PEEL INLET

MANAGEMENT PROGRAMME

1992

WATERWAYS COMMISSION

REPORT No. 27

January 1992

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Prepared for the Peel Inlet
Management Authority
by the Waterways Commission

WATERWAYS COMMISSION
REPORT NO 27
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WJ Carter	(Shire of Murray)
G Hitchcock	(Community Representative)
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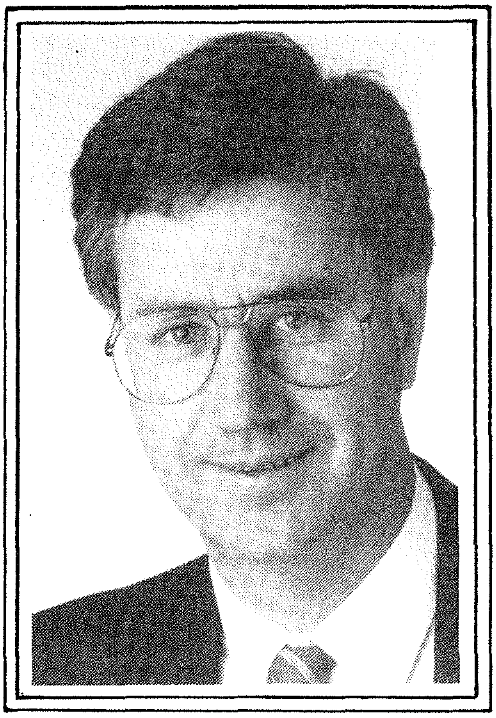


The waterways of Western Australia are among the State's most precious natural assets because of their conservation and recreation values and important fish stocks and as they provide an attractive focus for residential development. The Government is committed to their long term conservation and management which, to be successful, must be based on careful planning with the full involvement of the community.

In 1982, the Peel Inlet Management Authority (PIMA) released its first Management Programme which provided a framework for its operations for the last eight years. However, the waterway environment and the use pressures affecting it have changed dramatically since then and a much higher level of management will be necessary.

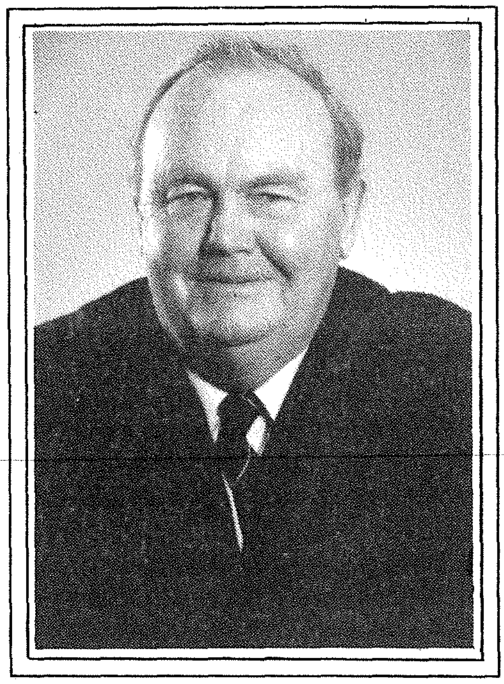
In August 1990, PIMA released its Draft Peel Inlet Management Programme Review which was available for public comment for three months. PIMA received 30 detailed submissions which have now been considered and the information used to complete this Management Programme 1991.

The Peel Inlet and Harvey Estuary Management Strategy (ERMP Stage 2), released in 1988, outlined the work needed to achieve a better nutrient balance in the waterway. This Management Programme 1992 complements the ERMP Stage 2 by identifying other management issues and establishing a broad vision for the future. It also addresses the need to balance the competing demands for use and development with the need to conserve a healthy functional estuarine environment. The report contains 306 recommendations which provide a detailed strategy for the management of the waterway environment for the rest of the century.

The challenge now for PIMA is to achieve the effective implementation of the Management Programme's recommendations and the aim and objectives outlined in this report to the public.

Bob Pearce MLA
Minister for the Environment

CHAIRMAN'S FOREWORD



The Peel-Harvey estuarine system is the largest inland waterway in south-western Australia and is the major feature of the Peel Region. It is an important natural system and drainage outlet for several major rivers.

Today, the waterway provides the most important recreational and landscape feature in the region and is subject to a wide range of pressures. These include a strong community desire for public access and to conserve a diversity of recreational activity including fishing, water sports and passive recreation. In addition, the waterways continue to provide a major focus for professional fishing, agriculture, residential, tourist and industrial development.

Initially, the management of the waterway occurred on an ad hoc basis and was the responsibility of a number of relevant State and local government authorities. In 1971, the Minister for Environmental Protection established the Peel Inlet Conservation Advisory Committee to provide co-ordinated advice about the waterway. In 1977, the Peel Inlet Management Authority was established in accordance with the Waterways Conservation Act 1976.

In 1982, PIMA released its first Management Programme which has guided management of the waterway since then, in accordance with the Waterways Conservation Act. Since 1982 the estuarine environment has changed and use pressures have increased. In 1988, PIMA resolved to review its Management Programme and produced a draft for consideration by the public and relevant authorities. This process has now been concluded with the release of this Peel Inlet Management Programme 1992.

Chapter 7 of the Management Programme provides a strategy for the implementation of the recommendations and begins the process of establishing priorities. PIMA will be working hard to implement these recommendations and achieve the objectives which have been defined.

PIMA looks forward to working with the community in pursuing its important charter.

Owen H Tuckey
Chairman
Peel Inlet Management Authority

GUIDE FOR READERS

THE SUMMARY

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

THE MAIN BODY OF THE DOCUMENT

Chapters 1-3 outline the current situation and identify the major issues.

Chapter 4 sets the objectives of the Management Programme.

Chapters 5 and 6 contain the recommendations by which the objectives are to be attained. General Recommendations in Chapter 5 (1-106) cover estuary-wide issues and form the basis for the more specific Area Recommendations (A1-A200) in Chapter 6. The Area Recommendations are cartographically displayed in Maps 1-18, each of which is accompanied by a list of recommendations and their associated planning considerations. Three General Recommendations have been included in the cartographic representation as their location needs to be displayed. These are General Recommendations 23, 26 and 51 relating to the Waterways Protection, Bank Revegetation and Public Access Precincts respectively. Explanation of these General Recommendations can be found in Sections 5.3.5, 5.3.6 and 5.4.5, respectively.

For interpretation of Maps 1-18 (Area Recommendations) a map legend is provided on a fold-out sheet at the back of the document.

Chapter 7 outlines the responsibilities of the various government agencies to implement the recommendations and the proposed procedures for monitoring implementation.

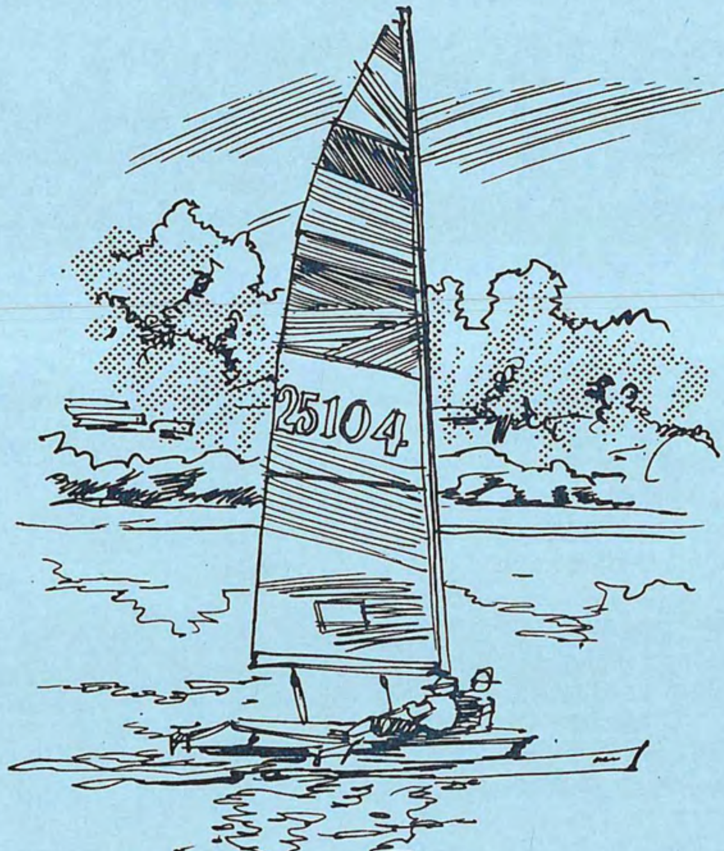
Taken together Chapters 4,5,6 and 7 comprise the overall management programme of future land use planning and management for the Peel-Harvey Estuary.

ABBREVIATIONS

Many State, local government and other organisations are mentioned in the Management Programme. For brevity initials are used in most references. To aid the reader, a fold-out sheet listing the full names of all abbreviations is provided at the back of the document (page 137).

COLOUR CODING

To simplify reading, the pages of this report are colour coded. The pages containing the Summary of the document are beige and the list of recommendations is green.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SUMMARY

BACKGROUND

The Peel-Harvey Estuary is a major landscape feature and recreational resource of the South West and includes wildlife habitats of international significance. The community gives high priority to the protection and rehabilitation of the estuarine waters and associated plant and animal communities.

Management of the waterway is the responsibility of the Peel Inlet Management Authority in co-operation with other State and local government authorities and the public.

The first Peel Inlet Management Programme was prepared in 1982 and was reviewed between 1989-1991 to take account of population growth and increased development since then.

As a basis for the review PIMA has adopted the following beneficial uses of the waterway:

- The waterway provides habitats for a variety of terrestrial and aquatic flora and fauna which should be preserved.
- The waterway provides an important scenic feature and focus for leisure activities for metropolitan, regional and tourist populations and it should be accessible to the public.
- The waterway serves as an important ocean outfall for a large part of the Swan Coastal Plain, Darling Scarp and hinterland.

The review was completed in 1991 and the aim of the Management Programme is:

> "To balance competing demands for use and development with the need to restore the nutrient balance of the waterway and conserve a healthy functional estuarine environment for present and future generations."

PIMA is committed to the preservation and enhancement of the quality of the environment and amenity of the waters of the Peel Inlet and associated land, and to the control or prevention of pollution of those waters and that land. The onus is therefore on any proponent of development to show that it will not have an adverse impact on the area or on the beneficial uses of the waterway.

Eight broad planning and management issues were identified through consultation with State and local authorities, interested groups and the community.

For each of these issues a primary objective and a series of specific objectives were formulated. The General Recommendations outline the action required to achieve these objectives.

Following the General Recommendations, eighteen specific areas are defined. For each area the major planning considerations (covering biophysical resources, land use and tenure, and land capability) are listed, followed by Area Recommendations.

The Management Programme 1991 will be complemented by a number of detailed management plans.

GENERAL RECOMMENDATIONS

The eight planning and management issues and their primary objectives are listed below with a summary of the intent and scope of the General Recommendations arising from them. The recommendations are set out in full on the green pages, and the agencies responsible for implementation are identified.

AGENCY CO-OPERATION AND PUBLIC PARTICIPATION

Primary Objective:

"Ensure that the local community and relevant State and local government authorities are adequately represented on PIMA and have the information and appropriate opportunities needed for effective involvement in the planning and management of the waterway."

The successful management of the waterway depends on co-operation between PIMA, other State and local government authorities and the public.

The recommendations cover:

- State and local government and community representation on PIMA.
- Establishment of administrative procedures to ensure that all planning policies, development proposals and management plans are referred to the relevant authorities.
- Public education programmes designed for specific groups.
- Public participation in decision making.

CONSERVATION AND ENVIRONMENTAL PROTECTION

Primary Objective:

"Minimise pollution of the estuary and protect and rehabilitate its waters, land, wildlife habitats and cultural sites in accordance with the ERMP Stage 2."

Over the past thirty years the leaching of fertilisers into the rivers which flow into the Inlet has caused eutrophication of the estuary and deterioration of water quality, with serious effects on biological productivity and diversity, and economic and amenity values.

The Peel Inlet and Harvey Estuary Management Strategy, ERMP Stage 2, proposed a comprehensive strategy to restore water quality. The Management Programme supports these proposals.

The recommendations are directed towards:

- Improved catchment management to reduce fertiliser intake and control pollution from point sources.
- Continued harvesting of aquatic weed.
- Protection of important wildlife habitats through regional reservation and local vesting.

- Conservation of waterway margins through restoration and maintenance of fringing vegetation and control of erosion.

- Protection of Aboriginal and European historic sites.

LAND USE AND WATERWAY PLANNING

Primary Objective:

"Ensure that land use within the Peel-Harvey catchment maintains or enhances the quality and amenity of the waterway environment."

Effective resource management depends on recognising constraints as well as opportunities. The Management Programme seeks to protect the estuarine environment by identifying the type and level of development and use which can occur in particular areas without loss of natural values or increased management costs.

The recommendations provide for:

- Involvement by PIMA in the preparation of regional plans for development in the management area consistent with protection of its environmental values.

- Reservation and vesting of foreshores.

- Early consultation on proposals for subdivision or development.

- Assessment of proposals for commercial development to ensure that social, environmental and physical planning criteria are met.

- Protection of the landscape values of the area.

- Provision for and management of public access.

- Recognition of the possibility of climatic change and rise in sea levels.

TOURISM

Primary Objective:

"Provide for a range of tourist facilities which are compatible with the conservation of the waterway and benefit from an estuarine location."

The Management Programme recognises the importance of tourism in the Peel-Harvey management area and the need to provide for tourist facilities and activities. The recommendations are intended to ensure that there is consultation between planning authorities and potential developers, and that provision for tourists does not result in environmental degradation and loss of the qualities which attract people to the area. A tourist education programme will encourage visitors to understand and enjoy the waterway without spoiling it.

FISHING

Primary Objective:

"Manage the fish resources of the waterway for the benefit of the community."

The Peel-Harvey Estuary supports the most important estuarine commercial fishery in Western Australia and is also heavily used by amateur fishermen throughout the year.

The recommendations are intended to ensure:

- Sustainable and equitable use of the fish resource.
- Minimum conflict between commercial and recreational fishermen.
- Maintenance of water quality and habitats for all stages of fish life.

RECREATION

Primary Objective:

"Encourage a range of recreation opportunities that reflect and complement the waterway environment."

The Peel-Harvey Estuary is a major recreational resource for local people and tourists. Management planning should provide for a wide range of recreational opportunities while ensuring that heavy or inappropriate uses do not result in environmental loss.

The recommendations provide for:

- Identification of recreation reserves and sites for water based activities.
- Improvement of facilities for foreshore users in identified areas.
- Research on recreation demand and trends.

NAVIGATION AND BOATING SAFETY

Primary Objective:

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

While management and control of boating is primarily the responsibility of the Department of Marine and Harbours, the Management Programme recognises that design and provision of boating facilities, and public education programmes can help to reduce hazards and improve public safety. The recommendations reflect this.

MANAGEMENT

Primary Objective:

"Ensure that a legislative and administrative base, and appropriately funded bodies and structures exist to achieve the primary objectives of this Management Programme."

Successful waterways management depends on co-operation between all agencies with responsibility for planning and management. The recommendations emphasise the need for continuing consultation and referral, and suggest improved emergency procedures.

IMPLEMENTATION

Implementation of the 306 recommendations in this Management Programme will be co-ordinated by PIMA. Because of their nature, some recommendations may take a number of years to implement, and action on others will depend on available staff and financial resources.

The Management Programme will be reviewed again in seven years time, to take account of what has been achieved and of changes in population and demand.

River Sheoak

RECOMMENDATIONS

All General Recommendations are listed below in numerical order (1-106). The rationale behind these recommendations is discussed in Chapter 5. Chapter 6 lists the Area Recommendations (A.1-A.200) in relation to their geographical locations. These have not been duplicated in this section because of the large number of recommendations presented and the need to consider them in conjunction with the relevant map. The agencies responsible for implementation of the recommendation are provided in abbreviated form following each recommendation. The lead agency is underlined. These abbreviations are expanded in full on a fold-out sheet at the back of the document.

GENERAL RECOMMENDATIONS

AGENCY CO-OPERATION AND PUBLIC PARTICIPATION

State, Local Government and Community Representation

1. Continue the practice of appointing representatives from the City of Mandurah and the Shires of Murray and Waroona, to PIMA (WWC).

2. Continue the practice of appointing representatives from relevant State government authorities to PIMA (WWC).

3. Continue the practice of appointing interested members of the public to PIMA (WWC).

Administrative Referrals

4. Seek advice from all relevant authorities before reviewing management programmes (PIMA).

5. Refer all management programme reviews and draft policies to the relevant authorities for comment (PIMA).

6. Refer PIMA meeting minutes to local authorities for their information (PIMA).

7. Refer all major development proposals to be undertaken by PIMA to the relevant authorities for comment (PIMA).

8. Comment on all proposed amendments to town planning schemes which affect the management area (PIMA).

9. Seek referral of all development applications affecting the management area or waterway which are being considered by town planning authorities, to enable input from PIMA concerning waterway issues (PIMA, DPUD, LGAs).

10. Seek referral of proposals to change the vesting, boundaries, purpose or use of reserves within the management area (PIMA, DOLA, LGAs).

Public Education and Participation

11. Seek advice from interested people and groups about the structure and content of management programmes (PIMA).

12. Advertise in local newspapers for public comment on management programmes reviews (PIMA).

13. Prepare a comprehensive programme of public education relating to the waterway and its management (PIMA, WWC), including:

    a) Information packages for members of management authorities and committees, LGA councillors and staff, and other authorities.

    b) Information packages for members of the public.

    c) Educational packages for schools, with assistance by PIMA staff in their interpretation and use.

    d) Information for neighbours, including farmers, canal estate and river bank residents and commercial property owners and tenants.

    e) Waterways information leaflets similar to Leaflet No 1 "The Blue Manna Crab". Other topics of immediate relevance include "Birdlife of the South-West Estuaries" and "The Samphire Marsh".

    f) Displays on the role and functions of PIMA for use in libraries and other public venues.

    g) Advertising to get information to specific audiences (for example, boat owners, anglers and yacht owners).

    h) An information video about the waterway and its management.

    i) Disseminate WWC guidelines on the control of pollution by anti-fouling paints to all slipyards and boating operators.

    j) Prepare a pamphlet on the possible impacts of climatic change on the waterway.

CONSERVATION AND ENVIRONMENTAL PROTECTION

Water Quality Management

14. Support and assist the implementation of the ERMP Stage 2 which will assist in the improvement of water quality of the waterways, and report to the community concerning changes in water quality (PIMA, WWC).

15. Support the creation of a central committee to co-ordinate all planning decisions which affect the catchment of the waterways, to enable full consultation between authorities. The committee should include representatives of local government (PIMA).

16. Develop a policy with respect to living on vessels within the management area to ensure they do not have an impact on water quality (PIMA, CM, SM, SW).

17. Protect fringing vegetation around the estuary which reduces the nutrient level of ground water (PIMA, LGA, CALM, DPUD).

Weed Harvesting

18. Upgrade weed harvesting operations to make more effective use of existing resources in accordance with Option A outlined in "Review of Weed Removal Operations - Peel Inlet and Harvey Estuary", prepared by the Waterways Commission 1989. The funding of this work is recommended in the EPA Assessment Report relating to the ERMP Stage 2 (PIMA, WWC).

Proposed Peel-Harvey Regional Park

19. Establish the Peel-Harvey Regional Park and an effective management framework based on existing authorities (DPUD, PHCDC, CALM, EPA, PIMA, LGAs).

20. Determine appropriate vestings and reserve purposes for foreshore land in accordance with the Area Recommendations as outlined in Chapter 6 (PHCDC, DPUD, DOLA, LGAs).

21. Establish a body to co-ordinate Regional Park management (DPUD, CALM, PHCDC).

Conservation Reserves

22. Support the implementation of the System 6 Recommendations C50 and C51 and provide technical advice concerning these areas if appropriate (Appendix 1). Investigate wildlife habitats within the study area and seek their protection (PIMA, PHCDC).

Conservation of Waterway Margins

23. Establish a Waterways Protection Precinct in areas where protection of waterways and adjacent foreshore margins is of high priority. To protect the waterway in this precinct PIMA will:

    - Seek the acquisition and reservation of any privately owned waterway areas and recommend appropriate vesting.
    - Provide advice about the development of private land which enables its use without unacceptable change to the waterways environment.
    - Investigate closely the rezoning of land in the precinct if it will enable more intensive development, and provide appropriate advice to decision making authorities.
    - Identify areas of fringing vegetation and determine their current ownership and management.
    - Prepare detailed recommendations about the future vesting of Vacant Crown Land and reserves which contain fringing vegetation.
    - Undertake work to protect and rehabilitate areas of vegetation within this precinct in co-operation with land owners and relevant authorities and in accordance with the WWC Foreshore Management Policy.

- Undertake research to determine effective techniques for rehabilitating degraded fringing vegetation.

- Support the long term use of the State Government's moratorium on clearing and drainage, and the Environmental Protection Authority's Wetland Policy.

- Identify and monitor all existing drainage outlets into the waterway and encourage the use of biological filters on all proposed drainage systems.

- Support the implementation of the Department of Agriculture's Soil Conservation Act which prohibits the clearing of more than 1 hectare of land without a permit.

- Encourage local land owners to form local management groups to address waterway management issues.

- Identify areas of remnant vegetation and seek their protection.

Erosion Control

24. Identify and monitor areas of the waterway at risk from erosion and implement a long term erosion control programme (PIMA, LGA, DMH). Control measures should include:

    - Foreshore stabilisation with native vegetation.

    - Tree planting adjacent to rivers.

    - Improving public access to stable areas of the waterway and discouraging access to erosion prone areas.

    - Adoption of agreements with landholders to prevent livestock from damaging the river banks and vegetation.

    - Beach renourishment, walling, groynes, flow redirection, use of baffle boards to dissipate wave action.

    - Modification to recreational activities in serious erosion areas.

25. Provide information to private land owners to encourage appropriate methods of erosion control (PIMA, LGAs).

26. Establish a Bank Revegetation Precinct in areas where revegetation of the river banks is of high priority. To prevent further loss of vegetation PIMA will encourage property owners, local government authorities and community groups to undertake revegetation programmes under PIMA's guidance (PIMA).

27. Develop techniques for propagating rushes for use in bank stabilisation programmes (PIMA, CALM).

Mosquito Control

28. Undertake the recommended works and monitoring programmes defined in the Interim Strategy for Mosquito Control in the Peel Inlet and Leschenault Estuary Regions (PIMA, HD, LGA).

Aboriginal Sites

29. Encourage management bodies and developers to consult with the Department of Aboriginal Sites, WAM, concerning development plans at an early stage to ensure that Aboriginal sites are not inadvertently disturbed (DPUD, PIMA, LGA).

