Kalgan Bridge the majority of the river foreshore is in public ownership. Two large reserves for the purposes of Conservation of Flora and Fauna and Parklands exist along this section of the river and a large area exists as vacant Crown land.

AWMA is currently conducting investigations in conjunction with the Department of Agriculture and the Oyster Harbour Catchment Group into the condition of foreshore areas of the Kalgan River. This includes an assessment of foreshore vegetation health (i.e. effects of salinity and frequent fires), location of fences, degree of weed invasion and severity of erosion. The information collected will be incorporated into a comprehensive management plan for the river which will make recommendations for future management of the river and identify the Waterways Protection Precinct (Refer Section Part A Section 5).

The lower reaches of the Kalgan River are used for water skiing.

MAP 6: KALGAN RIVER



4. KING RIVER

(SEE MAP 7)

The King River enters Oyster Harbour on its northwestern corner. It drains a smaller catchment than the Kalgan River to the north-west of the harbour. The river is about 27 km long and is joined by a relatively large tributary, Mill Brook 2 km west of Upper King Bridge.

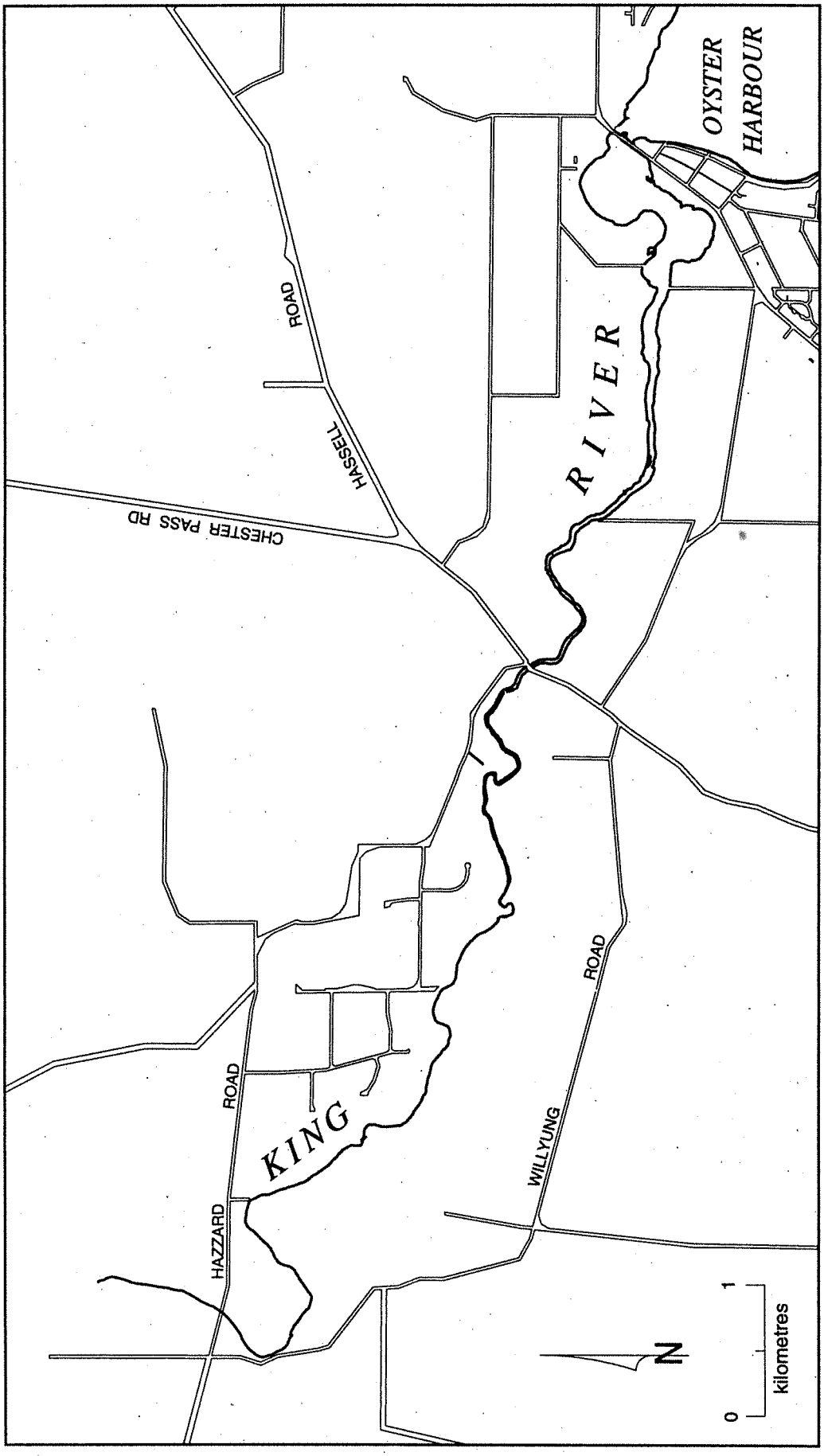
From Mill Brook to the Upper King Bridge, the river has a narrow winding channel between high sandy banks. In the vicinity of the Upper King Bridge granite outcrops are found in and near the river. The river then flows through low lying agricultural land with a fringe of sedges and paperbarks and then through a wide deltaic area of salt marsh and intertidal mud flats. It widens and deepens near the Lower Kalgan Bridge.