European Historic Sites

30. Identify and protect sites of cultural and/or historic significance by proclamation of Western Australian Heritage Legislation (WAHC).

31. Develop appropriate historic sites as tourist attractions (WATC, LGAs, WAHC).

LAND USE AND WATERWAY PLANNING

Peel Regional Planning Study

32. Provide advice to DPUD concerning waterway conservation needs during preparation of the Peel Regional Planning Study (PIMA, WWC).

Foreshore Reserves

33. Treat all foreshore reserves and the waterway as a single Regional Park for the purposes of planning and management (DPUD, LGAs, CALM, DOLA, PIMA).

34. Implement the recommendations which relate to the rationalisation of foreshore land outlined in the Area Recommendations (PIMA, DPUD, LGAs, DOLA, CALM).

35. Establish a fund to enable the purchase of privately owned foreshore land which cannot be acquired by other existing mechanisms (WWC, TREASURY).

36. Establish a priority order for the acquisition and vesting of foreshore land (DPUD, PIMA, LGAs).

37. Designate areas suitable for declaration of waterway recreation nodes, conservation areas and linear parks (DPUD, PIMA, LGAs, DOLA).

38. Develop foreshore reserves designated for recreational use in the Area Recommendations to facilitate water oriented activities or enhance the use of the waterway. Where the adjoining waterway is not suitable for recreational use other activities should be considered (LGA, PIMA, MSR, DPUD, DMH).

39. Determine the width of foreshore reserves taking into account the following criteria (DPUD, LGAs, PIMA, DOLA):

- future land use
- conservation of natural ecosystems
- educational value
- recreational links between linear parks
- the flood plain
- heritage values

- landscape conservation
- management access
- public access
- erosion and accretion processes
- wildlife corridors
- the need to protect water quality
- possible future changes in sea level
- the advice of the RAOU

40. Identify management agencies for all foreshore reserves and Vacant Crown Land (DPUD, LGAs, CALM, PIMA).

41. Plan service corridors to provide for the combined needs of utilities so that all services cross the waterway at a limited number of common locations where their impact can be minimised (DPUD, LGAs, and other relevant authorities).

42. Liaise with Treasury, DOLA, DPUD and LGAs to develop a properly structured mechanism for funding foreshore reserve management. Consider the use of Trust Funds as a management mechanism (PIMA).

Landscape Protection

43. Determine suitable means of land use control which enable the character of rural areas to be maintained while avoiding the necessity for land acquisition, including the use of strengthened provisions in LGA town planning schemes (DPUD, LGAs, DA).

44. Incorporate special zones into LGA town planning schemes to give protection to valued landscapes, particularly in built up areas (LGAs).

45. Prepare an overall landscape plan in order to co-ordinate landscape enhancement proposals (LGAs).

46. Develop site design criteria and development guidelines for recreational nodes (PIMA, DPUD, LGAs). Specific issues to be considered include:

    - recreational nodes, which should be complementary to each other. Site design should provide a range of offshore and onshore activities;

    - interpretative and educational facilities;

    - toilet facilities; and

    - a variety of modes of access, e.g. foot, vehicle and bicycle.

47. Control advertising signs within the management area in accordance with set guidelines (LGAs, PIMA).

48. Provide low key dinghy/yacht storage areas and liaise with boat owners concerning their use (PIMA).

49. If necessary, invoke the provisions of the Soil Conservation Act to prevent the clearing of large areas near the waterway (DA, PIMA).

Australian Heritage Listing

50. Support the ongoing protection of the waterway with reference to its place on the Register of the National Estate (PIMA, WWC).

Public Access

51. Establish a Public Access Precinct in areas where the provision and management of public access is of high priority. To secure, promote and encourage public access within these areas, PIMA will:

- Support DPUD's practice of reserving and retaining (where possible) river foreshore land to provide public access, and provide advice to DPUD where necessary.

- Seek the acquisition of freehold land in accordance with the WWC Foreshore Management Policy.

- Encourage the incorporation of Vacant Crown Land and unvested reserves into existing reserves for recreation or waterways management purposes and recommend appropriate vesting.

- Promote the preparation and implementation of management plans which improve public access.

- Investigate the feasibility of entering into agreements with private land owners to gain the right of public access, while protecting the right of property owners.

- Support the planning, construction and extension of dual use paths by LGAs in accordance with the Dual Use Path Guidelines.

- Seek to ensure that the boundaries between reserves and private properties are clearly defined by road, dual use path or substantial fencing.

- Identify areas where private development of foreshore reserves has occurred and liaise with property owners and relevant authorities to remove illegal developments.

- In conjunction with WAHC, LGAs and CALM, promote and develop the concept of heritage trails in the scenic or historic areas of the waterway to assist in the development of public awareness of the estuarine environment.

- Support the provision of unobtrusive sign-posting on public reserves, by the relevant authorities in accordance with recognised standards.

- Support the provision of foreshore facilities by LGAs to provide access for the disabled.

- Ensure ongoing public consultation on matters relating to public access.

- Consider the possibility of providing equestrian access through bridle trails.

Urban Development

52. Approving agencies to seek early consultations with PIMA when considering the subdivision or development of land within the management area to determine waterway management requirements (DPUD, LGAs).

53. Ensure that any subdivision or development in newly developed or undeveloped waterway locations has regard for (DPUD, Dev):

    - the nature of nearby foreshore reserves, whether conservation or recreation based;
    - the capacity of the foreshore to sustain heavier use;
    - the degree of protection provided for foreshore areas; and
    - the inclusion in town planning schemes of landscape protection areas identifying vegetation and landforms which must be protected to maintain landscape values.

54. Ensure that residential developments near the waterway include adequate foreshore reserves which are developed and managed in accordance with WWC Foreshore Management Policy (WWC, PIMA).

Commercial Developments

55. Ensure that commercial developments do not occur in areas reserved for conservation or waterway management purposes (DPUD, LGAs, DOLA, PIMA).

56. Have an input to ensure that commercial developments only occur in suitable locations which are chosen after careful consideration of social, environmental and physical planning criteria (DPUD, LGAs, PIMA), including:

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

57. Refer proposals which involve over-water structures or developmental dredging, or those which abut areas which are subject to System 6 Recommendations, to the EPA for environmental impact assessment (DPUD, LGA, PIMA).

Dredging

58. Implement the dredging guidelines prepared by the EPA as an environmental protection policy under the Environmental Protection Act 1986 (EPA, PIMA).

Canal Developments

59. Monitor the environment of all existing canal developments to increase overall knowledge of these artificial waterways (PIMA, Dev, EPA).

60. Establish a mechanism to ensure funds are available to undertake maintenance work on canal developments when required (LGAs, DMH).

61. Assess future developments on land zoned for canals with reference to increasing knowledge of the impact of existing canal estates and the implications of the proposed Dawesville Channel (EPA, DPUD, PIMA, LGAs).

Flood Plain Management

62. Investigate the need for legislative changes in conjunction with the consolidation of the Water Authority Acts and amendments to other planning Acts, to ensure that suitable co-ordination exists between planning authorities and the Water Authority for sound flood plain management (WAWA).

63. Prepare guidelines to assist agencies involved in the planning and management of flood prone land (WAWA, DPUD).

64. Undertake studies to prepare and update flood prone land maps and include all designated flood lands required for the proposed guidelines (WAWA).

65. Prepare flood plain management plans for the river system. These should consider factors such as flood behaviour, including risk and effects of future development, conservation of the natural environment, and planning issues (WAWA, DPUD, LGA, PIMA).

Water Transport

66. Improve facilities for boats and ferries (LGA, PIMA, DMH) by supporting the

- raising of the old traffic bridge which limits boat access; and
- provision of car parking, public toilets, and sewage pump out facilities.

Where appropriate developers of waterside facilities should contribute to the cost of providing these facilities.

67. Provide suitable sites for hire and drive operators at appropriate locations around the estuary (LGA, PIMA, DMH).

68. Ensure that proposals to develop new commercial boating facilities undergo proper investigations to avoid environmental problems and user conflicts (PIMA, EPA, DMH, LGA).

Living on Boats

69. Ensure that all boats which contain living facilities include effluent holding tanks, bilge tanks and pump out fittings (DMH, PIMA).

70. Ensure that effluent pump out facilities are included in the design of nominated marina facilities around the inlet (LGA, PIMA).

71. Seek Cabinet approval to gazette a regulation limiting the residential use of boats (HD, WWC, PIMA).

Planning for Climatic Change

72. Seek wider and more elevated areas of foreshore reserve to limit losses in the event of sea level rises (DPUD, LGA, PIMA).

73. Discourage the development of buildings and other permanent structures below 1.5 m AHD (WAWA, PIMA).

74. Ensure that all advice provided by PIMA relating to development proposals near the waterway contains a statement warning developers of the predictions of climatic change and sea level rises (PIMA).

TOURISM

Provision for Tourist Facilities and Activities

75. Limit foreshore tourist facilities to those providing direct services to tourists. Facilities providing support services to the tourist industry, e.g. administrative buildings, should be located away from the foreshore (DPUD, LGA).

76. Identify areas where tourist developments may occur without loss of the waterway environment (PIMA).

77. Prepare an information booklet and map detailing attractions of the waterway for tourist and day visitors and advising of the need to protect the waterway environment (PIMA).

78. Encourage developers of tourist facilities to seek advice about waterways management issues before preparing development proposals (PIMA).

79. Require tourist operations proposing to conduct tours near conservation areas to seek approval from the relevant authority. Any tourist operator working in conservation reserves must be licensed by the Department of Conservation and Land Management (PIMA).

FISHING

80. Reduce the number of professional fishing units using the mechanisms outlined in the "Need for Action", to a number which can operate viably on the waterway (DF).

81. Consider the waterway's capacity to sustain both professional and amateur fisheries when determining the "ideal" number of professional fishing units (DF).

82. Develop an education programme which emphasises the need for regulation and maintenance of habitats and breeding areas (PIMA, DF).

83. Continue research on (DF, PIMA):

- species taken by commercial and amateur fisherpeople;
- the impact of commercial and amateur fishing activities on fish stocks in the estuary; and
- the effects of changes to the waterway environment on fish and shellfish and their habitats.

RECREATION

84. Identify areas where recreation reserves can be created or increased in area and upgraded to provide for existing and future demands (PIMA, MSR, DPUD, LGA).

85. Improve water quality to encourage swimming and if appropriate create areas of deeper water suitable for swimming (PIMA, MSR, EPA, WWC, DPUD).

86. Improve picnic area design to create better areas for relaxing and social interaction within small groups (LGAs, PIMA, MSR).

87. Identify sites suitable for the development of recreation club activities (LGAs, PIMA, MSR).

88. Monitor trends in recreational use and participation through surveys, observation and public consultation to determine requirements for future recreation (MSR, PIMA, LGA, WWC).

89. Prepare a brochure which identifies recreational areas and facilities, and encourage the public to use those areas most suitable for particular activities (MSR, LGA, PIMA).

90. Integrate hire and drive operations with other foreshore activities and provide facilities (toilets, parking, picnic facilities, seating and shade) to serve all foreshore users (LGAS PIMA, Dev, MSR).

91. Identify areas which are suitable for hire and drive operations in foreshore management plans (PIMA, LGA, MSR).

92. Identify areas which may be used by horse riders and prepare guidelines for their use (PIMA, LGA, MSR).

NAVIGATION AND BOATING SAFETY

93. Prepare a strategy for the systematic upgrading of existing boat ramps to enable their most efficient use (PIMA, LGA, DMH).

94. Undertake engineering and environmental investigations to identify the location of additional boat ramps which will reduce congestion at existing facilities. Where appropriate developers of waterside land should contribute to the cost of providing boat ramps and associated facilities (DMH, PIMA, LGA).

95. Support the enforcement of WA Marine Regulations relating to boating safety (PIMA, DMH).

96. Consider the establishment of special use areas having regard for: (DMH, PIMA, DPUD)

- Boating safety.
- Recreational use.
- Impact on the foreshore including vegetation bank stability.
- Compatibility with the overall river plan for the area.

97. Extend the existing mechanism so that navigable waters may be closed for conservation and maintenance objectives as well as for safety reasons (DMH, PIMA, CALM).

98. Encourage and expand the recently introduced voluntary training programmes for boating operators (DMH).

99. Ensure installation of fire fighting equipment at all major jetties (DMH).

MANAGEMENT

Co-ordination

100. Prepare and implement procedures for referral and consideration of development proposals so that the interests of all relevant agencies are considered (DPUD, PIMA, all relevant authorities).

101. Prepare and implement procedures for the referral and consideration of all land use management plans and town planning schemes so that they may be considered by relevant authorities before adoption (DPUD, PIMA, all relevant authorities).

Emergency Procedures

102. Amend the CPDOSPHA so that its format is similar to DEPM (PIMA, WWC).

103. Acquire the equipment recommended in the DEPM and store in an appropriate manner (PIMA, WWC, Treasury).

104. Ensure that all PIMA staff are familiar with emergency procedures and are trained in the use of the equipment (PIMA).

105. Amend CPDOSPHA to reflect the requirement to react to emergencies throughout the entire catchment (PIMA, WWC).

106. Ensure that all Waterways Commission staff are familiar with DOSHWA procedures for handling dangerous materials (WWC, PIMA, DOSHWA).

THE WATERWAYS ENVIRONMENT IN THE FUTURE

The Peel-Harvey estuarine system is a unique feature of the Western Australian landscape, and has been placed on the Register of the National Estate. Beloved by generations of Western Australians as a holiday venue it is also a valuable local, regional, and State economic and environmental resource. The estuary and its attendant rivers are the focus of fishing, farming and tourist industries of major importance to the economic well being of the people of Western Australia. At the same time it is an irreplaceable environmental asset with its own intrinsic attractions which have drawn people to the area in ever increasing numbers for the past 100 years.

However its popularity has brought attendant problems and the waterways have been under stress from the cumulative effects of human occupation of its hinterlands ever since Thomas Peel and others settled there 160 years ago. This stress will not decrease in the foreseeable future, having regard to population growth projections, anticipated increase in tourist numbers, and the possible increase in intensive agriculture on the coastal plain. These difficulties will require careful management of the water system and of its marginal land.

The Management Programme endeavours to provide a blueprint and guidelines for managing the system for the benefit of all the people, maintaining a balance between the competing needs of the users and occupiers of the waterways and their hinterlands. It has been compiled with a vision of the Peel-Harvey estuarine system 100 years and more in the future, with the water bodies restored to a cleaner and more balanced condition.

A growing resident population and an ever increasing number of visitors, holiday makers and tourists will be seeking more water based recreational opportunities. Wherever possible passive recreation is to be encouraged to counterbalance the more active on-water pursuits. On the western margin of the estuarine system the programme identifies nodes which can be developed further for a range of recreational activities, including sailing, canoeing, swimming and wading. The widening of foreshore reserves will provide enhanced shore based recreation while also serving to absorb the impact of increased population.

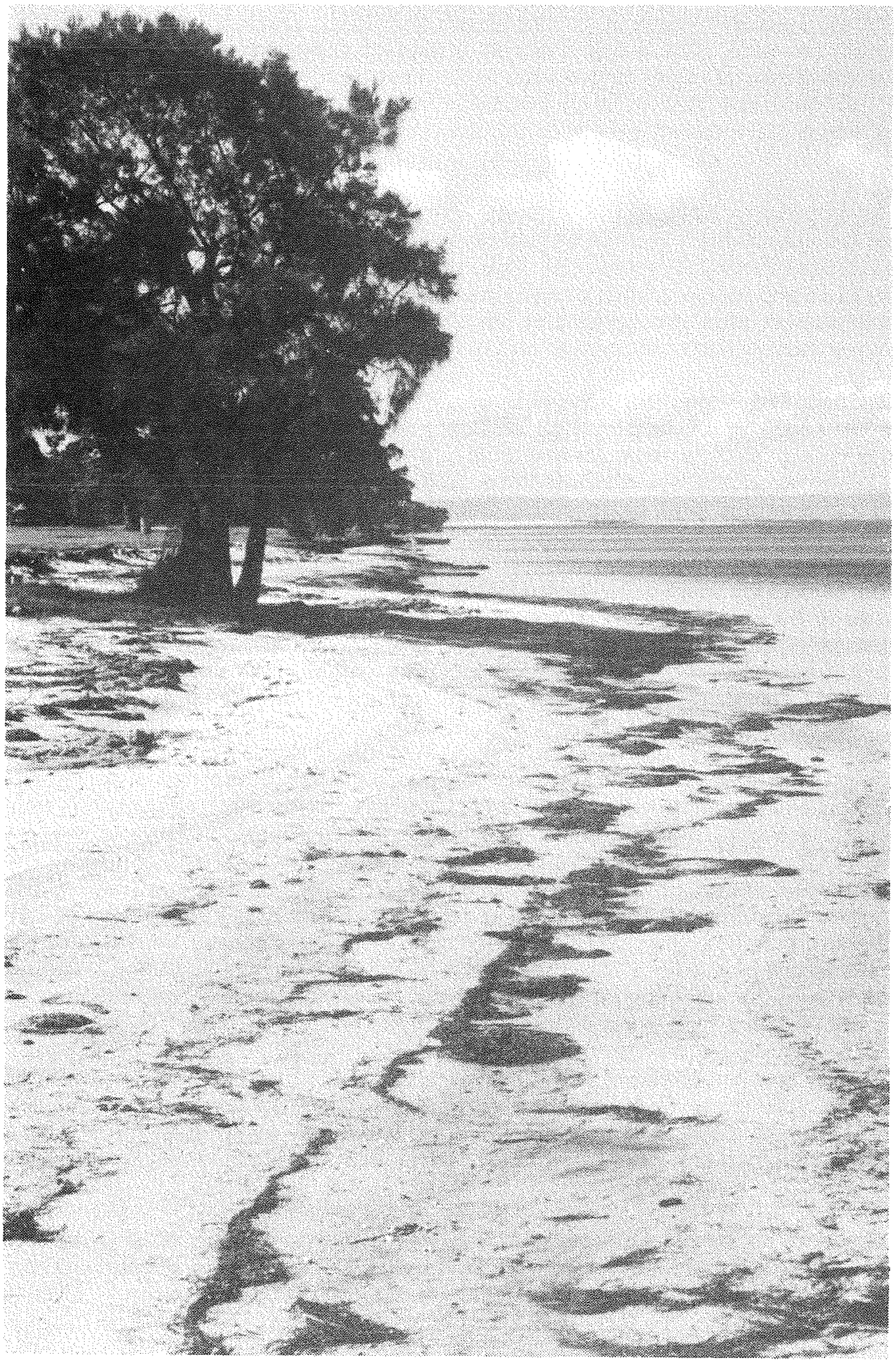
The programme has also identified areas of conservation value. Protection of conservation zones in these areas will be achieved by implementation of area-specific management plans in co-operation with local government and other government agencies and input from non-government agencies where feasible.

The programme recommends and requires appropriate vesting and management of existing and future foreshore reserves. Part of the management will be design and implementation of a co-ordinated landscape plan whose objectives would be to retain the visual and organic link between the waterways and the adjoining land. The provision of environmentally acceptable access to the foreshores will remain a high priority.

Along the upper reaches of the Murray, Harvey and Serpentine Rivers within the management area existing riverine reserves should be enlarged as opportunity occurs. Within them existing vegetation should be preserved and supported by additional planting to assist the control of erosion and interception of nutrient flow to the rivers. Power boating should be restricted in these reaches.

The Management Programme supports proposals to improve the water quality in the estuary, and maintain it in a viable condition for future generations. Its successful implementation requires the active participation and interest of the resident and itinerant community using the foreshores and waterways.

It is believed that our Western Australian community recognises the value of the Peel-Harvey estuarine system and hence this interest and participation will be readily forthcoming enabling the amenity which it has enjoyed in the past to be restored and sustained into the distant future.



Novara Beach

CHAPTER 1

INTRODUCTION

1.1 *AIM OF THE MANAGEMENT PROGRAMME*

The aim of this Management Programme is: **"To balance competing demands for use and development with the need to restore the nutrient balance of the waterway and conserve a healthy, functional, estuarine environment for present and future generations."**

The Peel-Harvey Estuary is the major feature of the region which includes Mandurah, Pinjarra and Waroona. It is an important landscape feature and provides a focus of regional importance for recreation, tourism and commercial fishing. In addition, the inlet and foreshores include wildlife habitat of international significance. The community places a high level of importance upon the need to protect and rehabilitate the estuarine waters and associated plant and animal communities.

Eight major objectives are identified to assist in achieving the above aim as detailed in Chapter 4. The programme identifies the major components of the waterway environment and mechanisms which degrade them or have the potential to do so.

The greatest threat to the waterway environment is nutrient enrichment and this programme briefly describes the work under way to restore the nutrient balance. However, this work is the subject of a number of detailed reports and therefore is not duplicated here, although PIMA's role in the process is described.

The need for co-operation between State and local government agencies and the role of the public is defined. The steps required to prevent environmental damage and rehabilitate damaged areas are defined with recommendations about who should do the work. The need to rationalise land use, tenure and planning is defined with specific recommendations about all reserves in the PIMA management area. The role of tourism, fishing and recreation on the waterway is described and recommendations about their management made. The need to control boating activity and the management role of various agencies are outlined.

The 306 recommendations in this programme show how PIMA will work and encourage others to protect the waterway.

1.2 *BACKGROUND*

1.2.1 *1982 Management Programme*

A report on the Peel Inlet Management Programme was prepared by Consultants Kinnaird Hill de Rohan and Young Pty Ltd for the Waterways Commission in 1982. This report was available for public comment for a period of three months, after which submissions were assessed by the Peel Inlet Management Authority. After considering the submissions and recommendations of the management authority, the Waterways Commission produced the Peel Inlet Management Programme, 1982. The programme included text and a map. The text discussed zoning, reserves, various developments and recommendations about the future of recreation sites around the estuary, the need for public education and further studies. The map outlined the boundary of the management area, reserves, conservation areas and cadastral information.

1.2.2 *Management Programme Review*

As outlined above, the first Management Programme was prepared in 1982 and since then a number of significant changes have occurred which will affect management of the estuary. The changes include increased recreational use, the development of two substantial canal estates, widespread housing development in Mandurah, Pinjarra and surrounding rural areas and associated population growth, and construction of a number of resort developments. Several other major developments are under way including a canal estate and proposed tourist developments.

Management of the estuary itself has altered substantially since 1982 with development of sophisticated and expensive weed harvesting operations and the introduction of extensive catchment management techniques. When the Dawesville Channel is constructed the waterway environment will alter significantly and management of this change should be considered.

The provisions of the Waterways Conservation Act 1976-82 require that the WWC review the Management Programme on a regular basis. Section 35(5) states "A Management Programme shall be kept under constant review and may subsequently be amended from time to time with approval of the Minister". PIMA undertook a review between 1989-91 involving extensive public input. This Management Programme 1991 resulted from this process.