The river is estuarine for 7 km through low lying land, most of which is cleared to the water edge. Small boats can be launched to the King River at both the upper and lower bridges, but the river is very shallow above the lower bridge.

The foreshore areas of the King River are in public ownership in the downstream sections. However, in upstream areas the foreshore is still in private ownership and access is restricted by high water mark titles. Initial vegetation surveys indicate that in lower sections of the river plant communities are of high quality, but upstream the vegetation becomes increasingly degraded by weed invasion and frequent fires.

Along similar lines to the Kalgan River, AWMA will prepare a comprehensive management plan for the King River which will make recommendations for future management of the river and identify the Waterways Protection Precinct (Refer Section Part A Section 5).

MAP 7: KING RIVER



Albany harbours and rivers - action plan

Strategies	Actions	Key Players	Implementation
56.Identify the physical, biological and cultural resources of Albany harbours and the King and Kalgan rivers and assess their condition.	56.1Carry out environmental investigations into the condition and importance of the foreshores of the Albany harbours and the King and Kalgan rivers. Include in these investigations: • Identification and mapping of all physical , biological and cultural resources including: Cadastral (Crown reserves, vacant crown land, private property, roads,) Topographical (Contours, bathymetry) Vegetation (extent and communities present, areas of weed encroachment) Environmentally sensitive areas (waterbird habitat and breeding areas, fish habitat and breeding areas, areas containing rare flora and fauna) Landscape features Recreation areas and facilities Fencing locations and areas where stock have access to foreshore areas. Areas where erosion is occuring. Historic sites Industrial/commercial development Existing landuse Location of future development, subdivision or urban expansion • Assessment of the condition of the resources listed above. • Identification of opportunities and constraints on development, human use and conservation which need to be considered in future planning and management.	AWMA	High priority One-off project requiring regular review. Information already being collected.

57. Identify future management requirements for the Albany harbours and the King and Kalgan rivers	57.1 Prepare recommendations for future management of the foreshores of the Albany harbours and the King and Kalgan rivers based on environmental investigations. Include in these recommendations: • Recommendations regarding the management of foreshore reserves. • Suitable vesting authorities and management of vacant crown land. • Management mechanisms for privately owned foreshore areas • Means of protection for environmentally sensitive areas. • Management plans for specific foreshore reserves or areas which are in a degraded state or are under increasing pressure. • Foreshore protection works in areas where foreshores are degraded. Identify responsible organisations or individuals to implement management recommendations and prioritise implementation.	**AWMA** **AWMA**, Other responsible agencies	High priority One-off project requiring regular review High priority Various One-off Projects
58. Identify the area of the critical importance in protecting the ecosystem of the Albany Harbours and King and Kalgan Rivers and ensure its protection.	58.1 Identify the Waterways Protection Precinct for the Albany Harbours and King and Kalgan Rivers in accordance with Waterways Commission Guidelines. 58.1Protect the environment within the Waterways Protection Precinct in accordance with Part A Section 5 of this Management Programme.	**AWMA** **AWMA**	High priority One-off project requiring regular review. High priority Ongoing Action

Outcomes

- **Well managed foreshore areas around the Albany harbours and along the King and Kalgan Rivers.**

5. TRIBUTARIES WITHIN THE CATCHMENT AREA

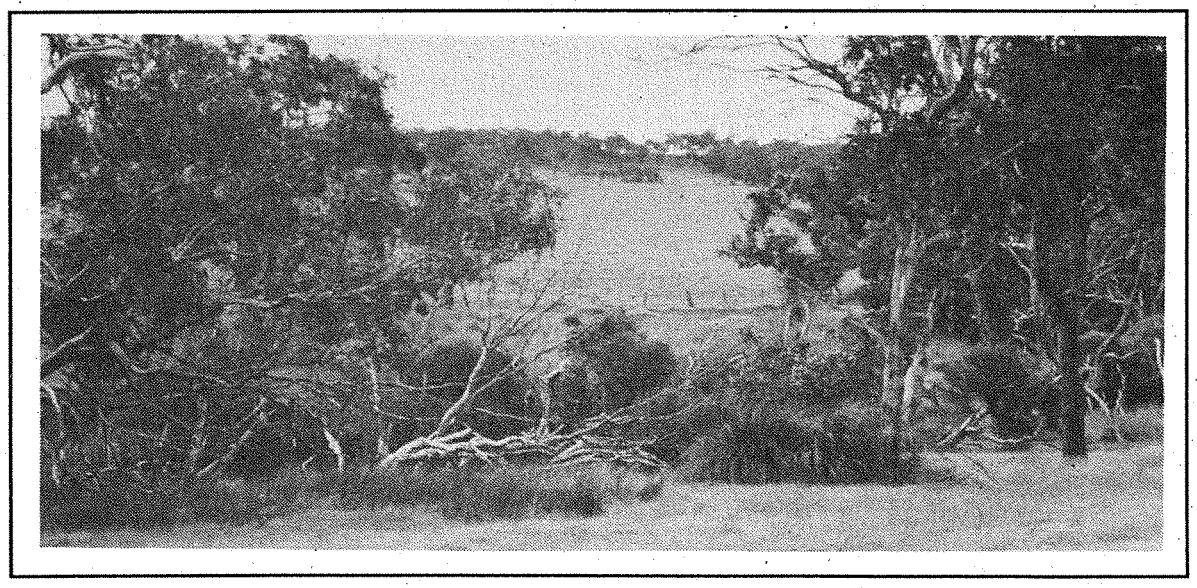
The Albany harbours catchments contain numerous small streams and creeks which feed into the major river systems flowing into the harbours. These tributaries drain primarily agricultural land. The quality of the water draining from these areas ultimately impacts on the quality of the water in the major river systems and the harbours.

The natural drainage lines within the catchments flow through the numerous subcatchments within the Oyster Harbour catchment area. The majority of these feed into the King and Kalgan Rivers and then into Oyster Harbour. The Princess Royal Harbour catchment area on the other hand has no natural drainage lines except for the small Limeburners Creek which enters the harbour on its southern shore. The creek drains a groundwater recharge area between the harbour and the coast. Numerous agricultural drains carry water from the catchment area to the harbour.

Streamlines within the catchment area contribute nutrients and other pollutants from agricultural lands to the river systems. For this reason their management is important. Management is also important to protect these areas as ecosystems in their own right. Often creeks and streams on private property become part of farm paddocks, vegetation is cleared and banks are degraded by stock and human use. The loss of fringing vegetation along these streamlines results in the loss of wildlife habitat. The vegetation also has an important pollutant trapping function which is lost when vegetation is cleared.

The Albany Waterways Management Area covers the entire Albany harbours catchments (See Map 1). The powers of the Authority, however focus on management of the major waterways, their bed, banks and foreshore areas. AWMA is keen to have an involvement in the management of streamlines on private property, however only in an advisory role.