1.3 *MANAGEMENT RESPONSIBILITY*

1.3.1 *History of the Peel Inlet Management Authority*

Initially management of the estuary was the task of local government authorities, namely the Shires of Mandurah, Murray and Waroona. However, during the 1960s management of the waterway became more complex and difficult and the local government authorities felt a need for a body which could co-ordinate their policies and activities in regard to the estuary, and assist in securing technical and specialist assistance from government authorities.

Mr Ewart Runciman introduced a delegation from the Shires to the then Minister for Works, Hon Ross Hutchinson,who agreed there was a need for a body to co-ordinate management of the waterway.

On 5 February 1971, the Minister for Environmental Protection, the Hon G C Mackinnon, established an advisory committee called the Peel Inlet Conservation Advisory Committee. The Committee was chaired by Mr R Courtney who was also Chairman of the Swan River Conservation Board at the time. Other members were:

Representing the Murray Shire Council:

Councillor H W Nancarrow, his proxy being
Councillor H J McCoy

Representing the Mandurah Shire Council:

Councillor J D W Ireland JP, his proxy being
Councillor H W Thompson

Representing the Waroona Shire Council:

Councillor Bremner, his proxy being
Councillor V Jones

The Health Inspector to be Mr B W Bell of the Mandurah Shire Council.

Representing the Minister for Works:

Mr J Gillespie, Engineer for Harbours and Rivers

Representing the Minister for Works (Harbour and Light Department):

Mr A Fuller, Manager of the Harbour and Light Department

Representing the Department of Fisheries and Fauna:

Dr A Burbidge

Representing the users and those generally interested in the waterways:

Mr Owen Tuckey of Muir Place, Mandurah.

The responsibilities of the Committee were outlined in a press release (47/71) prepared for the Premier Sir David Brand which said, "It will be the responsibility of the Committee working in co-operation with the Minister for Environmental Protection to establish guidelines and rules which will ensure that the whole area retains its main attractions."

The inaugural meeting of the Committee was held on Friday 19 February 1971, at the offices of the Mandurah Shire Council.

At the time the Committee was established consideration was given to the possibility of giving it statutory powers, perhaps delegated under the Environmental Protection Act 1971. However, after considering the matter the Government decided that granting such authority would have been premature at that time because the Environmental Protection Act had just been proclaimed, and the Committee was just beginning its work. The Committee continued to function until 1976.

During the early 1970s, the Government received requests for an increased management presence to deal with waterways conservation issues in a number of areas. The Waterways Conservation Act 1976 was enacted to provide the powers required to meet this need. The Act provides for the establishment of waterways management authorities.

On 10 August 1977 an Order in Council was published establishing the Peel Inlet Management Authority (PIMA). The order reads:

"Pursuant to the provisions of Section 10 of the Waterways Conservation Act 1976, and on the Recommendation of the Environmental Protection Authority, His Excellency the Governor, acting with the advice and consent of the Executive Council, hereby declares the area of the State containing the Peel Inlet and the Harvey Estuary to be a Management Area for the purposes of the Waterways Conservation Act, 1976 and:

a) Assigns to that area the name "Peel Inlet Management Area".

b) Constitutes the Peel Inlet Management Authority to be the management authority for the area.

c) Defines as the boundaries of the waters and associated land comprised in that area, the boundaries shown marked in red on Peel Inlet Management Authority plans 1 to 16 (both inclusive) held at the offices of the Peel Inlet Management Authority, Mandurah. (See Map 1).

d) Places that area under the control and management of the Peel Inlet Management Authority."

Other members were:

Roy Douglas Deering, 204 Culeenup Road, North Yunderup

James Frederick Armitage, P O Box 15, Waroona

Dudley Charles Tuckey, 20 Leslie Street, Mandurah

who were all nominated by interested local government authorities.

Francis Stewart Cross, 37 Rodoreda Crescent, Ravenswood

Ewart Runciman, 8 Muir Place, Mandurah

Ronald Wells, 1 Forward Street, Mandurah

Kevin Douglas Green, 4 Pinjarra Road, Mandurah

James Linton Butcher, Harbours and Rivers Branch of Public Works Department

Clive John Gordon, Manager of the Harbour and Light Department

Dr Andrew Burbidge, Fisheries and Wildlife Department

The first meeting of PIMA was conducted on 16 September 1977, at the Mandurah Shire Council Chambers.

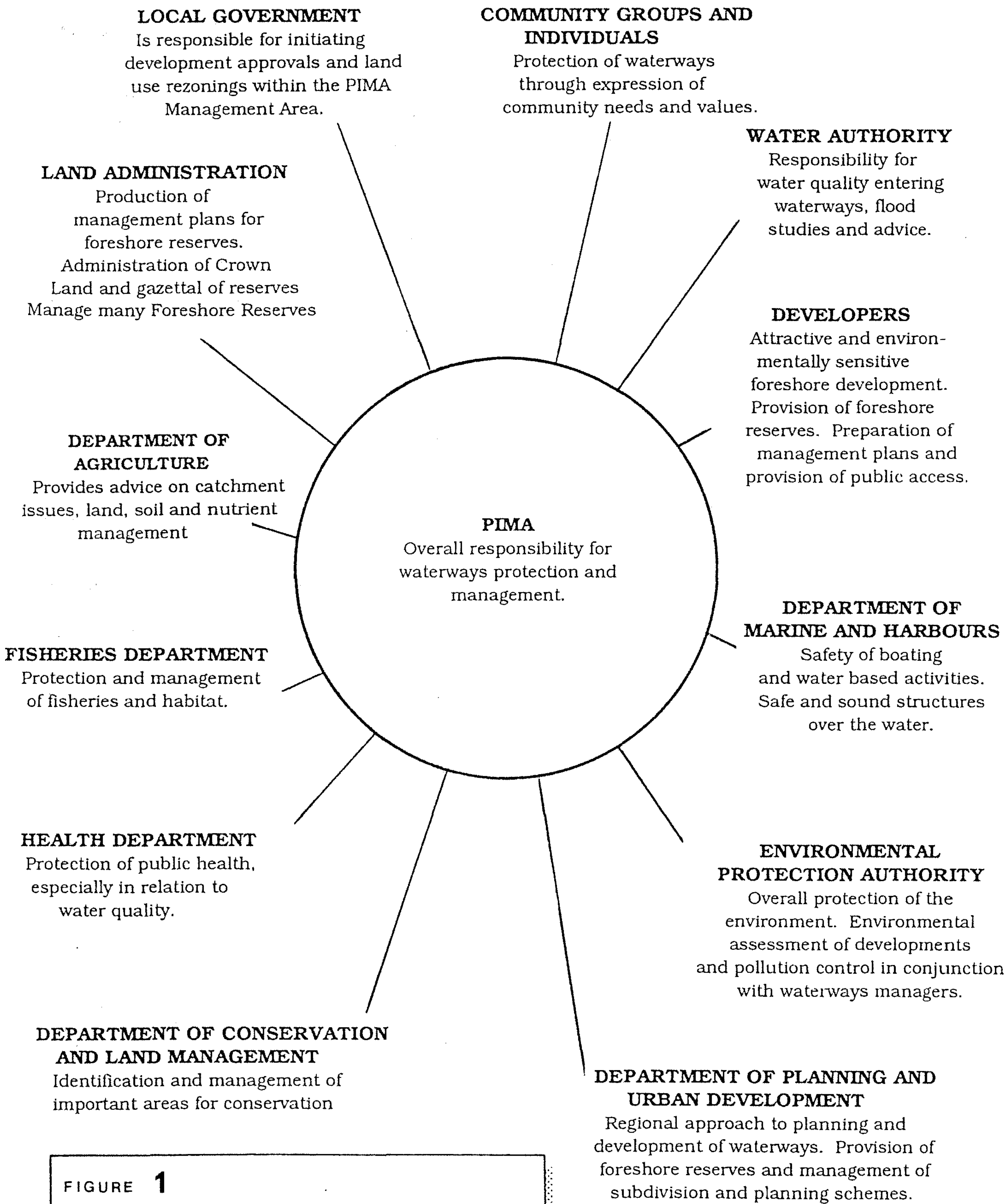


FIGURE 1

THE ROLE OF PIMA IN RELATION TO THE ROLE OF THE OTHER ORGANISATIONS AND GROUPS IN PLANNING AND MANAGING WATERWAYS

1.3.2 *Role of the Peel Inlet Management Authority*

Section 23 of the Waterways Conservation Act states the duty of the Waterways Commission. This duty is delegated to PIMA under Section 22(1) and is defined as:

- To preserve or enhance the quality of the environment and amenity of the waters of the Peel Inlet and associated land;

- To control and wherever practicable to prevent any act or omission which causes or is capable of causing pollution of those waters or that land;

- To provide advice and disseminate knowledge on the conservation and good management of Peel-Harvey system; and

- In so far as is practicable, to act in concert with, consult and make arrangements and agreement with relevant local government authorities, residents and other persons affected by the operation of the Act.

PIMA works in co-operation with a number of other authorities and bodies as outlined on Figure 1.

1.3.3 *Role of Other Bodies in Estuarine Planning and Management*

Other bodies with a major interest in the estuary include the LGAs represented on PIMA and the Departments of Fisheries, Marine and Harbours, Conservation and Land Management, Agriculture, Department of Planning and Urban Development, Water Authority of WA and South West Development Authority.

Local Government Authorities

Three local government authorities represented on PIMA are:

* Shire of Murray
* City of Mandurah
* Shire of Waroona

and their municipal boundaries are shown on Figure 2. As outlined in Section 1.3.1, LGAs were initially directly responsible for management of the estuary and the Peel Inlet Conservation Advisory Committee was established at their request. In addition, the three LGAs have been represented on PIMA since its inception.

Provisions of the Town Planning and Development Act confer several important powers upon LGAs which have a direct effect upon the management area. They:

- Prepare and initiate changes to town planning schemes which control development within the management area;

- Approve and supervise residential and commercial developments; and

- Provide advice to DPUD concerning the subdivision and amalgamation of land.

LGAs also have an important role in the planning, development and management of foreshore reserves because many Land Act reserves are vested in them and because they may own freehold land within the management area.

It is also the responsibility of Councils to monitor the changes and effects on farmlands, which may come about as a result of management controls brought into operation through recommendations of the Peel Inlet Management Programme, and to ensure they do not conflict with adopted farming practices.

Department of Agriculture

The Department of Agriculture plays an important role in managing the catchment of the Peel-Harvey system, and the Minister for Agriculture is a proponent for the purpose of implementing the Peel Inlet Management Programme.

The Department of Agriculture also:

- Identifies and monitors diffuse and point sources of nutrients entering the waters of the Peel-Harvey catchment;

- Provides advice to farmers to assist in reducing nutrient inputs; and

- Undertakes research and prepares reports about land and soil types and their capacity to sustain development without worsening nutrient inputs to the waterway.

FISHERIES DEPARTMENT

The Fisheries Department is responsible for the conservation and management of professional and recreational fisheries in the estuary and the state of the aquatic animal and plant life. The Minister for Fisheries and his Department are responsible for the management of professional and recreational fisheries of the waterway through the gazettal of Fisheries Regulations and Notices and their enforcement by Fisheries Inspectors.

The Research Branch also does research on the fish species of the estuary often in conjunction with other State departments or universities. Funding is provided through the Fisheries Research and Development Fund.

WESTERN AUSTRALIAN TOURISM COMMISSION

The Western Australia Tourism Commission's (WATC) role is to:

- Market Western Australia as a tourism destination for interstate and international travellers;

- Increase the amount of travel within Western Australia and the use of tourist facilities in Western Australia by Western Australians;

- Improve and develop tourist facilities in Western Australia; and

- Provide for more efficient and effective utilisation of investment in tourism within Western Australia.

The management of tourism centres on several organisations in the region including:

- WA Tourism Commission's regional directorate based at Bunbury;

- South West Regional Travel Association;

- Mandurah Tourist Bureau and Travel Centre; and

- Murray Tourist Information Centre at Pinjarra.

DEPARTMENT OF MARINE AND HARBOURS

The role of the Department of Marine and Harbours is to:

- Administer, exercise and perform the powers and duties necessary or convenient for the control and regulation in the State of marine and port affairs and navigation;

- Regulate, control and promote measures desirable to ensure the safety of life in connection with shipping and boating and to construct, maintain and manage facilities and equipment necessary for that purpose;

- Construct, provide and maintain facilities and services, both on land and water, that are desirable to meet the needs of effective and efficient shipping and boating, both recreational and commercial, including:

  * moorings
  * fishing industry facilities
  * launching ramps
  * navigation aids

- Regulate and control the construction, operation and maintenance of small boat harbours, and maritime, coastal and estuarine facilities within the State;

- Provide for and enhance the quality of the environment and amenities of the waters of the State, and to provide advice and disseminate information on, and co-ordinate management policies for, the conservation and good management of those waters;

- For the purpose of improving the use of the waters of the State, to carry out river training, dredging, reclamation, construction or other structural works;

- Control and regulate the excision or reclamation of any waters or land of the State; and

- Control the erection, construction, maintenance or use of any jetty as provided for under the Jetties Act 1926.

DEPARTMENT OF PLANNING AND URBAN DEVELOPMENT

The main functions of the Department of Planning and Urban Development are to:

- Co-ordinate and promote urban, rural and regional land use, planning and land development in the State;

- Prepare a planning strategy for the State as a basis for co-ordinating and promoting regional land use planning and land development; and

- Provide advice and assistance to any body or person on land use planning and development.

In particular, with reference to the Peel Inlet management area, it is the role of the Department to:

- Control the subdivision and development of land;

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

- Ensure public access to and around the waterway; and

- Prepare a regional plan for the local government areas of Mandurah, Murray, Waroona and Boddington.

The Department of Planning and Urban Development is currently undertaking the Peel Regional Planning Study. The Waterways Commission and PIMA are represented on the Technical Consultative Group, and have submitted technical papers to the Study's Project Team.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

CALM manages public land and natural resources, and conserves native wildlife on behalf of the people of WA. Emphasis is placed on informing the public of the Department's activities and, wherever possible, involving the public in planning and management. The decentralised structure of the Department ensures that CALM officers are on hand to interact with local communities and solve local problems.

CALM legislative base provides the following major requirements:

- Management must be in accord with a published management plan and all management plans must be made available for public review and comment in the draft phase;

- All lands are vested in two controlling bodies (not the Department). The controlling bodies (National Parks and Nature Conservation Authority and Lands and Forest Commission) are composed mainly of members of the public representative of conservation and land management interests.

- The Department must perform the following functions:

  * manage land vested in the NPNCA and LFC;
  * provide the NPNCA and LFC with assistance;
  * promote and encourage the forest production requirements of the State;
  * be responsible for conservation of flora and fauna throughout the State;
  * carry out research;
  * provide advice to other bodies;
  * advise the Minister.

- Indigenous State forests must be managed on a sustained yield basis to ensure long term social and economic benefits from forest resources;

- Exotic species forests must be managed for optimum timber yield;

- National parks and marine parks must be managed to provide for public recreation, consistent with conservation of flora, fauna, landscape and other features;

- Nature reserves must be managed to ensure the protection, care and study of wildlife.

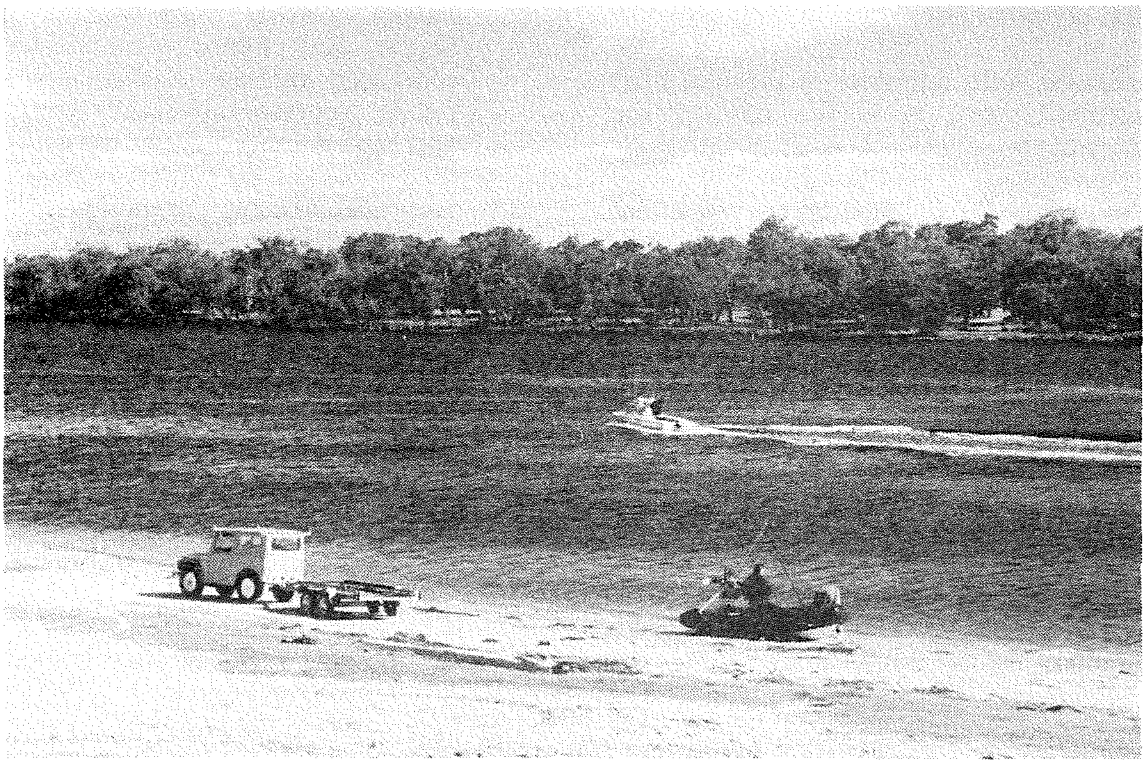
SOUTH WEST DEVELOPMENT AUTHORITY

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

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

- Provide the region's local authorities with information services on the findings of commissioned studies and other research;

- Promote investment and expansion in the region.



Mandurah Inlet Channel

CHAPTER 2

STUDY AREA

2.1 *LOCATION*

The Peel-Harvey estuarine system is located between 32°21' and 33°00' south, and 115°30' and 115°50' east. The northern end of the waterway is at Mandurah which is 75 km by road south of Perth (Figure 2).

This study includes an investigation of the Pinjarra section of the Swan Coastal Plain, which forms the hinterland of the estuary, as human activity in this area may impact significantly on the waterway. In addition, the entire catchment of the system is considered because of potential pollution problems (Figure 7).

The study area lies within the Darling System described in some detail by Mulcahy et al in "Atlas of Natural Resources Darling System Western Australia" (DCE, 1980), and readers are referred to that publication. It is not proposed to describe the study area in great detail here but to highlight features which are important in the waterway planning process. The Darling System is characterised by old landscape elements, deep weathering, infertile soils, and flora and fauna adapted to a unique environment.

2.2 *GEOLOGY*

The Darling System contains two distinct geological provinces which are separated by the Darling Fault, as shown on Figure 3. East of the Scarp is the Yilgarn Block, a relatively stable shield area of Archaean crystalline rocks. The Perth Basin lies west of the Darling Scarp in a deep trough filled with sedimentary rocks, extensively covered by Quaternary deposits (DCE, 1980). While a major portion of the catchment area of the Peel-Harvey system lies in the Yilgarn Block (Figure 3) it is human activity on the sedimentary deposits of the Perth Basin which influence the estuary most. Consequently, it is these deposits which are detailed on Figure 4 and described briefly below.

YOGANUP FORMATION

This formation consists of basal conglomerate overlain by sand containing shallow beds of clay. The yellow sands probably originated in beach deposits laid down when the sea was much higher and the Indian Ocean reached the Darling Scarp.

GUILDFORD FORMATION

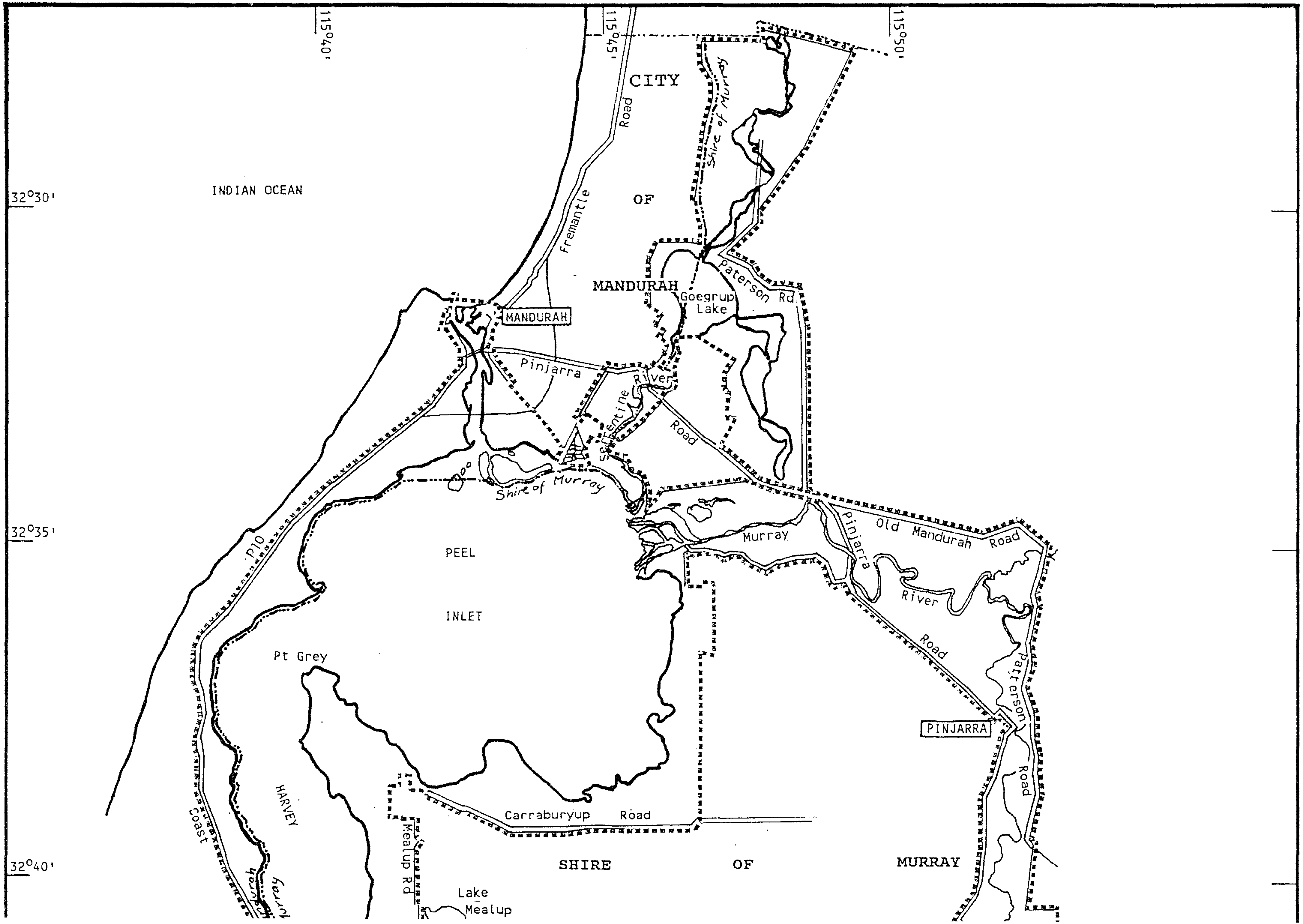
The Guildford formation consists of beds, interbeds and mixes of sand, clay and conglomerate which are locally calcareous. Most of the formation is of riverine origin but some may have been laid down in estuarine marine environments. This formation corresponds with the Guildford related soils described in Section 2.3.

BASSENDEAN SAND

The Bassendean sand forms a series of dunes parallel to the coast and inland from the Tamala limestone. The sand was probably deposited at older coastlines when the sea level was much higher than at present. The deposits are poorly sorted quartz sand, mainly fine to medium grained with coarse grains in some locations. Generally the dunes correspond with the Bassendean soil and land form unit.

TAMALA LIMESTONE

Tamala limestone occurs as a ridge which runs almost parallel with the coast throughout the study area, varying in width from approximately 1 km at Mandurah to 5 km near Lake Walyungup. It consists of coarse to medium grained calcareous limestone composed largely of fossil fragments and varying amounts of quartz sand. The Tamala limestone corresponds with the Karrakatta and Cottesloe soil units.


115°40'
115°45'
115°50'
32°30'
32°35'
32°40'
INDIAN OCEAN
CITY
OF
MANDURAH
Fremantle
Road
Shire of Murray
Paterson Rd
Goegrup
Lake
MANDURAH
Pinjarra
River
Serpentine
Road
Shire of Murray
Murray
Pinjarra
Old Mandurah Road
River
Road
PEEL
INLET
Pt Grey
Old
Coast
HARVEY
Patterson
PINJARRA
Road
Carraburyup Road
Mealup Rd
SHIRE
OF
MURRAY
Lake
Mealup

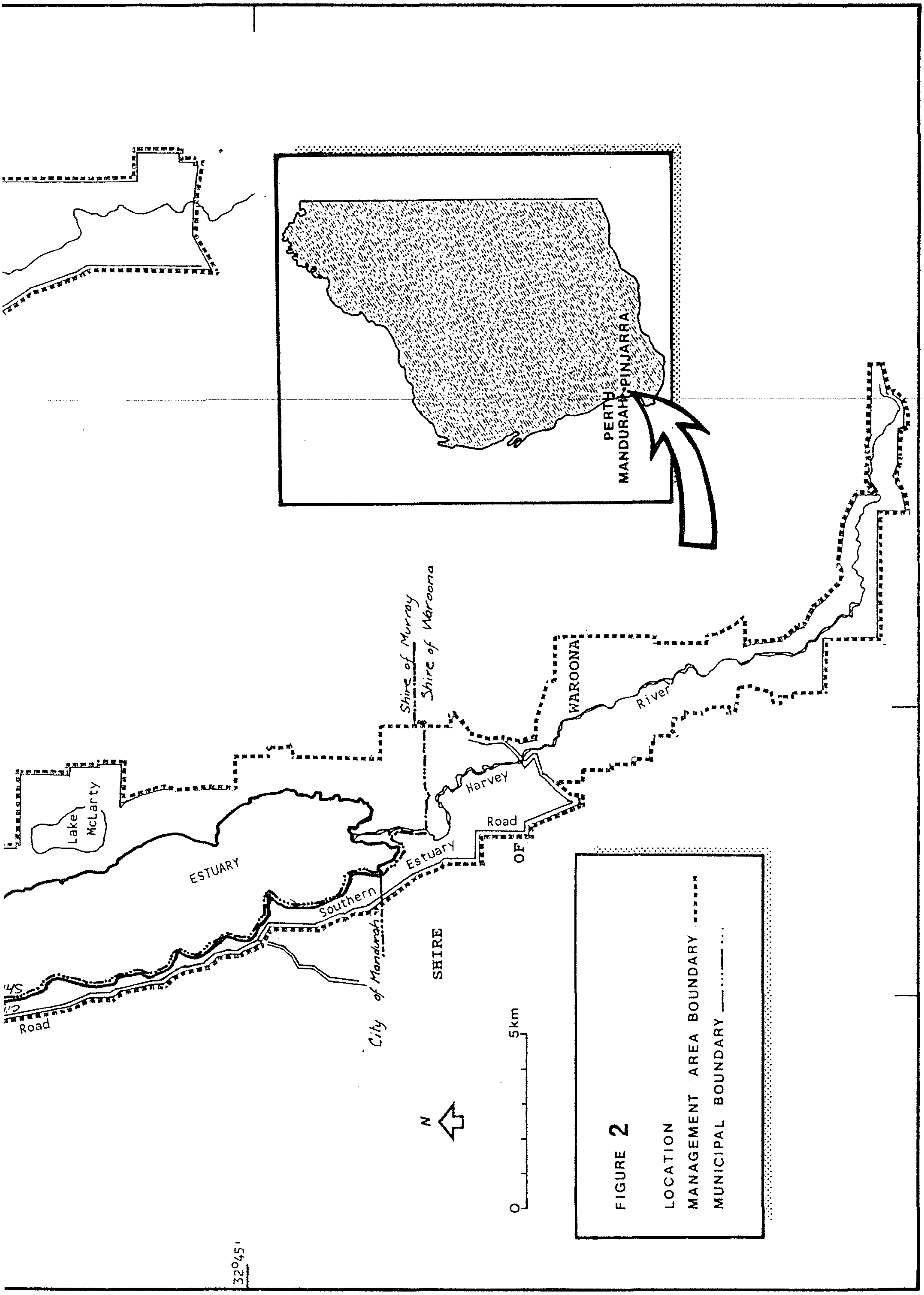


FIGURE 2
LOCATION

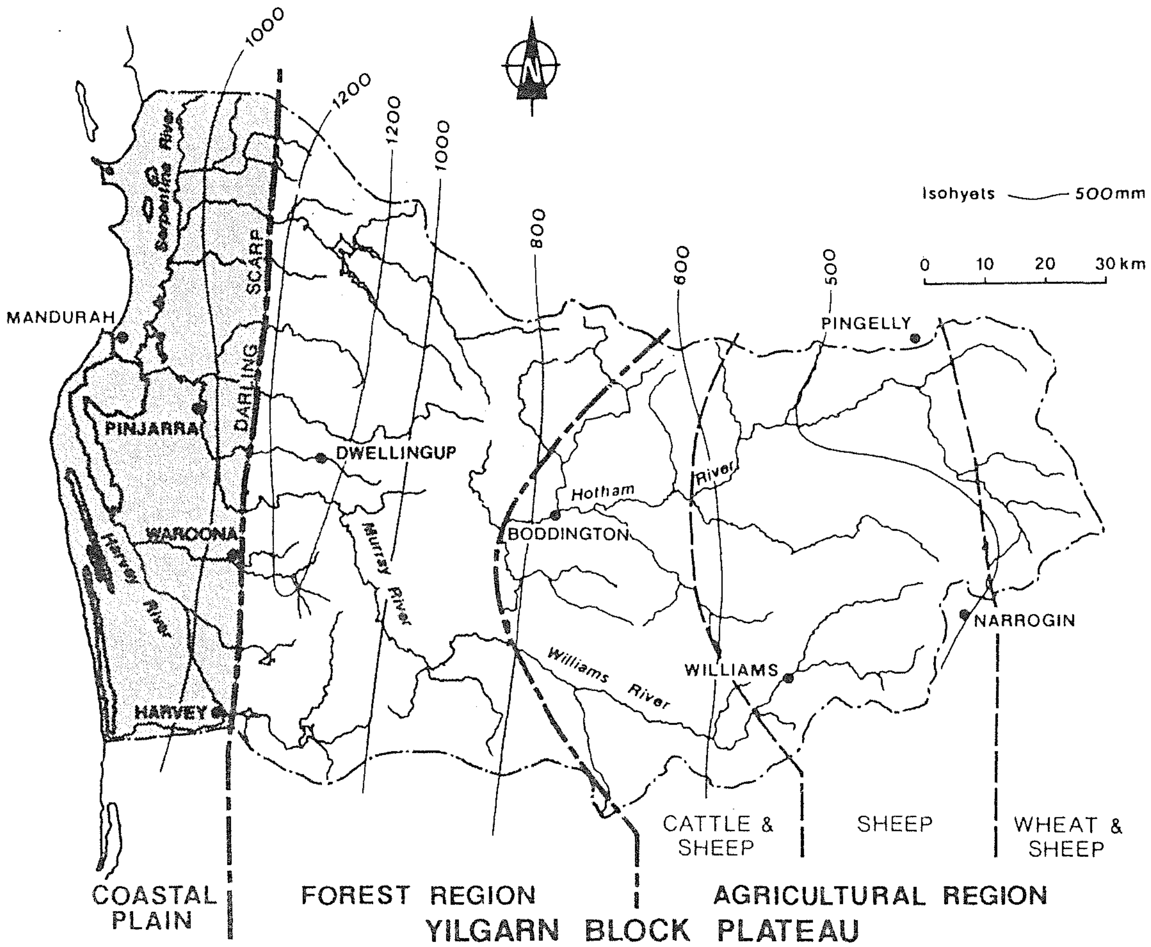


FIGURE 3

PHYSICAL FEATURES OF THE CATCHMENT OF THE PEEL– HARVEY ESTUARY
(FROM HODGKIN ET AL (1980)

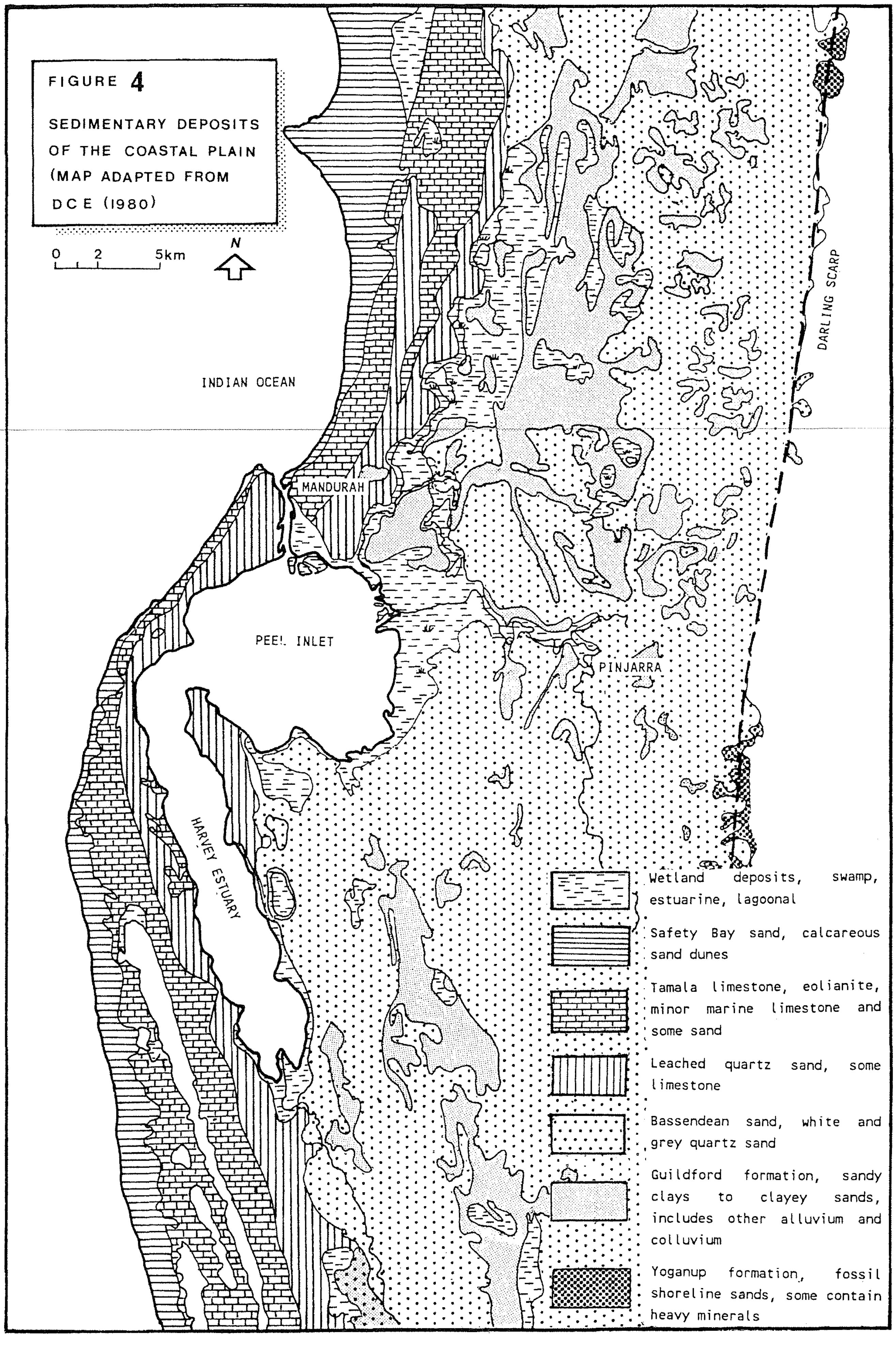


FIGURE 4
SEDIMENTARY DEPOSITS OF THE COASTAL PLAIN (MAP ADAPTED FROM DCE (1980)
0 2 5km
N
INDIAN OCEAN
MANDURAH
PEEL INLET
PINJARRA
HARVEY ESTUARY
DARLING SCARP
Wetland deposits, swamp, estuarine, lagoonal
Safety Bay sand, calcareous sand dunes
Tamala limestone, eolianite, minor marine limestone and some sand
Leached quartz sand, some limestone
Bassendean sand, white and grey quartz sand
Guildford formation, sandy clays to clayey sands, includes other alluvium and colluvium
Yoganup formation, fossil shoreline sands, some contain heavy minerals

LEACHED QUARTZ SANDS

In some locations leached quartz sands are associated with Tamala limestone and appear to be remnants of decalcified limesand dunes. The sand is composed of moderately sorted fine to coarse quartz sand, with patches of limestone remaining. Limestone outcrops also appear associated with the Karrakatta soils.

SAFETY BAY SANDS

The white beach and dune sands which occur along the coast are called Safety Bay sands, and normally overlie Tamala limestone. The sand is made up predominantly of shell fragments with variable amounts of quartz and some feldspar. The Quindalup soil unit is associated with these sands.

WETLAND DEPOSITS

Lake and swamp deposits occur at various locations, comprising clay, sand, peat, gypsiferous and diatomaceous materials. Soils associated with the wetland deposits include Mungala and Bassendean sands (DCE, 1980).

2.3 *SOILS AND LAND FORMS*

The slope and relief of the land and nature of the soil are basic considerations in planning. They determine to some extent how the land may be used and the ease and difficulty associated with various uses (DCE, 1980). Therefore these properties are combined to make land form soil units which are described below and delineated on Figure 5. Regional geology, described in the previous section, is a major influence on the pattern of land form soil units and provides the basis for classification.

The entire study area lies in the Swan Coastal Plain described by Churchward and McArthur in "Atlas of Natural Resources Darling System Western Australia" (DCE, 1980). The Plain is generally of low relief, between 20-30 km wide and composed of Quaternary sediments. The eastern boundary is defined by the Scarp and the western boundary by the Indian Ocean.

The base of the Scarp is fringed by sandy and gravelly deposits which have been washed from the Plateau to form spurs and foothills. These are the most recent alluvial deposits and are known as Forrestfield and South Dardanup units.

The alluvial terrain along the eastern fringe of the plain consists of materials of different ages which provide the basis of land form mapping. The older layers characterised by duplex soils are described as the Guildford unit. The Serpentine River unit was also formed on older alluvium, but in wetter conditions producing soils of finer texture and poor drainage. The Swan unit exists along the present courses of the Murray and South Dardanup Rivers and is composed of younger sediments than the Guildford unit.

The aeolian (wind blown) deposits are also arranged in age sequence with three main units which differ mainly in the nature of associated swamps. The Bassendean unit with peaty podzolic (layered) soils in the swamps is separated from the Southern River unit which occurs where the sand has been blown over alluvial soils giving the swamps a clay base. The Caladenia unit has a pattern of low dunes and discrete rounded permanent lakes. It differs from the Bassendean unit because of the predominant yellow sandy soil profile.

2.4 *VEGETATION*

Heddle et al in "Atlas of Natural Resources Darling System Western Australia" (DCE, 1980), have mapped 14 vegetation complexes within the study area. Their mapping units were based on the literature, ground surveys and aerial photographs. However, the object of their study was to depict the original vegetation as it existed at European settlement.

The original vegetation was reconstructed in cleared areas by comparison with roadside verges and other pockets of remnant vegetation, and their relation to land forms.

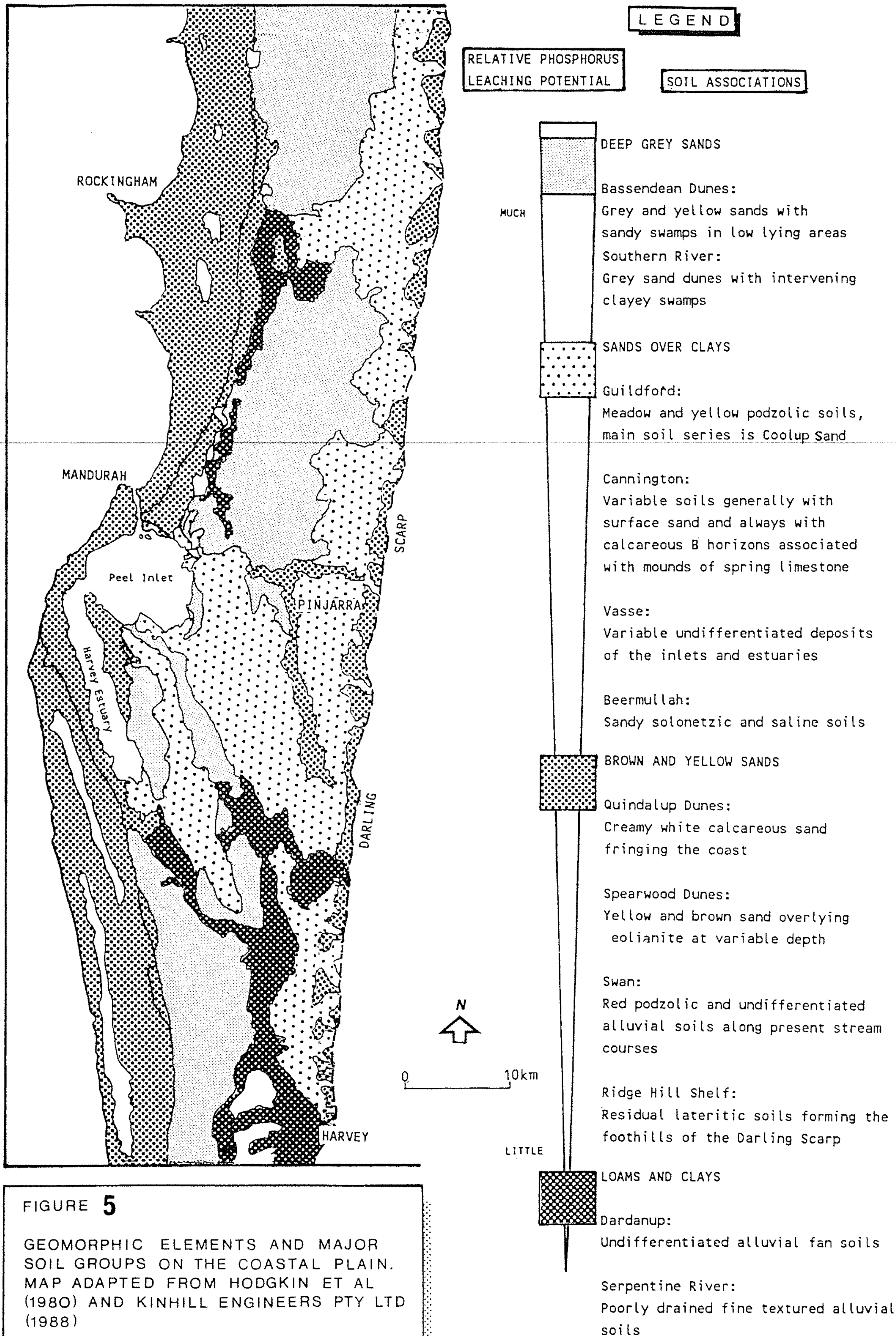


FIGURE **5**

GEOMORPHIC ELEMENTS AND MAJOR SOIL GROUPS ON THE COASTAL PLAIN. MAP ADAPTED FROM HODGKIN ET AL (1980) AND KINHILL ENGINEERS PTY LTD (1988)

However, a large portion of the study area has been cleared for agricultural, residential and industrial use.

The original Peel Inlet Management Programme prepared by Kinnaird Hill de Rohan and Young Pty Ltd contains a vegetation map for the management area at scale 1:50,000 which is useful for foreshore management planning purposes. The map is available from the Waterways Commission and PIMA Offices.

2.5 *WEATHER AND CLIMATE*

Weather and climate are important attributes which should be considered carefully in the waterway planning process. Daily variations in wind speed and direction, temperature, rainfall and humidity influence recreational use of the estuary and management operations like weed harvesting. Longer term variations in weather may affect water quality, algal growth and shoreline erosion, and may influence the location of developments. In addition, projected long term climatic changes may influence developments around the estuary.

2.5.1 *Factors Controlling the Weather of the Region*

The Bureau of Meteorology provides the following outline of factors influencing the region's weather.

"The climate of the Mandurah area is governed mainly by the movement of the anticyclonic belt which lies east-west of the South Coast in summer, and moves northward across the State in winter.

At the beginning of the year its axis lies off the South Coast, and easterly winds prevail in the area. As cells within the anticyclonic belt move eastward, low pressure troughs extend southward from the tropics between them, bringing air from central and northern Australia to the south of the State. When these troughs move eastward the hot northerlies preceding them are replaced by cool south-westerlies from the new anticyclone moving eastward from the Indian Ocean. During the next few days these winds back through south to east, and the cycle recommences as the anticyclonic centre moves away towards Tasmania.