AWMA is keen to see local landowners, land conservation district committees and catchment groups taking the lead in overall management of streamlines. Management would involve recognising the value of these waterways and carrying out restoration of their natural ecosystems. This may only involve fencing and excluding stock to allow natural regeneration of fringing vegetation. AWMA's role in this process is to provide advice on rehabilitation techniques and support landowner groups in their efforts.



Many small streams and creeks flow through private property within the catchment area.

Tributaries - action plan

Strategies	Actions	Key Players	Implementation
59. Encourage and support management of tributaries in the Albany Waterways Management Area	59.1 Provide information to landowners, LCDCs and catchment groups of the value and importance of managing waterways on private property.	**AWMA,** DAWA, LCDCs, CGs, LOs	High priority Ongoing action already in progress
	59.2 Encourage the consideration of waterway protection and rehabilitation in the farm and catchment planning process.	**AWMA,** DAWA, LCDCs, CGs, LOs	High priority Ongoing action already in progress
	59.3 Provide information to landowners, LCDCs and catchment groups regarding methods of protection and rehabilitation.	**AWMA,** DAWA, LCDCs, CGs, LOs	High priority Ongoing action already in progress
	59.4 Establish demonstration sites where successful rehabilitation of streamlines on private property has been achieved.	**AWMA,** LCDCs, CGs, LOs	Medium priority various one-off projects
	59.5 Conduct seminars and workshops for LCDCs and catchment groups to provide information regarding waterways protection and rehabilitation.	**AWMA,** LCDCs, CGs	Medium priority Ongoing action
	59.6 Encourage school groups to adopt local waterways for restoration projects. Provide information to aid teachers in this process.	**AWMA,** LCDCs, LGAs, SCHs	Medium priorityOngoing action
60. Minimise the impact of development on the bed and banks of major tributaries within the Albany Waterways Management Area.	60.1 Request planning authorities to refer all development proposals that may impact on the bed and banks of major creeks to AWMA for comment.	**AWMA,** LGAs, DPUD, DEV	High priority One-off project

Outcomes

- **Protection and restoration of the many streams, creeks and drains which exist within the Albany Waterways Management Area.**

PART E:

MAKING IT ALL HAPPEN

1. IMPLEMENTATION OF THE PROGRAMME

The management programme outlines numerous 'actions' which are considered necessary to conserve, protect and rehabilitate the waterways within the Albany Waterways Management Area. The overall responsibility for coordinating implementation of the actions rests with AWMA. Implementation of many actions is solely the responsibility of AWMA, however implementation of other actions also rests with State government agencies, local government authorities and other organisations. AWMA will liaise with these bodies to encourage their participation. The key players involved in implementation are identified in the action plans in Part C of this document.

The large number of actions recommended in the programme and the nature of some of them mean that implementation will take a number of years. For example, biological investigations may take several years to complete. Similarly the availability of staff and other resources may also limit implementation of some actions.

Action

61. AWMA will ensure the implementation of the management programme by:

- ***implementing many of the recommended actions itself; and***
- ***liaising with other bodies to initiate action for which they are responsible.***

AWMA will prepare a progress report on implementation of the management programme on a yearly basis. This report will be in conjunction with the annual report to the community recommended in Action 45.1. The report will indicate which actions of the programme have been implemented and any reasons for actions not being implemented.

Action

62. AWMA will prepare an annual report detailing progress on implementation of the management programme. This report will be made available to the community.

2. PLANNING MECHANISMS

To aid in its implementation of the management programme and in general day to day fulfilment of its waterways management role, AWMA utilises a number of planning mechanisms. These mechanisms provide a means of coordinating management and planning of the waterway environment and ensure that AWMA's advice and activities are streamlined and consistent. These mechanisms are discussed in detail below:

2.1 Management plans

The formulation of management plans for specific areas around the waterways provide a means of coordinating the views of the various responsible agencies, resolving conflicts and solving particular management problems. Management plans also provide a framework for carrying out works for rehabilitation and improvement in accordance with the wishes of the local community.

There are many different levels of management plan. This management programme forms the highest level of management plan outlining the guiding principles for planning and management of the waterways. It describes the overall objectives and methods AWMA will use to manage the waterways.

Local and regional management plans form the next level outlining actions necessary to manage specific areas. These plans focus on management of the foreshores of waterways and the immediate inshore waters. Local plans focus on a particular foreshore reserve or small area of the foreshore which needs specific management attention, whereas regional plans focus on a wider area such as one of the Albany harbours or major rivers feeding into them.

Action

63. AWMA will aim to prepare or aid in the preparation of detailed management plans for all the foreshores of the major waterways (Princess Royal, Oyster Harbour, King River, Kalgan River) in the Albany Waterways Management Area .

Refer Actions 56 , 57, 58

2.2 Policies

The Waterways Commission and AWMA have recognised the need for policies on certain aspects of planning and management for waterways. It is intended that these policies would provide proponents with information regarding AWMA's position on certain issues.

Policies are designed to guide the Authority on particular issues or developments which it must frequently approve or provide advice on. Policies are also intended to guide the public, consultants, developers and government agencies towards appropriate land use and development around the waterways. The policies provide these bodies with a clear idea of the standards required by the Authority in order to manage the waterways.

Actions

64. AWMA will develop policies for issues of concern to the Albany waterways. These policies will clearly outline AWMA's position on each issue.

65. AWMA will ensure its policies are regularly reviewed and amended where circumstances change.

66. AWMA will ensure that new policies and policy amendments are negotiated with affected parties.and released for public comment.

67. AWMA reserves the right to modify advice from the position given in a policy, however this modification must be with a two thirds majority of members at a full Authority meeting.

The Waterways Commission is currently developing a policy manual which will address issues common to all waterways management authorities. AWMA will be involved in developing these policies and will adopt them as AWMA policies. AWMA will also prepare policies for issues of particular concern to the Albany waterways which do not affect other waterways.

Action

68. AWMA will publish a policy manual containing all its policies. This manual will be released for public comment .

2.3 Guidelines

Guidelines are designed to provide specific advice to developers, landowners, individuals, community groups and government agencies. They may be designed to show how particular policies may be achieved and to detail the requirements of the Authority. Guidelines also assist the Authority to ensure its advice on particular issues is consistent.

The Waterways Commission is currently preparing sets of guidelines to assist in resloving particular issues on behalf of its waterways management authorities.

Action

69. AWMA in conjunction with the Waterways Commission will prepare waterways guidelines for specific issues to provide developers, local government ,State government agencies and the community with a guide to AWMA's requirements on particular issues.

2.4 Administrative procedures

Administrative procedures are prepared to detail the necessary steps that are required to obtain licences, approvals and permits for certain activities and land uses in the waterway environment. The procedures aid the community, other agencies and AWMA in simplifying the legislative requirements of waterways planning and management.

Procedures involve liaison and consultation between various government and local government agencies, therefore will need to be amended as departmental structures and legislation changes.

Experience with other waterways management authorities suggests that administrative procedures are required for activities which relate to the powers bestowed upon a waterways management authority under the Waterways Conservation Act and any other roles it undertakes. These activities include:

- Referral of development applications and planning proposals to AWMA for advice under Section 36 of the Waterways Conservation Act;
- Industrial licences required under the Environmental Protection Act 1986 and administered by AWMA under delegated powers;
- Works approvals for activities which alter the bed or the banks of the waterway or for the disposal of effluent to the waterways and;
- Activities addressed in the Waterways Conservation Regulations.

AWMA may choose to prepare procedures for other specific activities which relate to waterways planning and management.

Actions

70. AWMA will prepare administrative procedures for activities relating to waterways planning and management.

71. AWMA will produce a manual containing administrative procedures and make it available to local government, developers, State government agencies and the general public.

2.5 Operational planning

Operational planning is a tool used by AWMA to determine activities it will undertake in day to day operations. An operational plan is prepared on an annual basis to guide activities. However, the plan also needs to be prepared for a three year period to provide forward planning in line with the Government budget process.