A reliable sea breeze brings relief from high temperatures on most summer afternoons. It is most effective near the coast, but usually extends throughout the region. Largely because of this, the average wind speed is higher in summer than at any other time of the year.

As the year progresses, the anticyclonic belt moves northward, and by mid March the change towards autumn conditions becomes apparent. The average date of the "break of season" in Mandurah is about mid April, and in this month or in May the first of the winter storms is usually experienced.

In the winter months, June, July and August, depressions originating in the Indian Ocean or Southern Ocean pass close to Cape Leeuwin and sometimes bring westerly gales to Perth. Winds usually exceed 100 kph on several occasions during the year, and have reached 155 kph. In winter the anticyclonic belt lies over the southern half of Western Australia, so that Perth is often in an area of light pressure gradients and despite the occurrence of occasional winter gales, the average wind speed is lower than at any other time of the year.

As the year progresses the anticyclonic system gradually moves southward again, and southern depressions affect Mandurah less and less. In consequence rainfall decreases, and by December dry summer conditions are established again. Occasionally, as the low pressure trough extends down the west coast during the summer months, the anticyclonic belt south of the State does not split into two cells, but maintains its intensity while moving only slowly eastward. In these circumstances a flow of air from the tropics or central Australia may be maintained for periods of a week or so, and high temperatures persist in the area.

Unusual weather is experienced occasionally when a tropical cyclone passes close to Mandurah. Due to their distance from the warmer tropical waters, the storms are usually weakening at this stage, and although they have produced high wind speeds, stronger winds accompany some of the winter storms which originate south of the tropics." (Bureau of Meteorology, 1965).

2.5.2 *Rainfall*

On the coastal plain, average annual rainfall increases fairly slowly with distance from the coast with the increase amounting to about 125 mm in 30 km. From the foot of the Scarp to the top, rainfall increases rapidly by about 250 mm in 5 km. Eastward from the top of the Scarp there is a rapid decline (Figure 3).

The region has a wet season (winter) between May and October inclusive, with June and July being the wettest months (Graph 1). During the rest of the year (November to April) some rain falls, but it is much less than winter. Most of the coastal plain receives about 100 mm during the period.

2.5.3 *Evaporation*

Readings recorded in Perth since 1889 indicate that the annual rate of evaporation on the coastal plain is about 1700 mm. The highest evaporation occurs in January (262 mm) and the lowest in July (49 mm) as shown on Graph 2.

2.5.4 *Growing Season (Terrestrial Plants)*

The minimum amount of rainfall which will sustain plant growth above wilting point is defined as the effective rainfall which is determined by relating rainfall to evaporation.

The average length of the growing season may be determined from curves of average rainfall and effective rainfall. The part of the year during which average rainfall is greater than effective rainfall, may be taken to represent the growing season, and the points at which the curves intersect represent the beginning and end of the season.

However, plant growth is also limited by temperature and light and consequently little plant growth occurs during June and July because of these limitations (Seddon, 1972).

2.5.5 *Growing Season (Aquatic Plants)*

The estuarine plants fall into three main groups: the microalgae or phytoplankton, macroalgae and aquatic angiosperms (sea grasses).

During the greater part of the year the phytoplankton community is dominated by diatoms, with relatively high species diversity in summer and low in winter. *Nodularia spumigena* dominates the blue-green flora with the Harvey Estuary having higher numbers of blue-greens than Peel Inlet.

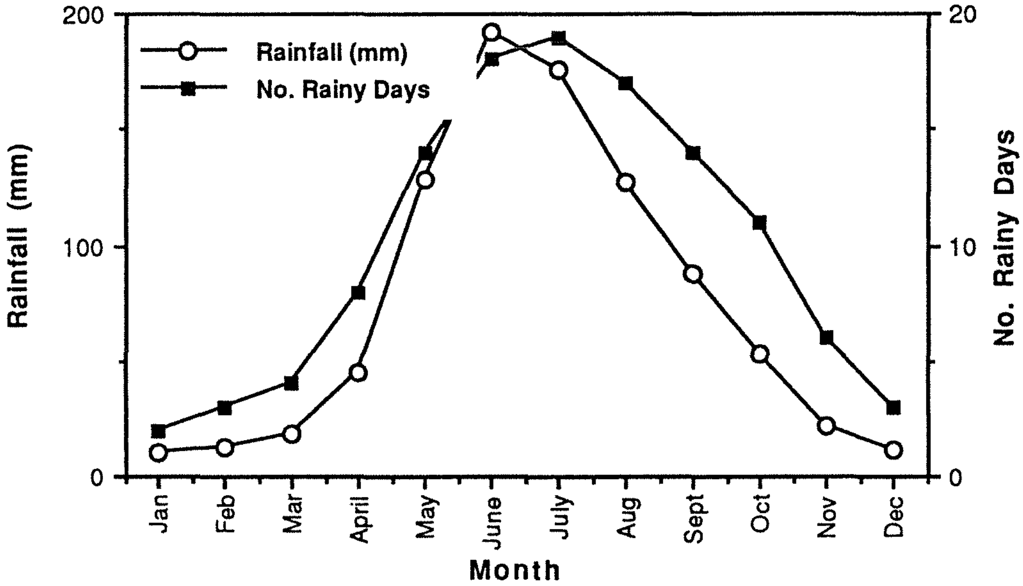
The diatoms bloom mainly in winter following high nutrient input from the rivers. Blue-green blooms mostly occur in the warmer months of the year. Nutrient analysis shows that *Nodularia* blooms occur when there is a high phosphorous availability combined with a low nitrogen:phosphorous ratio.

Phytoplankton play an important role in recycling nutrients for benthic algae, especially *Cladophora*. The winter diatom blooms prevent most of the river borne nutrients from being lost at sea. Most of these blooms settle to the bottom where they decompose and release nutrients for subsequent phytoplankton blooms and benthic algae.

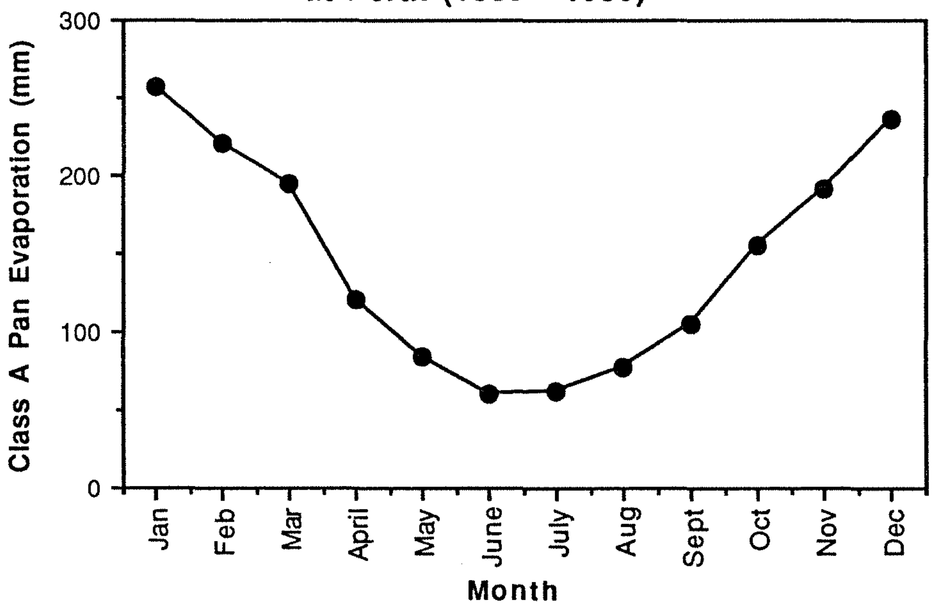
The most abundant macroalgae are *Cladophora*, *Chaetomorpha*, *Enteromorpha* and *Chondria*.

Generally, growth of these plants is dependent upon higher temperature and light levels, with most growth occurring during summer after commencing in early December. However, sizable blooms of *Enteromorpha* may occur during late winter, probably as a result of high nutrient levels (Hodgkin et al, 1980).

Graph 1 Average Monthly Rainfall Figures at Mandurah (1889-1989)



Graph 2 Average Class 'A' Pan Evaporation at Perth (1889 - 1989)



Note: Evaporation measurements are not recorded at Mandurah.

2.6 *PREDICTIONS OF CLIMATIC CHANGE*

After much careful research and evaluation, there can be little doubt that humans have unwittingly begun processes that will cause very significant changes to global climate. This is the so-called "greenhouse effect" of heat being trapped in the earth's atmosphere more effectively than in the past. The process is largely due to the rapid escalation in combustion of fossil fuels since early last century, freeing carbon dioxide that had been locked away over millions of years in the form of fossil fuels like coal and oil. Other gases such as the freons, methane and nitrous oxides (even water vapour) add to this effect, and are also increasing. During the 1970s the combined effect of these was comparable with that of carbon dioxide, though in the long term carbon dioxide is expected to be the major determinant.

Although the overall effects of a long term carbon dioxide induced global warming are generally accepted, the timing is less certain. It is agreed that it will be difficult to prevent the process from occurring, as it will require a worldwide change in industrial practices involving the use of less polluting activity.

Computer models have been used to help predict the impacts of future climatic changes on a global scale. They indicate that increasing carbon dioxide concentrations are likely to result in widespread changes in our climatic, economic, social and agricultural patterns. Some of these effects will probably be felt within two decades. In several decades average annual temperatures in southern Australia may be 4-5^{o}C higher than now, the south-west will probably have a lower rainfall (particularly winter rain) and increased storm frequency. There will be a trend toward higher sea levels accompanied by higher rates of coastal and estuarine erosion (Chittleborough, 1985).

2.7 *HYDROLOGY AND BATHYMETRY OF THE PEEL-HARVEY SYSTEM*

Fresh water enters the system from the Murray, Serpentine and Harvey Rivers, agricultural drains, ground water and rainfall. In addition, there is a free exchange with the ocean so there is a gain of sea water to the system and a loss of estuarine water to the sea.

The catchment of the estuary is shown in Figure 7. The total catchment area is 11300 km^2 and of this 6890 km^2 is in the hills catchment of the Murray River and is not dammed while 1720 km^2 of the Serpentine and Harvey Rivers catchment is dammed, and 500 km^2 of the hills catchment of these rivers is not dammed. The remainder lies in the coastal plain and drains to the estuary via the three rivers or directly through agricultural drains.

The rainfall of the catchment area and related information is outlined in 2.5, and while the frequency of rainfall does not equal frequency of river flow it gives a reasonable approximation of the relative magnitude of river flow. It should also be noted that because of the large surface area of the water body (131 km^2) direct rainfall represents a significant percentage of total water input. Research indicates that during periods of low rainfall coastal plain catchments contribute a higher proportion of stream flows than in normal or wetter seasons.

In 1987 the Department of Marine and Harbours undertook dredging works of the Sticks Channel which has increased the rate of ocean flushing of the system, but to date precise measurements are not available. Before these works were undertaken computer models indicated that the flushing of the Harvey Estuary to the Peel Inlet took 1.0 to 1.7 weeks. Between all and 0.6 of the estuarine waters are flushed each week. More importantly, the exchange between the Peel-Harvey system and the ocean is calculated to be similar (Hodgkin et al, 1980). A water exchange model of the Peel-Harvey Estuary is shown in Figure 6.

The dimensions and bathymetry of the system are outlined on Figure 8. From these it can be seen that the 5 km long inlet channel is small in relation to the size of the estuary and this has a damping effect on diurnal tides. In addition, the channel is obstructed at both ends, by a sea bar and a tidal delta. Dredging works, the most recent of which were completed in 1988, have reduced these constrictions but the impact of the works has not been assessed fully at this time.

The Murray River discharges to the Peel Inlet through the Yunderup delta with its six distributaries one of which is dredged for navigation, but the mouths of the others are closed by bars which are dry at lowest low water (LLW). It is tidal to the Pinjarra Weir. The Serpentine River discharges at the northern end of the Peel Inlet through a number of distributaries. A number of agricultural drains discharge into the eastern side of the system.

The narrower parts of the Murray and Serpentine Rivers have scoured and may be up to 5 m deep.

The Peel Inlet is a saucer shaped basin about 10 km in diameter with a central basin about 2 m deep. The margins are shallow and dry out at LLW. The Harvey Estuary is a long narrow water body 20 km long and 2-3 km wide running NNW-SSE. It is 2 m deep in the middle with narrow marginal shelves on each side. It is joined to the Peel Inlet by a narrow channel through the Point Grey Sill.

The salt marshes on either side of the inlet channel are flooded during normal winter high tides. There are similar marshes on the eastern side of the Peel Inlet and southern segment of Harvey Estuary. Narrow fringing marshes also occur at other locations around the system (Hodgkin et al, 1980).

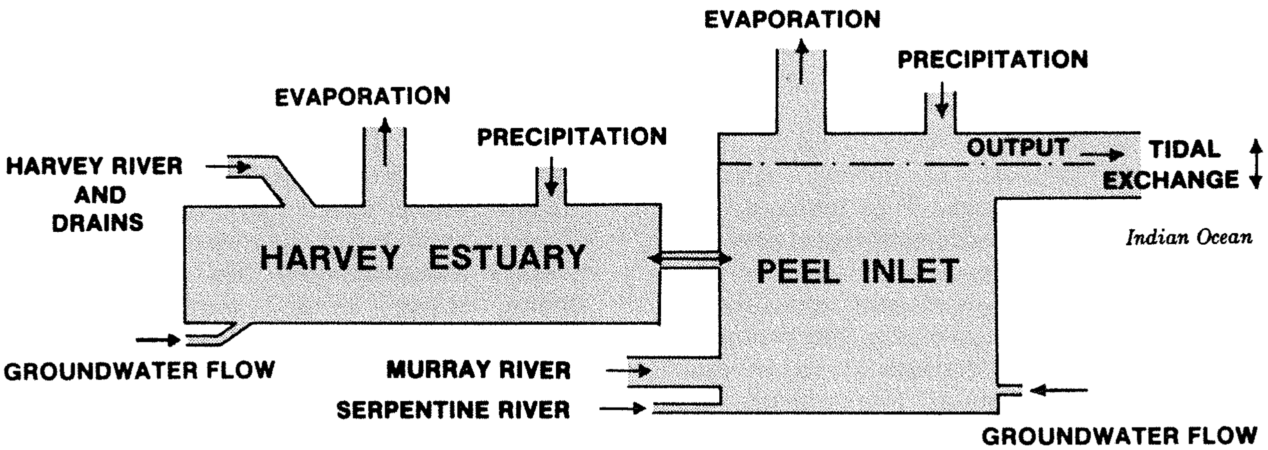


FIGURE 6 PEEL-HARVEY ESTUARY WATER BALANCE MODEL (FROM HODGKIN ET AL (1980)

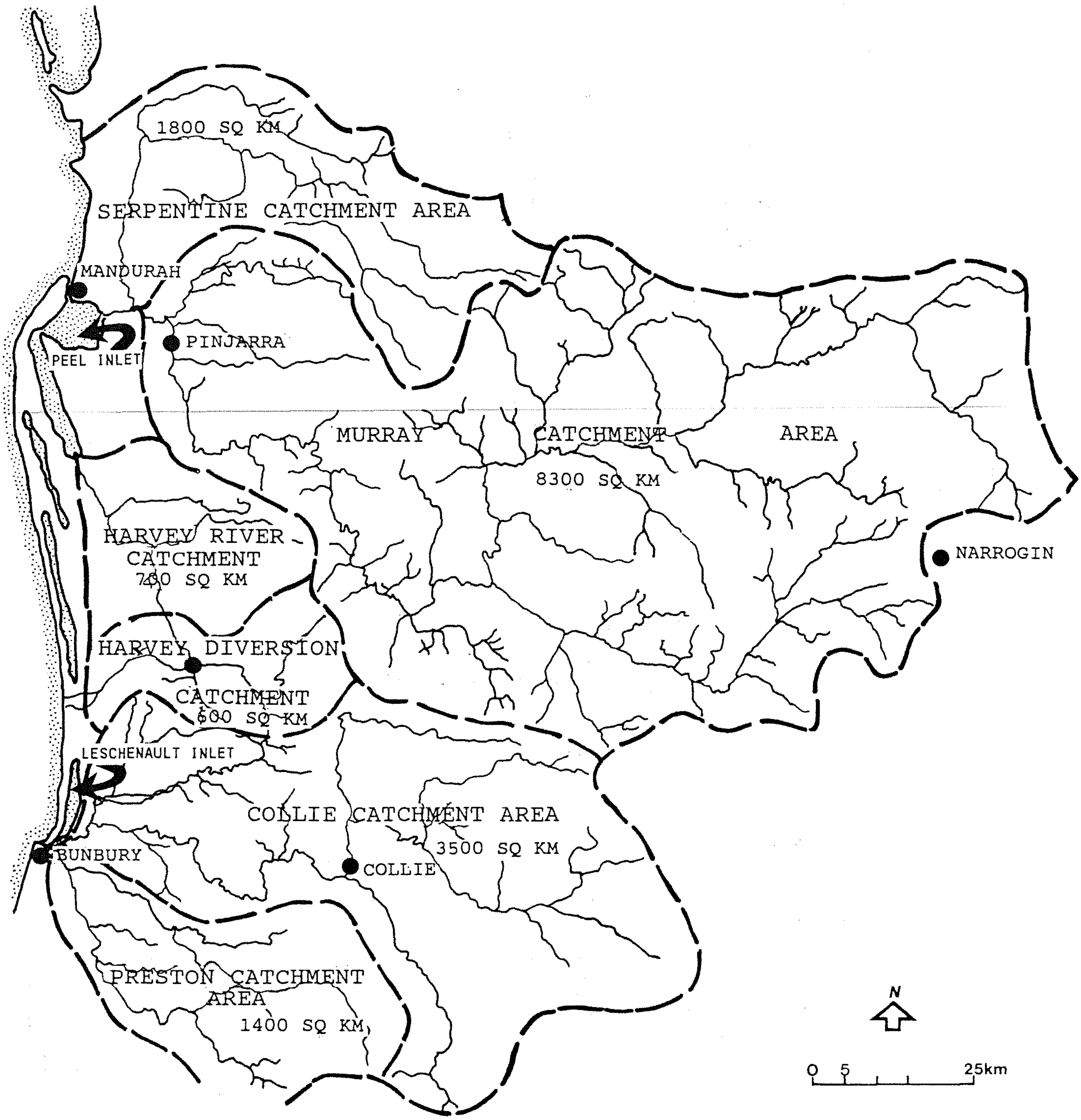
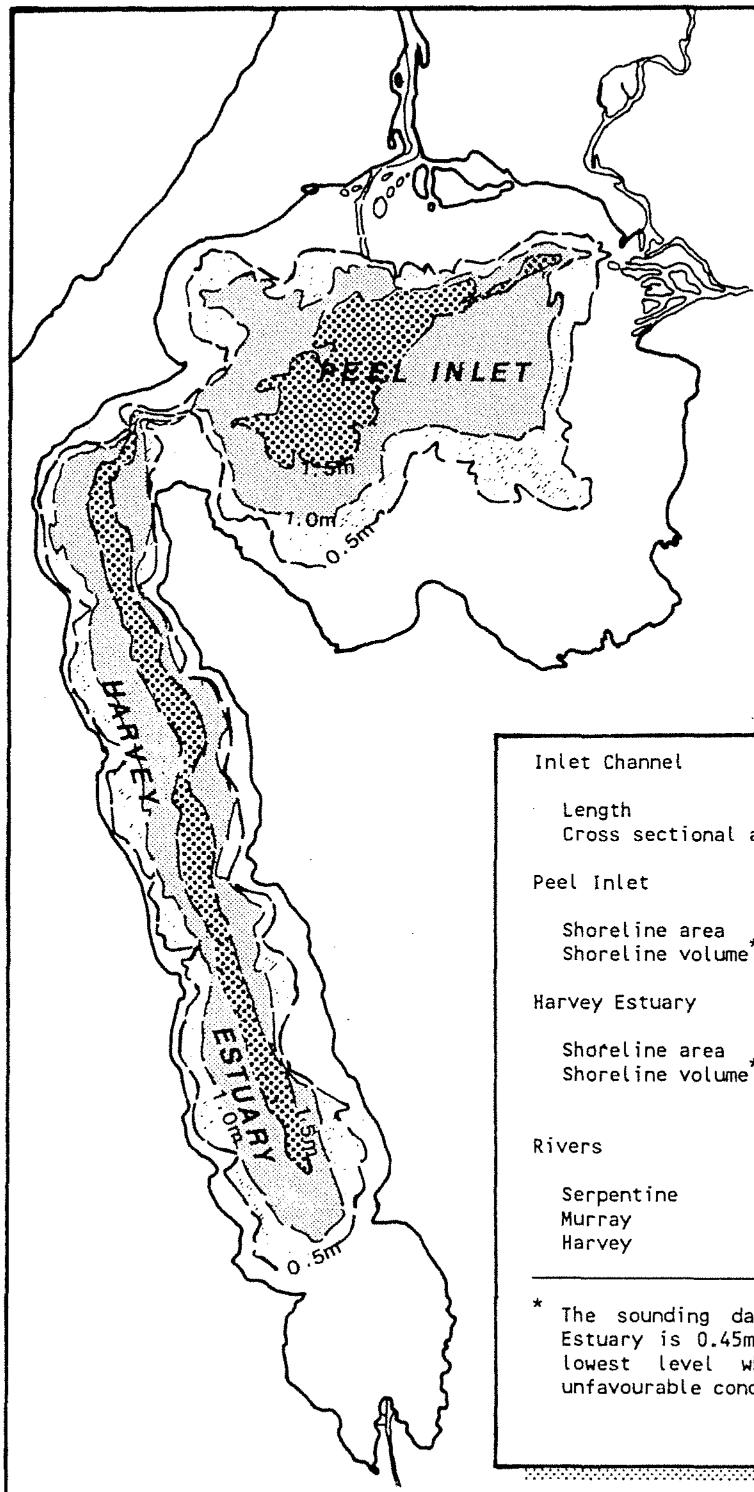
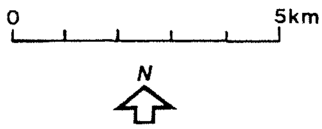


FIGURE 7

CATCHMENT AREAS OF THE PEEL-HARVEY AND LESCHENAULT ESTUARIES (FROM KINNAIRD ET AL (1979)





Inlet Channel

Length : 5 km
Cross sectional area at Mandurah Bridge: 700 m^2

Peel Inlet

Shoreline area : 75 km^2) Volume at sounding
Shoreline volume*: $60 x 10^6 m^3$) datum = $117 x 10^6 m^3$

Harvey Estuary

Shoreline area : 56 km^2) Mean observed volume
Shoreline volume*: $56 x 10^6 m^3$) for study period = $152 x 10^6 m^3$

Rivers

Serpentine	appr. 24km, includes Goegrup Lake ($2km^2$)
Murray	24km
Harvey	appr. 4km

* The sounding datum adopted for Peel Inlet and Harvey Estuary is 0.45m below State Mean Sea Level. It is the lowest level which will be reached under the most unfavourable conditions.

FIGURE **8**

DIMENSIONS AND BATHYMETRY OF THE PEEL-HARVEY ESTUARY (FROM HODGKIN ET AL (1980)

CHAPTER 3

WATERWAY PLANNING AND MANAGEMENT

3.1 *INTRODUCTION*

Waterway planning and management requires an understanding of the relationship between the two activities and a definition of the roles of relevant agencies. Planning and management may be seen as part of a process in which government agencies and the public are involved to differing degrees.

The need for management arises because of things people do, or may do, which cause unacceptable effects on the waterway, to the user, or sometimes to the manager (Peterson and Lime, 1979). Without some form of control over use, the various qualities that people seek from a waterway may be degraded. Management of the waterway environment is not only concerned with natural processes but also with meeting the needs of the community. There is also a need to manage environmental changes which may be natural and unplanned.

In contrast, planning takes a broader perspective, involving social, economic and political, as well as physical considerations concerning development and conservation of the waterway, its foreshores and adjoining land, extending to the total catchment.

There are a number of State and local government authorities and numerous private individuals and companies which have a direct responsibility for the planning, development and management of the waterway. To be effective, all involved authorities and people must approach these roles in a co-operative and organised manner, which enables the best use of available powers, skills and resources. Such an approach requires careful planning and proper co-ordination.

Through this chapter abbreviations are used for agencies. These are listed on a fold-out sheet at the back of this report.

3.2 *POLICIES*

PIMA currently operates with a number of policies which are listed in Waterways Commission's Report No 10, 1986, "Waterways Commission Policy Document." Report No 10 lists 38 policies, however many of these are currently under review and will be updated in the near future.

3.3 *ISSUES*

As outlined in 1.3.3 a number of agencies have planning and management responsibilities in the study area and approach their duties in varying ways. This Management Programme identifies issues which relate to waterways management and the agencies with the leading role in addressing the issues, and other interested bodies. It also makes recommendations about the resolution of issues. The issues were identified in a number of ways including public surveys and questionnaires, formal and informal contact with State and local government, meetings with interested groups, and discussion with PIMA members and Waterways Commission staff. For the purposes of documentation, issues have been classified into eight broad areas:

- Agency Co-operation and Public Participation
- Conservation and Environmental Protection
- Land Use and Waterway Planning
- Tourism
- Recreation
- Navigation and Boating Safety
- Fishing
- Management

Only issues requiring action have been identified and will be addressed in the Management Programme. Other problems which are not foreseen during this study may arise before the plan is reviewed in 1997. Consequently, monitoring and evaluation are important and are outlined in Chapter 7, and the Management Programme must be flexible to enable effective resolution of unforeseen issues.

3.3.1 *Agency Co-operation and Public Participation*

State and Local Government and Community Representation

The direct involvement of relevant State and local government authorities is essential if adequate agency co-operation is to occur. Section 14(3) of the Waterways Conservation Act states that membership of PIMA should include representatives of local government authorities and officers from Departments of the State Public Service having responsibility for and knowledge of the estuary.

Administrative Referrals

It is essential that PIMA and State and local government authorities inform each other about any decisions or plans which may affect the future of the estuary. The advice of relevant authorities should be sought and considered before proposals are made public.

Public Education and Participation

The public has a considerable interest in the planning, development and management of the waterway and Section 14(3) of the Waterways Conservation Act states that PIMA shall include members of the local community.

It is essential that the public be advised when management programmes are being prepared and reviewed so they are able to contribute to and comment on draft plans. Section 35(4) of the Waterways Conservation Act requires the Waterways Commission to advertise the preparation and review of management programmes in the local paper.

Effective public participation in the waterway planning and management process is dependent upon a well informed public which has a sound knowledge of and interest in the estuary. A properly structured public education programme is required to ensure that people have the information needed to participate in waterway management.

3.3.2 *Conservation and Environmental Protection*

Water Quality Management

The leaching of fertilisers from surrounding farmland, urbanisation, increased stormwater runoff, and clearing of catchments have resulted in eutrophication of the estuary and deteriorating water quality. The proposed construction of the Dawesville Channel and associated catchment management will result in a rapid improvement in water quality.

Weed Harvesting

Excessive growth of macroalgae resulting from the eutrophic state of the estuary causes a problem when it washes ashore near populated areas and rots. PIMA manages this nuisance with the aid of weed harvesters.

Proposed Regional Park

The estuary is surrounded by a series of reserves and Vacant Crown Land with varying vestings and levels of management. A regional park is proposed to enable better management of these areas.

Conservation Reserves

While the ecology of the entire waterway must be protected some areas are of particular value and have been reserved for conservation purposes requiring specialised management.

Conservation of the Waterway Margins

The ecological values of the entire estuary are important and areas which are not protected by reserve status also require careful management.

Erosion Control

Erosion of stream and estuary banks is resulting in the siltation of deltas, eutrophication of waters, loss of public and private property, destruction of trees and shrubs, and loss of landscape values. Erosion control is a major function of PIMA.

Much of the river bank in the PIMA management area is located within private land and this may make the management of erosion difficult.

MOSQUITO CONTROL

Mosquito breeding in some estuarine waters can create a public nuisance and may cause a health risk. The construction of the Dawesville Channel may increase the mosquito nuisance under some circumstances.

ABORIGINAL SITES

The district contains sites of significance to Aboriginal people. These sites are protected by State legislation.

EUROPEAN HISTORIC SITES

There are a number of sites of historic interest and they should be protected and retained where possible.

3.3.3 *Land Use and Waterway Planning*

PEEL REGIONAL PLANNING STUDY

The Department of Planning and Urban Development is currently liaising with other State and local government bodies to prepare a regional plan for the district. This study will provide a framework to address some issues raised in this Management Programme.

FORESHORE RESERVES

Reservation of foreshore land is important to enable the maintenance of ecologically important estuarine margins, ensure public access, protect landscape values and provide space for recreational use and appropriate commercial activities.

LANDSCAPE PROTECTION

The estuary provides significant landscape benefits which could be degraded by developments and activities which have not been designed in a sensitive manner.

URBAN DEVELOPMENT

The estuary provides an attractive focus for urban development for permanent and holiday purposes. Urban development near the estuary should occur within a planning framework which ensures protection of the estuarine environment.

PUBLIC ACCESS

Public access to foreshore areas is a concept which Australians have considered important for 200 years, however, the public does not have access to the foreshore in some places. Strategies are required to overcome this difficulty.

COMMERCIAL DEVELOPMENTS

Some commercial developments require a waterside location to enable effective operation, while others enhance public use of the waterway. Planning and development of the estuary should provide adequate opportunities for these developments, while facilities which do not meet these criteria should be located elsewhere.

WATER SUPPLY AND DRAINAGE

The rivers, drains, inlets and groundwater aquifers in the study area provide significant water resources for domestic, industrial and agricultural use. In addition, the waterway provides an essential drainage system enabling surface stormwater runoff to reach the sea.

CANAL DEVELOPMENTS

Five canal estates have been established around the inlet, and similar developments are under consideration. Canal estates can provide attractive and valuable home sites which may add to the amenity of the estuary, however, they can result in management problems if they are not well located, designed and managed. Development of canal estates may result in the destruction of environmentally valuable marshes and wetlands.

Flood Management

Areas of land which are above normal river level at most times are flooded after heavy rain in the catchment. Parts of the waterway may be classed as "floodway" which carries rapid flows during times of flooding and "flood fringe" which is merely submerged during flooding. Both the floodways and flood fringe require particular planning controls.

Road Network

Roads are planned and constructed around and over the waterway. Such works always have an impact on the estuarine environment and so any road development proposal requires careful consideration.

Water Transport

Boats and ferries are used to transport people around the estuary, providing a valuable tourist attraction, and these services require particular facilities.

Living on Boats

People live on boats for holidays and as semi-permanent residences. These activities can create environmental and management difficulties and require management to avoid problems.

Planning for Climatic Change

As outlined in 2.6 there is growing evidence that increased levels of carbon dioxide and other gases in the atmosphere will alter the world's climate and elevate the mean sea level. The planning process must consider this possibility.

3.3.4 *Tourism*

Provision of Facilities

The estuary is a major focus for the tourist industry and appropriate facilities are provided to enable the development of this important industry. Tourist facilities must be developed in a manner which does not result in environmental loss.

Tourist Management

Tourist use of the area occurs in peaks which results in crowding of facilities and may result in a loss of amenity. Strategies are required to spread tourist visits over longer periods. In addition, facilities should be designed after considering the variation in levels of use.

Tourist Education

If people have a knowledge of natural systems they have more opportunity to appreciate and enjoy them. In addition, people with such knowledge are more likely to behave in a manner which is compatible with the natural environment, and so create fewer management problems.

Consequently, effective public education is an integral part of waterways management.

3.3.5 *Recreation*

Recreational Use

The estuary is an important recreational focus for tourists and local people. The management planning process should provide for a broad range of opportunities for recreational activities which are compatible with the estuarine environment.

Boating Activities

Boating is a major recreational activity on the estuary and planning should designate areas for a range of boating activities.

Marinas, Yacht Clubs and Associated Activities

Development of marine oriented facilities on the foreshore requires careful and detailed planning to avoid conflict and environmental loss.

DEVELOPMENT OF DEEP WATER FOR RECREATION

Generally the margins of the estuary include wide shallow banks which limit use of the waterway for aquatic recreation like boating and swimming. There is some interest in the possibility of dredging to create deeper water in selected locations to allow a broader range of recreational opportunity.

HORSE RIDING

Many people living in the Peel District own or ride horses for pleasure and currently this occurs in an unplanned manner. As unrestricted access to the waterway environment may result in environmental damage a management plan is required to ensure horse use that is compatible with waterway protection.

3.3.6 *Navigation and Boating Safety*

Public safety, environmental impact and use of adjacent areas all require consideration in determining control of boating activities.

3.3.7 *Fishing*

The Peel Inlet supports the most important commercial estuarine fishery in Western Australia and receives heavy use by amateur fisherpeople throughout the year. Careful management of the fishery is required to avoid conflict. In addition, estuarine fisheries can be affected by changes to the environment.

PUBLIC INVOLVEMENT AND EDUCATION

Public involvement in the planning and management of the fish stocks should be encouraged.

3.3.8 *Management*

CO-ORDINATION

Successful management relies on co-ordination of agencies involved in the planning and management of the estuary.

MANAGEMENT PROCEDURES (EMERGENCIES)

Clear guidelines and emergency plans are required to minimise the environmental impacts associated with petrol, oil and chemical spills.

STAFF AND FINANCE

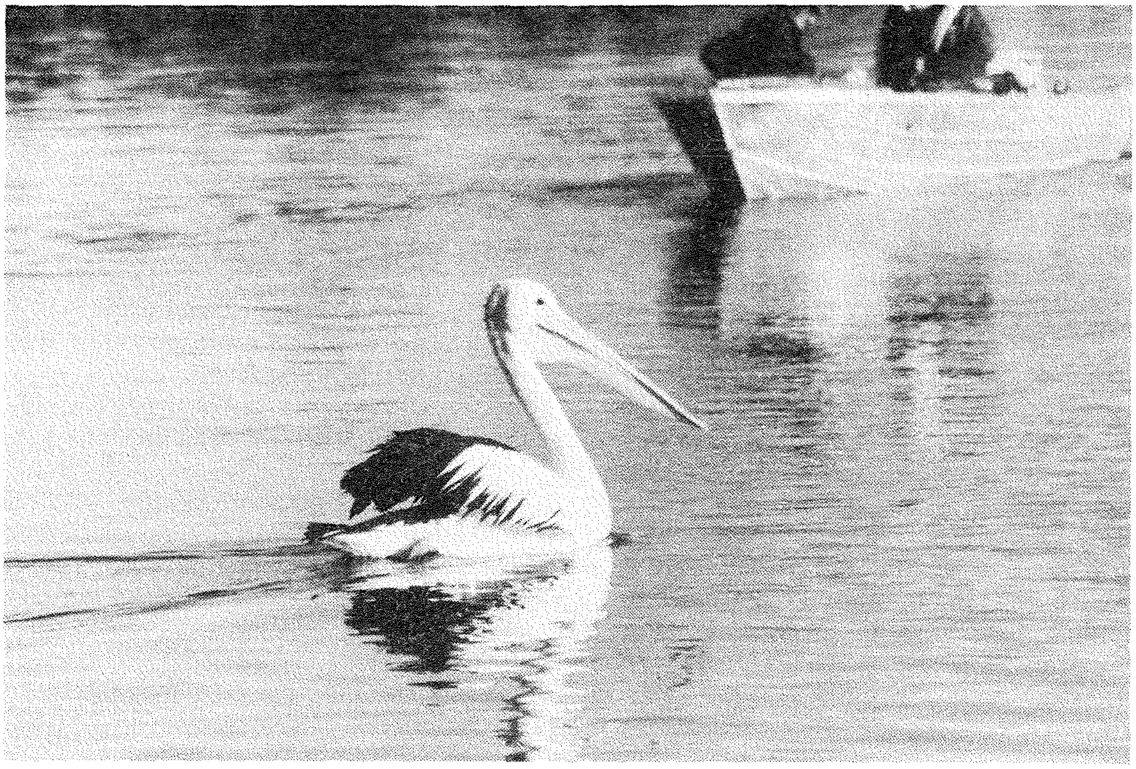
The proper implementation of the management programme requires adequate staffing and funding levels.

PEEL INLET MANAGEMENT AREA

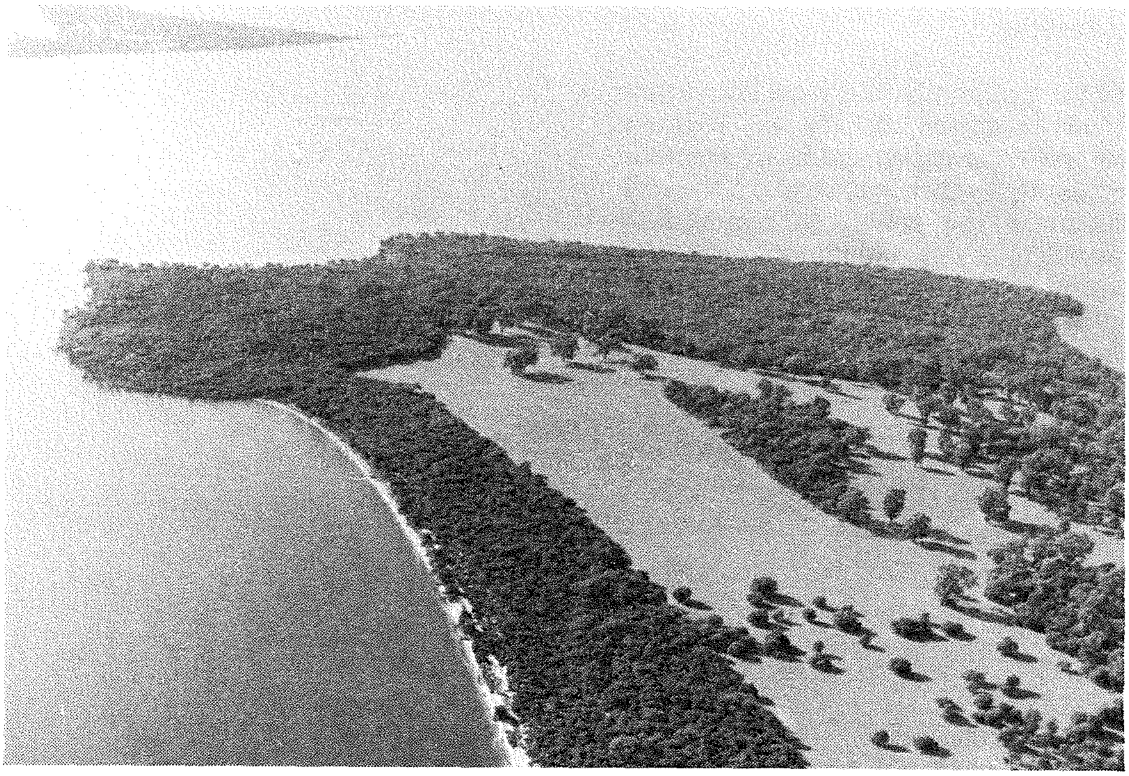
Effective management of the waterway is dependent upon PIMA having input into land use decisions on nearby areas. The land of major concern is known as the management area.

CAPITAL AND MAINTENANCE WORKS

Adequate funding is required to undertake capital and maintenance work in the management area.



Pelican



Point Grey with Point Ward above

CHAPTER 4

OBJECTIVES

4.1 *INTRODUCTION*

The following objectives have been prepared to assist in achieving the aim outlined in 1.1; that is to balance the competing demands for use and development with the need to restore the nutrient balance of the waterway and conserve a healthily functioning estuarine environment for present and future generations.

The Government's decision to implement the proposals outlined in the Peel Inlet and Harvey Estuary Management Strategy - Environmental Review and Management Programme Stage 2 will have a profound effect on the entire estuary and so influence future development and use. The catchment management programme will lead to a continuing decline in the amount of phosphorus entering the system. The construction of the Dawesville Channel will result in greater tidal flushing, improved water quality, a more marine system and better recreational opportunities.

The protection of the estuary as a living system will be assisted by the construction of the channel but it will also require better management of conservation reserves and other areas of valuable habitat throughout the management area. The landscape of the estuary will also require careful management. The increasing recreational use of the estuary will necessitate the modification of some areas to provide a range of opportunities and an environment capable of sustaining concentrated use by people. Some small areas will be modified considerably to provide for the needs of particular commercial and residential uses.

The objectives recognise that the estuary is a living system and its integrity must be protected and retained wherever possible. A range of biological and physical functions should be retained and all proposed uses should be evaluated to determine their capacity to adversely affect the waterway.

The objectives have been prepared after considering all of the known management issues which relate to the waterway. The issues are outlined in Section 3.3 and are grouped into the following categories: Agency Co-operation and Public Participation, Conservation and Environmental Protection, Land Use and Waterway Planning, Tourism, Recreation, Navigation and Boating Safety, Fishing and Management. The objectives are also grouped under these headlines. A primary objective and a series of specific objectives have been prepared for each of these groups, enabling the preparation of recommendations and policies for all issues.

4.2 *AGENCY CO-OPERATION AND PUBLIC PARTICIPATION*

Section 14 of the Waterways Conservation Act contains provision for the establishment of authorities for the Swan River, Peel Inlet - Harvey Estuary and Leschenault Estuary. It states that the membership of PIMA includes, so far as practicable, persons resident in the local community, persons from the relevant local government authorities and officers from State government departments with relevant knowledge and responsibilities. Effective co-operation between various State and local government authorities and the public is considered vital in the conservation and development of the estuary. Public involvement in the planning and management of the estuary is also required under Section 35 of the Act which relates to the preparation of management programmes. In addition, Section 59 requires that any proposal for regulations, management programmes or working plans shall be published in the Government Gazette and three issues of a local newspaper, to inform the public and invite their comments and representation.

These provisions of the WWC Act ensure that the local community and local government authorities have an important role in the waterways planning process. In addition, a major principle of the State Conservation

Strategy is that community attitudes and perceptions of the estuarine environment need to be assessed and considered when making planning and management decisions.

PRIMARY OBJECTIVE 1

Ensure that the local community and relevant State and local government authorities are adequately represented on PIMA, and have the information and appropriate opportunities needed for effective involvement in the planning and management of the waterway.

SPECIFIC OBJECTIVES

- Appoint to PIMA representatives of the City of Mandurah, Shire of Murray and Shire of Waroona.
- Appoint to PIMA members of the local community who have an appropriate interest in the estuary.
- Prepare information about current issues affecting the estuary and make it readily available to the public.
- Ensure that all proposals to prepare management programmes and working plans are advertised and the public given an opportunity to make representations.
- Incorporate community attitudes, needs and perceptions into planning and management decision making.
- Develop public education programmes concerning the estuary and the need for proper management.

4.3 *CONSERVATION AND ENVIRONMENTAL PROTECTION*

Deteriorating water quality within the Peel-Harvey system during the last 20 years has become a major conservation issue, with effects which have implications for biological productivity and diversity, tourism, property values, fishing and public health. This problem is caused by phosphorus from fertilisers used on farmland and other sources in the catchment of rivers flowing into the inlet, and some point sources, encouraging excessive algal growth. This imbalance has destabilised the estuarine environment. As this problem has developed over about 30 years and resulted in significant changes to the waterways nutrient budget, it will take years to correct.

The fringing wetlands of the estuary provide a variety of habitats for plants and animals. Some of these are of national and international importance for transequatorial wading birds. In addition, these natural wetlands form an integral part of the landscape and act as a buffer, assisting to protect the waterways from pollution from activities on nearby land.

The Peel-Harvey Estuary is naturally attractive to people and consequently it contains sites of cultural significance to Aboriginal and non Aboriginal groups. Such sites should be identified where possible and steps taken to protect them.

PRIMARY OBJECTIVE 2

Minimise pollution of the estuary, and protect and rehabilitate its waters, land, wildlife habitats and cultural sites in accordance with the ERMP Stage 2.

SPECIFIC OBJECTIVES

- Reduce leaching of phosphate from farmland around the estuary and other sources in the catchments of the Serpentine, Murray and Harvey Rivers.
- Increase tidal flushing of the estuary.
- Avoid point source pollution of the estuary.
- Identify and conserve waterbird habitats, including those which support migratory bird populations which are the subject of international agreements and those supporting local bird populations.

- Monitor and prepare reports about changes in the estuarine environment.
- Undertake continuing research into the causes of environmental degradation.
- Undertake research on the rehabilitation of degraded estuarine environments.
- Cater for a range of community uses, interests and opportunities while conserving the indigenous flora and fauna.
- Ensure that use and development proposals undergo appropriate environmental impact assessment before proceeding, and that developments comply with conditions of approval.
- Identify and conserve significant scenic, geological, Aboriginal and European cultural sites.

4.4 *LAND USE AND WATERWAY PLANNING*

The Peel-Harvey Estuary is of regional significance. This Management Programme examines the waterway and associated foreshores as a single entity and considers it in its regional context. The programme seeks to protect the estuarine environment by promoting appropriate development and use in various parts of the management area. The management area contains opportunities to provide for human needs, while the nature of the environment limits or constrains the type and level of use which can occur without loss of natural values or increased management costs. Recognising constraints as well as opportunities is vital for effective resource management.

PRIMARY OBJECTIVE 3

Ensure that land use within the Peel-Harvey catchment maintains or enhances the quality and amenity of the waterway environment.