In preparing an operational plan the Authority will consult with the management programme to determine which actions need to be implemented. An attempt will be made to include high priority actions in the operations plan for the few years following the gazettal of the programme. This will of course depend on available resources.

Operational plans are based on the programme structure of the Waterways Commission. This allows coordination of the support given to AWMA by the various programmes of the Commission. It also allows easy access to information required for annual reporting and performance indicators.

Actions

72. AWMA will produce an annual operations plan detailing the activities AWMA will undertake each year.

73. AWMA will prepare a three year operations plan to provide forward planning in line with the Government budget process.

3. REVIEW AND AMENDMENT OF THE MANAGEMENT PROGRAMME

Under Section 35(5) of the Waterways Conservation Act this management programme shall be kept under review and may from time to time be amended subject to approval by the Minister for the Environment.

Experience from other waterways management authorities has shown that with changing issues management programmes quickly become outdated and require review. A life span of approximately seven years is expected from the programme. Review of the programme will of course depend on the resources available and the need to update management initiatives recommended.

Actions

74. AWMA will amend and review its management programme when necessary and in doing so will consult with affected parties and seek the approval of the Minister for the Environment.

Appendix 1:

EPA Recommendations

The following outlines the recommendations made by the Environmental Protection Authority in 'Recommendations of the Environmental Protection Authority in relation to the environmental problems of the Albany harbours', Bulletin 442, 1990.

AWMA currently coordinates the implementation of these recommendations and reports to the community on an annual basis on the progress with each recommendation.

Recommendation 1:

A management organisation be established to provide for future on-site management of the Albany harbours.

Note: This recommendation was implemented with the establishment of AWMA on 17 May 1991.

Recommendation 2:

Algal harvesting to be employed to enable immediate removal of the large accumulations of macroalgae in Princess Royal Harbour and Oyster Harbour. The rate of algal removal should be sufficient to remove these accumulations by March,1992.

Recommendation 3:

The five industries currently discharging pollutants directly or indirectly into Princess Royal Harbour be directed to commence immediately the formulation of a strategy, and to reduce, by March 1992, nutrient loads entering Princess Royal Harbour to levels outlined in Table 1.

Effluent concentrations from the industries discharging directly to the harbour should not exceed the levels outlined below in Table 2.

Table 1: Upper limits to industrial nutrient loads to Princess Royal Harbour (EPA Bulletin 442)

Industry	Total Phosphorus (kg/yr)	Total Nitrogen (kg/yr)
Southern Processors	660	2190
*Metro Meats	430	1420
*Kailis and France	100	340
Albany Woollen Mills	150	780
CSBP	800	1250
TOTAL	**2140**	**5980**

* Ceased operating since EPA Recommendations were adopted.

Table 2: Upper limits for Princess Royal Harbour effluent discharge concentrations (EPA Bulletin 442)

Effluent constitutent	Concentration (milligrams per litre)
Biological oxygen demand (BOD_5)	less than 20
Total suspended solids	less than 80
Oil and grease	less than 30
Total nitrogen	less than 10
Total phosphorus	less than 3

Recommendation 4

The Water Authority of Western Australia commence immediately the formulation of a strategy to cease discharging domestic wastewater from the King Point outfall by March 1994.

Recommendation 5

The Town and Shire of Albany complete by March 1991 a program to determine the groundwater and surface runoff pollutant loads into the Albany harbours from urban point sources. Upon completion of this program, the Town and Shire of Albany implement a management plan that will eliminate, within one further year, pollutant loads to the Albany harbours from existing point sources. To facilitate this, local government authorities should seek advice from appropriate State government departments in relation to cooperative use of existing State government resources.

Recommendation 6

The Town and Shire of Albany jointly develop a management plan to reduce nutrient loads to the Albany harbours for urban diffuse sources (e.g. urban runoff and groundwater contaminated by garden fertilisers, septic tank leachate) to 400 kilograms of total phosphorus per year and 650 kilograms of total nitrogen per year, by March 1992. To promote community involvement, the Town and Shire of Albany undertake an education programme related to minimising pollution from these sources.

Recommendation 7

The Western Australian Department of Agriculture evaluate current information to identify high phosphorus source areas within the catchments of the Albany harbours, and prepare a strategy for their management by March 1991.

The Western Australian Department of Agriculture continue, in consultation with farmers and other groups, to develop and promote the adoption of catchment management plans which will reduce rural nutrient loads (from diffuse and point sources) to target loads specified.

Target rural phosphorus loads are less than 4.6 tonnes of total phosphorus per year for Princess Royal Harbour and less than 13.9 tonnes of total phosphorus per year for Oyster Harbour.

In addition, catchment management should endeavour to achieve rural nitrogen loadings of less than 13.5 tonnes of total nitrogen per year to Princess Royal Harbour and less than 107.9 tonnes of total nitrogen per year to Oyster Harbour.

The Western Australian Department of Agriculture report annually to the Environmental Protection Authority on the effectiveness of management strategies to reduce rural nutrient inputs to the harbours, and on the previous year's nutrient loads into the harbours from rural sources.

Recommendation 8

Further investigations to refine initial estimates of the annual nutrient assimilative capacity of Oyster Harbour be undertaken as a matter of high priority by the proposed Albany waterways management organisation.

Recommendation 9

The proposed Albany waterways management organisation be responsible for ensuring that all pollutant inputs to the Albany harbours are monitored in order to assess the overall effectiveness of management practices in reducing these inputs.

Recommendation 10

CSBP be directed to undertake an extensive survey of the heavy metal concentrations in the sediments and biota of Princess Royal Harbour to assess the current contamination of the harbour resulting from its former effluent discharges and, if necessary, to formulate, by March 1991, a management plan to reduce lead and mercury in the biota of Princess Royal Harbour to below State health limits which are 0.5 parts per million for mercury and 1.5 parts per million for lead (except for molluscs such as mussels and cockles where the limit for lead is 2.5 parts per million). CSBP is to report to the Environmental Protection Authority by June 1991.

Recommendation 11

A regional liaison structure be developed to ensure co-ordination of Government, technical and community involvement in the integrated management of the catchments and waterways of the Albany harbours.

Recommendation 12

Evaluation of removal of nutrient-rich sediments from the Albany harbours as an effective environmental management strategy be undertaken by the proposed Albany waterways management organisation.

GLOSSARY

Aquaculture

The farming of fresh or saltwater fish or crustaceans, usually for commercial purposes.

Beneficial use

Use of the environment, or of any portion thereof, which is conducive to public benefit, public safety, public health or aesthetic enjoyment and which requires protection from the effects of discharge of wastes or of emissions of noise, odour or other pollution.

Biota

All plant and animal life within an ecosystem.

Catchment

The boundary of a river basin defined naturally by the watershed line along the top of a ridge which separates it from the neighbouring valley. The area within the line is the catchment area, from which precipitation drains to collect in waterways.

Community

For the purposes of this document the community will refer to the residents and all interest groups in the local area. This definition excludes bodies such as State government agencies, and local government who have a legal or otherwise defined role in management of the river system.

Conservation

The management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilisation, restoration and enhancement of the natural environment.

Ecosystem

A functional unit within the biosphere including both the organisms and nonliving environment together with the processes and interrelationships which maintain that unit.

Estuary

A n enclosed or semienclosed body of water having an open or intermittently open connection to marine waters in which water levels vary in a periodic fashion in response to ocean tides.

Fauna

The animal life of a geological period or a region.

Floodprone land

All land subject to flooding including the floodway, flood fringe and flood plain.

Flood 100 Year

Refers to the most severe flood which has a statistical probability of occurring once in a 100 years. The 100 year flood level is generally defined as a contour through the flood plain to which this flood will rise.

Flood fringe

The area of the flood plain, outside the floodway, which is affected by flooding. This area is generally covered by still or very slow moving waters during the 100 year flood.

Flood plain

The portion of a river valley adjacent to the river channel which is covered with water when the river overflows its banks during floods.