SPECIFIC OBJECTIVES

- Create a geographic information system to assist planning authorities and developers to recognise developments or land uses which may damage the estuarine environment.
- Develop a planning framework which assists planning authorities, developers and the public to appreciate the regional significance of the estuary and foreshores.
- Promote guidelines which assist planning authorities to ensure that development affecting the estuary is compatible with the estuarine environment.
- Establish a programme of land acquisition to enable the protection of land currently threatened by development.
- Provide advice to planning authorities and developers concerning development in the management area.
- Outline areas where water oriented developments may occur with limited environmental loss.
- Prepare guidelines for developments, in the management areas, which may have the potential to produce hazardous discharges.
- Discourage developments near the waterway which do not require an estuarine location to achieve their major objectives.
- Preserve and enhance the public right of access to and use of the estuary.
- Establish a framework for a comprehensive and integrated system of parks and reserves around the estuary, and maximise public ownership of foreshore land.
- Maintain the estuary as a major ocean outlet for surface and groundwater drainage.

- Manage areas of bushland to minimise fire risk to neighbouring properties.

4.5 *TOURISM*

The Peel-Harvey Estuary and nearby beaches provide an important focus for tourism in the Perth region, and the basis of a tourism industry which is an integral part of the district's economy. Development of the tourism industry is a major objective in Mandurah Town Planning Scheme 1A. The primary objective of the Mandurah Tourism Development Plan (MTDP) is to develop Mandurah as a major regional tourist centre.

The MTDP demonstrates that the estuary and activities associated with it are the major tourist attraction for the district. The report also discusses problems associated with the seasonality of the tourism industry and associated peak period crowding by people as a waterway management problem.

This programme recognises the need to provide for tourist facilities and activities associated with the inlet, however, it emphasises that there are limits to the use which can occur without environmental loss. That is, the features which attract people to the inlet can be degraded by inappropriate use, but careful planning as outlined in 3.3.3 can reduce this risk significantly.

The MTDP indicates there is a need for a phased restructuring of tourist facilities around the inlet, and this issue will be considered during the estuarine planning process.

PRIMARY OBJECTIVE 4

Provide for a range of tourist facilities which are compatible with the conservation of the waterway and benefit from an estuarine location.

SPECIFIC OBJECTIVES

- Identify areas which could be developed as attractive tourist locations without environmental loss.
- Advise planning authorities and potential developers about possible environmental impacts of proposals.
- Prepare interpretative material about the inlet which assists tourists' appreciation and enjoyment of the estuarine environment.
- Manage human use of the estuary to minimise overcrowding of particular facilities.
- Undertake management works such as algae and litter control in a manner which enhances visitor use.

4.6 *FISHING*

The Peel-Harvey Estuary contains a substantial and diverse fish fauna and supports the most important estuarine commercial fishery in temperate Australia. The annual catch of 500-1000 tonnes per year comprising yellow-eye mullet (*Aldrichetta forsteri*), sea mullet (*Mugil cephalus*) and cobbler (*Cnidoglanis macrocephalus*) is taken by 30 fishing units. Catches are taken either by locating and then hauling schools of fish with nets or by setting unattended gill nets overnight in areas where fish are likely to be caught (Lenanton, 1984).

In addition, the estuary supports a commercial fishery based on blue manna crabs (*Portunus pelagicus*) yielding up to 48 tonnes per year, western king prawn (*Penaeus latisulcatus*) and western school prawn (*Meta penaeus dalli*).

During the 1950s and 60s professional fishermen were, for various reasons, not receiving an adequate return for their effort. In addition, recreation fishing was increasing pressure on fish stocks and the number of other estuary users was increasingly placing additional constraints on fishermen.

In 1969 the Fisheries Department put into place a long term management plan (conditional licence policy) that was aimed at gradually reducing commercial fishing effort to a level:

i) So that the combined effect of fishing and other factors would not ultimately adversely affect estuarine fish populations and dependent fisheries;

ii) At which individual fishermen were able to achieve a worthwhile economic return from fishing alone.

The plan was achieved by the following two licence conditions:

i) Not allowing new estuarine fishing authorisations to be issued.

ii) Prohibiting the transfer of individual authorisations (unless otherwise directed by the Minister), i.e. if a fisherman chose to leave the industry he would not be replaced (Lenanton, 1986).

The estuary also supports a very important amateur fishery which may take the species listed above. However, anglers also fish for tailor (*Pomatomus saltatrix*), herring and King George whiting (*Sillago schomburgkii*).

The continuation of the fishery is dependent upon maintenance of suitable water quality and habitats for all stages of fish life. Preservation of quiet areas and the free movement of fish is also important.

The fish resources of the estuary should be managed for the benefit of the community by optimising yields and ensuring stocks are distributed equitably among different user groups.

PRIMARY OBJECTIVE 5

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

SPECIFIC OBJECTIVES

- Manage and utilise fish stocks on a sustainable basis for the commercial and recreational fishery.
- Continue research to improve knowledge of fish stocks.
- Conserve fish species and fish habitats, particularly juveniles and nursery habitats.
- Minimise conflict between professional and recreational fisherpeople.

4.7 *RECREATION*

The estuary is a major recreational resource for local people and tourists. This management programme recognises that the estuary provides a wide range of recreational opportunities which could be expanded by the well planned development of appropriate facilities. Care and good management is required however, to ensure development of facilities, and that heavy or inappropriate recreational uses do not result in environmental loss.

PRIMARY OBJECTIVE 6

Encourage a range of recreation opportunities that reflect and complement the waterway environment.

SPECIFIC OBJECTIVES

- Support diversity in providing recreational opportunities and facilities so that users can seek a variety of appropriate recreational experiences from the estuarine environment.
- Support a range of commercial and non-commercial opportunities and facilities to be available for the benefit of the community and visitors.
- Ensure that any recreational development proposal is subject to appropriate environmental assessment.

4.8 *NAVIGATION AND BOATING SAFETY*

The inlet is a major recreational waterway with more than 700 boats in operation during busy periods. The standard of boat use is variable and the unsafe use of craft was a major concern of many respondents during the recreation survey conducted in January 1988. While the management and control of all boating activities is the direct responsibility of the Department of Marine and Harbours this programme recognises the need for proper controls in the area of navigation and boating safety. It also recognises a need for an education programme for boat users.

PRIMARY OBJECTIVE 7

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

SPECIFIC OBJECTIVES

- Ensure that all navigable waters are kept safe for navigation.
- Provide boating facilities which will enhance waterway use by boat users and reduce boat hazards.
- Maintain high standards of safety by reducing user conflict whilst recognising the rights of all waterways users.
- Support proposals for a comprehensive education programme for boat users on the estuary.

4.9 *MANAGEMENT*

There is a variety of authorities which have some management function on or around the estuary, as shown on Figure 1. To assist effective co-ordination, this programme outlines the roles of those authorities and contains recommendations about implementation of relevant tasks.

PRIMARY OBJECTIVE 8

Ensure that a legislative and administrative base, and appropriately funded bodies and structures exist to achieve the other primary objectives of this Management Programme.

SPECIFIC OBJECTIVES

- Ensure co-ordination of bodies with an interest or involvement in the waterway.
- Ensure management of the waterway in accordance with this programme.
- Prepare a works programme to enable the proper planning and execution of PIMA's Works Programme.

General Recommendations and Area Recommendations prepared to assist in achieving these objectives are set out in Chapters 5 and 6 and separate reports relating to specific areas. Each issue addressed contains recommendations for action and identifies responsible agencies. Mechanisms for implementing and monitoring of the recommendations are set out in Chapter 7.

CHAPTER 5

GENERAL RECOMMENDATIONS

5.1 *INTRODUCTION*

In Section 3.3 thirty-nine issues were listed which require attention during development of the management programme. These are divided into eight categories: Agency Co-operation and Public Participation, Conservation and Environmental Protection, Land Use and Waterway Planning, Tourism, Fishing, Recreation, Navigation and Boating Safety, and Management. Chapter 4 further expanded this classification defining Primary and Specific Objectives of the management programme according to these eight categories.

This chapter outlines the General Recommendations required to achieve the Primary and Specific Objectives. General Recommendations relate to issues which are relevant to a large part or all of the waterway and cannot be effectively covered by a recommendation applied to a specific area. Each issue listed in Section 3.3 is treated in this chapter, detailing the "Need for Action" which sets out the current problem or issues and mechanisms required for resolution. "Recommendations" are then listed and agencies responsible for implementation of the recommendation identified in brackets. The lead agency is underlined. (Abbreviations for agencies are listed on a fold-out sheet at the back of this document.)

5.2 *AGENCY CO-OPERATION AND PUBLIC PARTICIPATION*

OBJECTIVE - Ensure that the local community and relevant State and local government authorities are adequately represented on PIMA and have the information and appropriate opportunities needed for effective involvement in the planning and management of the waterway.

5.2.1 *State and Local Government and Community Representation*

NEED FOR ACTION

The proper management of the waterway is dependent upon co-operation between PIMA, other relevant authorities and the public. Authorities with an immediate interest in the estuary include the City of Mandurah, Shires of Murray and Waroona, Departments of Marine and Harbours, Agriculture, Conservation and Land Management, Fisheries, Land Administration, Water Authority of Western Australia, Planning and Urban Development and South West Development Authority. In addition, there are a number of clubs, community groups and members of the public with an interest in the waterway. Co-operation can be best achieved by ensuring that all interested authorities and the public are aware of important issues, are informed about management decisions and have an opportunity to comment on them.

RECOMMENDATIONS

1. Continue the practice of appointing representatives from the City of Mandurah and Shires of Murray and Waroona, to PIMA (<u>WWC</u>).

2. Continue the practice of appointing representatives from relevant State government authorities to PIMA (<u>WWC</u>).

3. Continue the practice of appointing interested members of the public to PIMA (<u>WWC</u>).

5.2.2 *Administrative Referrals*

NEED FOR ACTION

It is essential that PIMA and State and local government agencies inform each other about any decisions or plans which may affect the waterway, including the land portion of the management area. The advice of relevant authorities should be sought and considered before proposals are made public.

Under Section 36 of the Waterways Conservation Act PIMA may request town planning authorities to refer to it particulars of each proposal to approve

(a) a town planning scheme
(b) an interim development order
(c) the subdivision or amalgamation of any lot or lots
(d) the development of any land.

Where such matters are referred to PIMA it may

- consider the matter and consult with the relevant authority; and

- advise if it considers the proposal should proceed, not proceed or proceed in a modified form.

When preparing advice in accordance with Section 36 PIMA must have regard to its management programme. If a matter has been referred to PIMA the relevant town planning authority must consider PIMA's advice before exercising its power to approve items listed in (a) (b) (c) and (d) above.

Where a Minister of the Crown is aware that a development proposal, project or industry may have a detrimental effect on the waterway he must advise PIMA and keep it fully informed of the situation. In addition PIMA may request that a Minister provide information concerning any matter which may affect the waterway.

Any member of the public may advise PIMA of activity which may cause pollution of the waterway and if appropriate, PIMA may advise any Minister about the issue.

As outlined above, the Waterways Conservation Act provides for considerable referral of issues affecting the waterway. It would be desirable, however, that authorities, groups and individuals with an interest in the waterway inform each other of significant issues as a matter of course.

RECOMMENDATIONS

4. Seek advice from all relevant authorities before reviewing management programmes (PIMA).

5. Refer all draft management programme reviews and draft policies to the relevant authorities for comment (PIMA).

6. Refer PIMA meeting minutes to local authorities for their information (PIMA).

7. Refer all major development proposals to be undertaken by PIMA to the relevant authorities for comment (PIMA).

8. Comment on all proposed amendments to town planning schemes which affect the management area (PIMA).

9. Seek referral of all development applications affecting the management area or waterway which are being considered by town planning authorities, to enable input from PIMA on waterway issues (PIMA, DPUD, LGAs).

10. Seek referral of proposals to change the vesting, boundaries, purpose or use of reserves within the management area (PIMA, DOLA, LGAs).

5.2.3 *Public Education and Participation*

NEED FOR ACTION

Public participation in the management process is essential if waterways management is to be effective in Western Australia. People should be involved to ensure that the preparation of management programmes addresses all major issues. In addition public involvement is required to deal with problems of inappropriate development and use and to overcome issues of pollution and other environmental degradation.

Effective public input can only occur if people have an understanding of the estuarine ecosystem and the issues which affect it and influence its management. Therefore a public information system should be developed to increase public awareness.

RECOMMENDATIONS

11. Seek advice from interested people and groups about the structure and content of management programme (PIMA).

12. Advertise in local newspapers for public comment on future management programme reviews (PIMA).

13. Prepare a comprehensive programme of public education relating to the waterway and its management (PIMA, WWC), including:

    a) Information packages for members of management authorities and committees, LGA councillors and staff, and other authorities.

    b) Information packages for members of the public.

    c) Educational packages for schools, with assistance by PIMA staff in their interpretation and use.

    d) Information for neighbours, including farmers, canal estate and river bank residents and commercial property owners and tenants.

    e) Waterways information leaflets similar to Leaflet No 1 "The Blue Manna Crab". Other topics of immediate relevance include "Birdlife of South-West Estuaries" and "The Samphire Marsh".

    f) Displays on the role and functions of PIMA for use in libraries and other public venues.

    g) Advertising to get information to specific audiences (for example, boat owners, anglers and yacht owners).

    h) An information video about the waterway and its management.

    i) Disseminate WWC guidelines on the control of pollution by anti-fouling paints to all slipyards and commercial boating operators.

    j) Prepare a pamphlet on the possible impacts of climatic change on the waterway.

5.3 *CONSERVATION AND ENVIRONMENTAL PROTECTION*

OBJECTIVE - Minimise pollution of the estuary and protect and rehabilitate its waters, land, wildlife habitats and cultural sites in accordance with the ERMP Stage 2.

5.3.1. *Water Quality Management*

NEED FOR ACTION

As outlined in the Peel Inlet and Harvey Estuary Management Strategy - Environmental Review and Management Programme Stages 1 and 2 the eutrophication of the estuary during the last 30 years has resulted in a decline in water quality. Stage 2 of the ERMP seeks government approval for a comprehensive strategy to restore water quality, including:

- catchment management to reduce the amount of phosphorus entering the estuary;
- construction of the Dawesville Channel to increase the loss of phosphorus to the ocean and increase salinity; and
- continuation of weed harvesting to reduce the weed accumulations especially near residential areas.

Implementation of both the catchment management and Dawesville Channel proposals have been recommended to achieve the management objective of restoring the Peel-Harvey system to a clean, healthy and resilient state. In December 1988 the Premier of Western Australia announced that the Government would go ahead with the works and policies recommended in the ERMP Stage 2.

Less important but significant pollution problems can also be caused by:

- the discharge of waste water from domestic and commercial developments near the waterway;
- the discharge of septic effluent from houseboats and other pleasure craft;
- polluted ground water flowing into the estuary; and
- litter from boats and foreshore areas.

The control of polluting discharges into the management area is provided for under Section 47 of the Waterways Conservation Act, however licences to discharge are issued by the Environmental Protection Authority, after considering the advice of the Waterways Commission which sets conditions.

RECOMMENDATIONS

14. Support and assist the implementation of the ERMP Stage 2 which will assist in the improvement of water quality of the waterways, and report to the community concerning changes in water quality (PIMA).

15. Support the creation of a central committee to co-ordinate all planning decisions which affect the catchment of the waterways, to enable full consultation between authorities. The Committee should include representatives of local government (PIMA).

16. Develop a policy with respect to living on vessels within the management area to ensure they do not have an impact on water quality (PIMA, CM, SM, SW).

17. Protect fringing vegetation around the estuary which reduces the nutrient level of ground water (PIMA, LGA, CALM, DPUD).

5.3.2 *Weed Harvesting*

NEED FOR ACTION

The high nutrient level of the waterway stimulates the growth of large weed or algae which is blown into the shallows or onto beaches where it dies and putrefies, causing odours which are a considerable nuisance to nearby residents. Since 1974, PIMA has removed up to 8000 tonnes of weed from beaches and the estuary each year using front end loaders (FEL) and underwater weed harvesters, thereby significantly reducing the problem. However, when weed is blown into water less than 0.5 m deep it is inaccessible to PIMA machinery and since this represents 44% of the total water surface, it is a significant problem. By the time the weed is eventually washed ashore it is usually putrid and furthermore, current FEL operations tend to aggravate the odour problem and remove beach sand.

The two underwater harvesters have a limited impact on algae biomass and cannot cope with massive blooms. To be effective, weed should be harvested at periods of peak growth.

Although the weed is unsightly and fouls beaches and waterways, its physical presence is not a major problem. The smell of decomposing weed can be detected at low levels, which has an impact on the quality of life in Mandurah and the tourism industry.

The annual nuisance will continue while the Dawesville Channel is being constructed and until catchment management measures begin to work. These measures are likely to take several years to become fully effective. In addition, the cleaner water which will result from construction of the Dawesville Channel will favour the growth of large weed. This growth will increase for a while until the level of phosphorus is reduced and improvement occurs. This increased weed harvesting effort will require the reorganisation of PIMA's existing operations which have been subject to an investigation "Review of Weed Removal Operations - Peel Inlet and Harvey Estuary."

The review recommends the upgrading of PIMA's weed harvesting capacity by:

- improving machine maintenance to reduce down time;
- improving the methods of transporting weed after harvesting; and
- improved harvesting techniques involving the use of more flexible and effective machines.

RECOMMENDATION

18. Upgrade weed harvesting operations to make more effective use of existing resources in accordance with Option A outlined in "Review of Weed Removal Operations - Peel Inlet and Harvey Estuary", prepared by the Waterways Commission 1989. The funding of this work is recommended in the EPA Assessment Report relating to the ERMP Stage 2 (PIMA, WWC).

5.3.3 *Proposed Peel-Harvey Regional Park*

NEED FOR ACTION

The waterway and surrounding wetlands provide some important wildlife habitats which require management and protection if they are to retain their values. In 1985 the Peel-Harvey Conservation and Development Committee (PHCDC) was established to:

- investigate detailed conservation needs in terms of areas and their management around the Peel-Harvey Estuary;
- ensure that planning for conservation is incorporated in the statutory planning process around the Peel-Harvey Estuary;
- to oversee development projects to ensure that prior to ceding and vesting of proposed conservation areas no undue degradation of them occurs and that necessary steps for conservation management are carried out. This implies arranging for provision of the resources needed for such management; and
- to arrange the efficient transfer of conservation areas to the bodies in which they are to be vested.

The Committee engaged a consultant to complete a conservation assessment of the Yunderup Island Delta, Sticks Channel Delta and Harvey River Delta which are of international significance as conservation areas. The report articulates these conservation values and stresses the need to manage and protect the deltas. The report also outlines the need to amalgamate the smaller areas of reserve around the entire waterway to create a "regional estuarine reserve" to improve their viability for conservation and recreation purposes and economise on overall management effort for reserves around the estuary.

The management of such a "regional estuarine reserve" should involve inputs by the Departments of CALM and Fisheries, PIMA and relevant local government authorities. Areas which are to be developed for recreation should be vested in the LGA while areas to be managed for conservation purposes should be vested in CALM. If CALM cannot accept responsibility for small areas of wetland and fringing vegetation they should be vested in WWC. PIMA's specific role would be the protection and management of the waterway.

In January 1989 the Minister for Conservation and Land Management, Environment and Waterways announced that the Government had decided to establish a Regional Park based on the Peel-Harvey Estuary.

In January 1991, DPUD commenced a study relating to the Regional Park Proposal. The objectives of the study are to:

a) Examine the System 6 recommendations and the Peel Inlet Management Authority's area of control, in light of the proposed land uses in the draft Peel Regional Plan.

b) Identify the area to be included in the Park.

c) Establish the preferred land and water uses for the Park.

d) Establish the preferred management arrangements for the Park, including the zoning, reservation or vesting of land required to give effect to the preferred uses and protection of the Park and adjacent land.

e) Establish guidelines for subsequent management of the Park.

The Area Recommendations of this Management Programme are derived from two studies namely:

a) Study of the Western Foreshore of the Peel-Harvey Estuary.

b) Study of the Eastern and Northern Foreshores of the Peel-Harvey Estuary.

NOTE: Study (b) includes associated river and lake systems.

These studies identify the various areas of Vacant Crown Land, and vested and unvested reserves around the waterway. They also make recommendations about the rationalisation of reserve boundaries and the future management of the land.

RECOMMENDATIONS

19. Establish the Peel-Harvey Regional Park and an effective management framework based on existing authorities (DPUD, PHCDC, CALM, EPA, PIMA, LGAs).

20. Determine appropriate vestings and reserve purposes for foreshore land in accordance with the Area Recommendations and as outlined in Chapter 6 (PHCDC, DPUD, DOLA, LGAs).

21. Establish a body to co-ordinate Regional Park management (DPUD, CALM, PHCDC).

5.3.4 *Conservation Reserves*

NEED FOR ACTION

The management area contains a number of conservation reserves. The Department of Conservation and Environment (1983) System 6 Recommendations C50 and C51 contain a number of suggestions to improve the status and tenure of these areas (Appendix 1).

The System 6 Report recognises the Peel-Harvey wetlands as the most important conservation area for water birds in south western Australia. These habitats include the extensive shallows around the southern and eastern shores and the tidal flats around Channel and Creery Islands.

Many of the most important conservation areas are vested in and managed by CALM, although some areas identified in the System 6 Report are in need of reservation and vesting. The System 6 Report also supports the concept of a Regional Park.

As yet CALM has not been able to prepare detailed management plans for the areas under its control. However, the Department manages these nature reserves in accordance with their Interim Guidelines which provide a basis for ongoing activity.

Careful management is required to ensure that areas of natural bushland do not create a fire hazard and CALM works with neighbours to address this problem.

RECOMMENDATION

22. Support the implementation of the System 6 Recommendations C50 and C51 and provide technical advice concerning these areas if appropriate (Appendix 1). Investigate wildlife habitats within the study area and seek their protection (PIMA, PHCDC).

5.3.5 *Conservation of the Waterway Margins*

NEED FOR ACTION

As outlined in 5.3.3 the management area contains areas which are of major significance as wildlife habitats and which are subject to System 6 Study recommendations to enable their long term conservation. However, most of the estuary is surrounded by a strip of relatively undisturbed fringing vegetation which has important functions in the maintenance of the estuarine environment, but is not recommended for reservation in the System 6 Report. The protection of these areas and nearby shallow banks is considered of critical importance in the management of the estuary and the land of concern includes the estuary bed.

Many areas of land which are important in the management of waterway margins contain Vacant Crown Land, unvested reserves and reserves with inappropriate purposes or vestings. Management of these areas is difficult and in many cases inappropriate land uses and other activities are leading to their degradation. These areas require careful investigation and their long term purpose and vesting should be determined during the establishment of the proposed Peel-Harvey Regional Park. They should be vested in the Waterways Commission and managed by PIMA in accordance with the WWC Foreshore Management Policy, on an interim basis until the Regional Park study is complete and their long term tenure and management determined. These areas are identified and recommendations about their interim management are shown in the Area Recommendations.