Floodway

The river channel and portion of the flood plain which forms the main flow path of flood waters once the main channel has overflowed.

Flora

The plant life of a geological period or region.

Groundwater

Water which occupies the pores and crevices of rock and soil as opposed to surface water which runs off into streams.

Habitat

The native environment or place where a plant or animal naturally grows or lives.

Integrated catchment management

The planning and management of our natural resources on a river or groundwater catchment basis to achieve sustainable use which provides for social and economic development.

Landscape

The appearance of broad areas of the environment having certain uniform characteristics or homogeneity which distinguish that part from others. Landscape includes visual appearance of both the natural and manmade environments.

Leaching

The process of nutrients or pollutants being washed down through the soil into the groundwater.

Macroalgae

Algae(chlorophyll containing plants including seaweeds and various freshwater forms) which can be seen with the human eye in contrast to microscopic algae which must be studied under the microscope.

Nutrients

Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorus (phosphate). Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.

Nutrient enrichment

Over enrichment of water by dissolved nutrients particularly nitrates and phosphates which lead to excessive growth of aquatic plants.

Nutrient load

The amount of nutrients reaching the waterways over a given time (usually per year) from its catchment area.

Pollution

Any direct or indirect alteration of the environment to its detriment or degradation; includes any effluent, litter, refuse, sewage or waste, or any other matter or thing, of whatever form, that impairs or is likely to impair the environment.

Public comment

A legal requirement to consult the public (including the local residents of the area, State and local government agencies and any other bodies having an interest or management responsibility) prior to decision making in management and planning issues.

Remnant vegetation

The parts of the natural vegetation still existing after major change to the environment.

Seagrasses

Marine flowering plants (angiosperms) found in coastal rivers, estuaries and protected coastal embayments which are important to ecological functioning as they provide habitat for many organisms, stability to the bed of the waterbody and, in a decomposed form, a major food source for a variety of organisms.

Stormwater

Natural water from the surface of the ground, paved areas or roofs.

Tributary

A stream, creek or small river which flows into a major river.

Vacant Crown land

The land under the control of the Minister for Lands which is not reserved and vested in an authority for specific purposes, contracted to be granted in fee simple or subject to the right of purchase.

Waterway

All streams, creeks, rivers, estuaries, coastal lagoons, inlets and harbours through which water flows to eventually meet the ocean.

Waterways environment

The waters and foreshores of a waterway and its natural components, both physical and biological, its ecological processes and its cultural components such as scenic, recreational and historic values.

Waterways management area

An area managed by a waterways management authority and declared under the Waterways Conservation Act 1976-1982.

Water quality

The water quality of a waterways is a measure of its suitability for particular uses. The suitability is determined by a combination of factors including the water's appearance, smell and the concentration of many chemical components.

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ABBREVIATIONS

AHC	Australia Heriatge Commission
APA	Albany Port Authority
AWMA	Albany Waterways Management Authority
AWMAC	Albany Waterways Management Advisory Committe
BFB	Bush Fires Board
CALM	Department of Conservation and Land Management
CG	Catchment Groups
COM	Community
DAWA	Departement of Agriculture of Western Australia
Dev	Developer
FD	Fisheries Department of Western Australia
DOLA	Department of Land Administration
DOT	Department of Transport
DPUD	Department of Planning and Urban Development
EPA	Environmental Protection Authority
GOTAG	Government Officers Technical Advisory Group
GSDA	Great Southern Development Authority
HCWA	Heritage Council of Western Australia
HD	Health Department of Western Australia
ICMCG	Integrated Catchment Management Coordinating Group
IND	Industry
LCDCs	Land Conservation District Committees
LGAs	Local government authorities
LOs	Landowners
MSR	Ministry for Sport and Recreation
OCM	Office of Catchment Management
OHCG	Oyster Harbour Catchment Group
SCHs	Schools
TPS	Town planning scheme
WAM	Western Australian Museum
WATC	Western Australian Tourism Commission
WAWA	Water Authority of Western Australia
WWC	Waterways Commission