Fringing vegetation may be degraded by changes in drainage patterns or land surface contours, weed and noxious animal invasion, fire, clearing, or litter and various forms of development. The management techniques required to protect fringing vegetation are known, but there is a need for more information about rehabilitation techniques which should be applied in degraded areas.

Much of the land around the estuary is in private ownership and zoned for rural purposes. As the population grows there is increasing pressure to change the zoning and use of this land. PIMA provides advice to decision making authorities about these changes after considering their likely impact on the waterway. The Area Recommendation Maps show a "Waterways Protection Precinct" which PIMA will use as a guide to limit the impact of environmental change. The boundaries of the "Waterways Protection Precinct" have been determined after considering the existence of fragile estuarine margins, natural and exotic vegetation, wildlife habitat, landscape values, the location of the WAWA floodway and flood plain and relevant contours.

Much of the land adjoining the river has been cleared for agricultural purposes and in many locations a single line of mature trees separates the river from the grassland. As natural and other erosive forces undermine the trees they fall into the river and there is concern that eventually the tree line will disappear. There is a need for voluntary agreements between PIMA and private property owners to enable the establishment of a wide belt of new trees to replace older trees as they disappear. The proposed location is shown on the Area Recommendation Maps and is described as the "Bank Revegetation Precinct".

RECOMMENDATIONS

23. Establish a Waterways Protection Precinct in areas where the protection of waterways and adjacent foreshore margins is of high priority. To protect the waterway in this precinct PIMA will:

    - Seek the acquisition and reservation of any privately owned waterway areas and recommend appropriate vesting.

    - Provide advice about the development of private land which enables its use without unacceptable change to the waterways environment.

- Investigate closely the rezoning of land in the precinct if it will enable more intensive development. The aim would be to provide advice to decision making authorities on how the development would affect the intent of the precinct.

- Identify areas of fringing vegetation and determine their current ownership and management.

- Prepare detailed recommendations about the future vesting of Vacant Crown Land and reserves which contain areas of fringing vegetation.

- Undertake work to protect and rehabilitate areas of vegetation within this precinct in co-operation with land owners and relevant authorities and in accordance with the WWC Foreshore Management Policy.

- Undertake research to determine effective techniques for rehabilitating degraded fringing vegetation.

- Support the long term use of the State government's moratorium on clearing and drainage, and the Environmental Protection Authority's Wetland Policy.

- Identify and monitor all existing drainage outlets into the waterway and encourage the use of biological filters on all proposed drainage systems.

- Support the implementation of the Soil Conservation Act Regulations which prohibits the clearing of more than 1 hectare of land without a permit.

- Encourage local land owners to form local management groups to address waterway management issues.

- Identify areas of remnant vegetation and seek their protection.

5.3.6 *Erosion Control*

NEED FOR ACTION

Erosion is a natural and continuing process on any waterway. With increasing land use it is not always desirable to allow continuing erosion, because of the threat to property and limited conservation and recreation areas. The major agents of erosion include stream flow, tidal flow and wave action, both natural (wind induced) and artificial (boat wash).

Erosion in the waterway can be divided into four broad categories.

(a) **EROSION AT THE WATER LINE**

The protection of these areas and nearby shallow banks is considered of critical importance in the management of the estuary and this includes the estuary bed.

Fringing vegetation may be degraded by changes in drainage patterns or land surface contours, weed and noxious animal invasion, fire, clearing, or litter and various forms of development. The management techniques required to protect fringing vegetation are known, but there is a need for more information about rehabilitation techniques which should be applied in degraded areas.

Generally this is more apparent in tidal areas, where water levels vary diurnally and are less affected by variations in stream flow. Erosion at the water line generally causes the most public concern and most attention.

(b) **EROSION BELOW THE WATER LINE**

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

(c) **Erosion above the Water Line**

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

Minor erosion at the water line attracts the most attention. Wave action and boat wash can increase bank erosion, especially if the foreshore vegetation has been damaged, and in many areas of the waterway the foreshore vegetation is confined to a very narrow strip.

Upstream in rural areas, access to the river bank by livestock causes damage to the vegetation, and this destabilises the bank.

(d) **Mechanical Erosion**

When algae is blown onto beaches it is removed by front end loaders (FEL) as outlined in Section 5.3.2. The FELs push the rotting weed into heaps and load it onto trucks which take it away to designated tip sites. Each time this operation occurs on a beach, some sand is removed, resulting in beach erosion over a long period.

Erosion caused by natural forces, human activity or grazing may result in the undermining of large trees and shrubs which eventually fall into the water. In some areas, particularly on river banks, a thin line of trees is all that remains between the river and grassland. When these trees are lost the landscape will be degraded and erosion may accelerate.

PIMA will seek approval to establish a Bank Revegetation Precinct in which it works with private land owners to fence off and replant wider areas of the waterway margin.

RECOMMENDATIONS

24. Identify and monitor areas of the waterway at risk from erosion and implement a long term erosion control programme (PIMA, LGA, DMH). Control measures should include:
    - Foreshore stabilisation with native vegetation.
    - Tree planting adjacent to rivers.
    - Improving public access to stable areas of the waterway and discouraging access to erosion prone areas.
    - Adoption of agreements with landholders to prevent livestock from damaging the river banks and vegetation.
    - Beach renourishment, walling, groynes, flow redirection, use of baffle boards to dissipate wave action.
    - Modification to recreational activities in serious erosion areas (PIMA, LGA, DMH).
25. Provide information to private land owners to encourage appropriate methods of erosion control (PIMA, LGAs).
26. Establish a Bank Revegetation Precinct in areas where revegetation of the river banks is of high priority. To prevent further loss of vegetation, PIMA will encourage property owners, local government authorities and community groups to undertake revegetation programmes under PIMA's guidance (PIMA).
27. Develop techniques for propagating rushes for use in bank stabilisation programmes (PIMA, CALM).

5.3.7 *Mosquito Control*

NEED FOR ACTION

While wetlands are widely regarded as places of high scenic value and support a variety of attractive bird life, they are also breeding areas for mosquitoes. Mosquitoes are a nuisance and in some cases present a health threat both for those who venture into wetlands and for nearby residents.

This leads to demands for the introduction of eradication measures, often resulting in the degradation or loss of the beauty that first attracted the residents. People should be made aware of these problems before settling near wetlands.

In 1984 the WWC established the Mosquito Control Review Committee to evaluate the conservation value and waterbird usage of estuarine mosquito breeding areas, to review mosquito control methods used by local government, and to assess the environmental impact of those methods. At the same time the Health Department of WA initiated field studies to investigate the mosquito problems in the Mandurah and Bunbury regions. These studies were conducted in 1985 and the results released in 1986. The Mosquito Control Review Committee will collate all the information collected and develop long term mosquito control strategies for Peel Inlet and Leschenault Estuary that can be implemented in an environmentally responsible way. The timetable for the development of these long term strategies is dependent upon the completion of current environmental research.

In January 1989 the Western Australian State Government approved a special funding grant for two years to control mosquitoes in the Peel Inlet and Leschenault Estuary Regions. The control measures to be implemented include:

- channelling and minor filling of 15 designated wetlands where mosquitoes are known to breed;
- a programme of larvicide application in wetlands where channelling and minor filling are not suitable;
- establishment within the Health Department of WA of facilities to monitor and conduct research on Ross River Virus; and
- a public awareness campaign to inform residents and visitors in the Mandurah and Bunbury regions of the risk of Ross River Virus.

The State Government also released the "Interim Strategy for Mosquito Control" to achieve an effective immediate reduction in mosquito health risk and nuisance as well as preserving valuable wetland areas in the two regions.

Further information concerning the mosquito problem and proposed control measures is outlined in "Interim Strategy for Mosquito Control in the Peel Inlet and Leschenault Estuary Regions" by the Government of Western Australia (1989), which is available from the WWC.

RECOMMENDATIONS

28. Undertake the recommended works and monitoring programmes defined in the Interim Strategy for Mosquito Control in the Peel Inlet and Leschenault Estuary Regions (<u>PIMA</u>, HD, LGA, WWC).

5.3.8 *Aboriginal Sites*

NEED FOR ACTION

The entire estuarine system and its tributaries provide an important spiritual focus for Aboriginal people. In the past the waterway provided a valuable environmental resource which ensured a permanent supply of fish and water, and supported a wide range of edible plants and animals.

Aboriginal sites are vulnerable to inadvertent damage because their locations are not disclosed to the general public.

All Aboriginal sites are protected by the Aboriginal Heritage Act (1972-80). Under this legislation the onus is on the developer to determine if the proposed development site contains any ethnographic and archeological sites. Any proposal involving physical disturbance of the ground on the river foreshore should first be referred to the WA Museum (WAM) for advice.

RECOMMENDATIONS

29. Encourage management bodies and developers to consult with the Department of Aboriginal Sites, WAM, concerning development plans at an early stage to ensure that Aboriginal sites are not inadvertently disturbed (DPUD, PIMA, LGA).

5.3.9 *European Historic Sites*

NEED FOR ACTION

The waterway has provided a focus for European settlement and as a result there are significant historic sites located around the foreshore. Some of these sites are either listed or registered with the National Trust of WA. Those sites registered with the Trust are included in the National Estate Register. They are protected under the Australian Heritage Commission Act (1975).

RECOMMENDATIONS

30. Identify and protect sites of cultural and/or historic significance by proclamation of Western Australian Heritage Legislation (WAHC).

31. Develop appropriate historic sites as tourist attractions (WATC, LGAs, WAHC).

5.4 *LAND USE AND WATERWAY PLANNING*

OBJECTIVE - Ensure that land use within the Peel-Harvey catchment maintains or enhances the quality and amenity of the waterway environment.

5.4.1 *Peel Regional Planning Study*

NEED FOR ACTION

The Department of Planning and Urban Development, in conjunction with a number of government departments and local government, is undertaking a major study of the Peel region. The study area incorporates the City of Mandurah and the Shires of Boddington, Murray and Waroona.

A regional plan is required as a guide for future planning and development in the Peel region, which has strong population growth, growing competition between land uses, a broad range of valuable environmental assets and is strategically located between Bunbury and Perth.

The aim of the study is to prepare a regional plan that provides for the social and economic growth of the study area, consistent with the need for the proper management of its environmental values. The Waterways Commission and PIMA are represented on the Technical Consultative Group and submitted technical papers to the group. The study provides an opportunity to develop planning decisions and policies which assist in estuarine management. This may include:

- the control or elimination of inappropriate land uses and agricultural practices within the catchment;
- the preparation of a catchment management plan co-ordinated by DPUD; and
- planning controls to minimise other pollution and erosion problems.

The study also provides an opportunity to establish the administrative framework for a Regional Park in the management area, and provide enhanced recreational opportunities.

RECOMMENDATIONS

32. Provide advice to DPUD concerning waterway conservation needs during preparation of the Peel Regional Planning Study (PIMA WWC).

5.4.2 *Foreshore Reserves*

NEED FOR ACTION

The reservation of foreshore land enables the protection of environmental values and the provision of public access to the waterway, and provides space for the development of recreational facilities.

In some areas the surveys associated with the original subdivision of the land provided adequate foreshore reserves, while in others freehold titles extend to high water mark or very narrow foreshore reserves exist.

Land use planning should provide for the acquisition, planning and development of foreshore reserves.

This Management Programme recognises the need to consider the waterway and all of its foreshores as a single entity in the form of a Regional Park managed by a co-ordinating body representing the existing management bodies. The Regional Park would include the waterway, and adjoining conservation, recreation and water reserves and Vacant Crown Land. The management body should include representatives from DPUD, LGAs, PIMA, CALM and Fisheries Department.

Vacant Crown Land should be reserved and vested in appropriate authorities. All recreation reserves should be vested in LGAs and reserves with conservation value should be vested in CALM. If CALM is unable to accept vesting of minor areas they should be vested in the relevant LGA or PIMA.

Where freehold land extends to high water mark, foreshore reserves should be acquired in accordance with the WWC Foreshore Reserves Policy. If land adjoining the foreshore is being subdivided or being developed for multi unit development, a foreshore reserve should be given over, free of charge, to the Crown as a development approval condition in accordance with Section 20A of the Town Planning and Development Act.

Some areas of important foreshore land remain in private ownership and they must be purchased if it is to be resumed. There is need for a fund to finance purchase of such areas if they cannot be acquired in accordance with Section 20A of the Town Planning and Development Act.

Foreshore reserves are often regarded as ideal locations for the placement of utility services, and at times this may be unavoidable. In such cases the service must be developed in a manner which does not detract from the purpose of the reserve.

The proper management of foreshore reserves requires the provision of an adequate level of funding to ensure the staff, materials and contracts which are required to do the work are available.

PIMA may be involved in the funding of foreshore reserve developments in accordance with WWC Foreshore Management Policy. This policy provides for PIMA involvement in the provision of certain recreational facilities and water oriented works including boat ramps and jetties and when works are required to protect the waterway environment.

The following recommendations are intended to set overall directions and identify those agencies responsible for taking action. More specific recommendations are included in Chapter 6.

RECOMMENDATIONS

33. Treat all foreshore reserves and the waterway as a single Regional Park for the purposes of planning and management (<u>DPUD</u>, LGAs, CALM, DOLA, PIMA).

34. Implement the recommendations which relate to the rationalisation of foreshore land outlined in the Area Recommendations (<u>PIMA</u>, DPUD, LGAs, DOLA, CALM).

35. Establish a fund to enable the purchase of privately owned foreshore land which cannot be acquired by other existing mechanisms (<u>WWC</u>, TREASURY).

36. Establish a priority order for the acquisition and vesting of foreshore land (DPUD, PIMA, LGAs).

37. Designate areas suitable for declaration of waterway recreation nodes, conservation areas and linear parks (DPUD, LGAs, PIMA, DOLA).

38. Develop foreshore reserves designated for recreational use in the Area Recommendations to facilitate water oriented activities or enhance the use of the waterway. Where the adjoining waterway is not suitable for recreational use other activities should be considered (LGA, PIMA, MSR, DPUD, DMH).

39. Determine the width of foreshore reserves taking into account the following criteria (DPUD, LGAs, PIMA, DOLA):

    - future land use
    - conservation of natural ecosystems
    - educational value
    - recreational links including linear parks
    - the flood plain
    - heritage values
    - landscape conservation
    - management access
    - public access
    - erosion and accretion processes
    - wildlife corridors
    - the need to protect water quality
    - possible future changes in sea level
    - the advice of the RAOU

40. Identify management agencies for all foreshore reserves and Vacant Crown Land (DPUD, LGAs, CALM, PIMA).

41. Plan service corridors to provide for the combined needs of utilities so that all services cross the waterway at a limited number of common locations where their impact can be minimised (DPUD, LGAs and other relevant authorities).

42. Liaise with Treasury, DOLA, DPUD and LGAs to develop a properly structured mechanism for funding foreshore reserve management. Consider the use of Trust funds as a management mechanism (PIMA).

5.4.3 *Landscape Protection*

NEED FOR ACTION

The waterway includes a number of landscapes both natural and modified which need protection as they provide a visually attractive backdrop for the estuary. The maintenance of significant views to and from the waterway is also important.

A number of activities cause landscape degradation including unplanned clearing and earthworks, uncontrolled beach access and boat launching, off-road vehicle activity, car parking and vegetation disturbance on the foreshore.

Although the foreshore has obvious recreation nodes, access to the beach or water is often indiscriminate or uncontrolled by circumstantial use patterns rather than intentional planning policy. For example current vehicle access to the salt marsh south of the new traffic bridge is causing considerable impact on the landscape.

It would be preferable to provide access through the upgrading of recreational nodes, taking into account convenience, the wishes of people living nearby and optimal walking distance. However, nodal development should provide for the protection of foreshore vegetation. (Uncontrolled recreation and foreshore access disturb the natural vegetation stands and initiate erosion as the margin of protective vegetation is removed.)

In much the same way that access to the foreshore has evolved in an ad hoc manner, boat launching and storage locations along the foreshore relate to convenience factors more than to an appropriate planning rationale.

The present alignment of Estuary Drive has created a very narrow foreshore reserve along parts of the water front which makes those particular stretches very vulnerable to disturbance of the vegetation and consequently to erosion. The road could be re-aligned in some locations to create a wider reserve and reduce pressure on the foreshore. This new route would be designed to create minimum visual impact.

There are few formal carparks along the western foreshore which leads to random parking, thus further exacerbating the problem of uncontrolled beach access. In peak season there are often many kilometres of continuous, end-to-end parking lines. This creates considerable pressures on the foreshore and frustrates visitors, often resulting in further damage to vegetation in places that would not otherwise be used for parking.

The loss of vegetation due to disturbance and vandalism or natural death, causes areas of the reserves to look downgraded and bleak. Replanting is necessary, particularly in parkland areas where little natural regeneration occurs to reinforce the existing vegetation stands.

Poor design legibility for the existing reserves and lack of coherence also contribute to deteriorating scenic quality, as does the presence of litter.

Unplanned clearing or excavation to enable development can have a major impact on the landscape. For example, the earth works associated with the sporting facilities south of Wannanup are visible many kilometres away. Inappropriate development, including advertising hoardings, and illegal development, including filling, mar the landscape.

Means of providing protection to valued landscapes while avoiding the need for acquisition of private property, are currently being identified and include special zoning in LGA town planning schemes. The City of Mandurah Town Planning Scheme includes a landscape protection zone.

At times, land near the waterway is cleared before developers make application for approval to subdivide their land. The approval of the Commissioner of Soil Conservation is required before areas of more than 1 hectare may be cleared. Such clearing should not proceed if it is likely to result in increased nutrient inputs to the waterway.

RECOMMENDATIONS

43. Determine suitable means of land use control which enable the character of rural areas to be maintained while avoiding the necessity for land acquisition, including the use of strengthened provisions in LGA town planning schemes (<u>DPUD</u>, LGAs, DA).

44. Incorporate special zones into LGA town planning schemes to give protection to valued landscapes, particularly in built up areas (<u>LGAs</u>).

45. Prepare an overall landscape plan in order to co-ordinate landscape enhancement proposals (<u>LGAs</u>).

46. Develop site design criteria and development guidelines for recreational nodes (<u>PIMA</u>, DPUD, LGAs). Specific issues to be considered include:

    - recreation nodes, which should be complementary to each other. Site design should provide a range of offshore and onshore activities;
    - interpretative and educational facilities;
    - toilet facilities; and
    - a variety of modes of access, e.g. foot, vehicle and bicycle.

47. Control advertising signs within the management area in accordance with set guidelines (<u>LGAs</u>, PIMA).

48. Provide low key dinghy/yacht storage areas and liaise with boat owners concerning their use (<u>PIMA</u>).

49. If necessary, invoke the provisions of the Soil Conservation Act to prevent the clearing of areas near the waterway (<u>DA</u>).

5.4.4 ***Australian Heritage Listing***

NEED FOR ACTION

On 18 April 1989, the Australian Heritage Commission proclaimed a Notice of Intention to enter the waterway on the Register of the National Estate. The Notice reads as follows:

WESTERN AUSTRALIA

MANDURAH SHIRE

Peel-Harvey Estuarine System

Approximately 14,000 ha, located south of Mandurah comprising the waters of Peel Inlet and Harvey Estuary to High Water Mark, the islands within those waters, Reserve 2738 on the eastern side of Harvey Estuary, National Park 20215 at the mouth of the Murray River and areas designated C50, C51 and C52 in "Conservation Reserves for Western Australia, the Darling System - System 6, Department of Conservation and Environment, WA, 1983", and located respectively at the northern and south-eastern sides of Peel Inlet, along the Harvey Estuary and around and including Lakes McLarty and Mealup.

MURRAY SHIRE

Peel-Harvey Estuarine System - See Mandurah Shire

The Register of the National Estate is an inventory of places that have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community. It is a list of the nation's heritage resources available to all decision makers to assist them to make better informed decisions. There are no legal constraints placed on owners of private property, or on State or local government property by the entry of that property in the Register.

In essence, the Register is an alerting and educational inventory compiled on the single criterion of national estate significance. It is being developed to be as comprehensive as practicable, and it has implications for protection where actions by the Commonwealth are concerned.

The Australian Heritage Commission considers all objections made concerning its intention to enter places in the Register and seeks to be informed of the specific grounds on which an objection is based. It points out, however, that the final decision must be made in the light of the objects of the Act under which it is operating and therefore the prime consideration in the assessment of an objection must be whether the place in question does or does not have national estate significance.

RECOMMENDATION

50. Support the ongoing protection of the waterway with reference to its place on the Register of the National Estate (PIMA, WWC).

5.4.5 ***Public Access***

NEED FOR ACTION

The provision of public access to the foreshore is an issue of major concern in waterways planning, and as the population increases there will be a greater demand for foreshore access.

In some locations, access is limited by high water mark freehold titles. In other areas, access is difficult because facilities have not been provided and these problems are addressed in the Area Recommendations.

Unrestricted public access is not always desirable, particularly where environmentally sensitive wetlands or conservation reserves exist. If the public is to enter these areas, access must be carefully managed to avoid conflict between human and conservation interests.

A primary concern in foreshore planning is to ensure that physical and visual alienation does not occur. Forms of alienation already exist where adjoining property owners have developed public reserves for their own purposes including filling and the construction of illegal structures such as sheds and jetties. These matters are identified in greater detail in the Area Recommendations. When private jetties are licensed and constructed on public foreshores, care must be taken to avoid the impression that the reserve is privately owned.

Dual use paths provide and encourage linear access to the foreshore for both cyclists and pedestrians. Such paths exist at various locations around the foreshore, but they tend to be truncated and a planning and construction programme is required to link them together. The increasing popularity of cycling may result in a need to widen or duplicate paths in the future and this should be considered at the planning stage. The development of dual use paths can result in environmental damage and the Dual Use Path Guidelines should be used when designing these.

The development of heritage trails for walking, cycling and driving, and canoeing trails which follow a route taking in points of historic interest, can improve access and develop an awareness of natural and cultural heritage on the waterway.

RECOMMENDATIONS

51. Establish a Public Access Precinct in areas where the provision and management of public access is of high priority. To secure, promote and encourage public access within these areas, PIMA will:

    - Support DPUD's practice of reserving and retaining (where possible) river foreshore land to provide public access, and provide advice to DPUD where necessary.
    - Seek the acquisition of freehold land in accordance with the Waterways Commission Foreshore Management Policy.
    - Encourage the incorporation of Vacant Crown Land and unvested reserves into existing reserves for recreation or waterways management purposes and recommend appropriate vesting.
    - Promote the preparation and implementation of management plans which improve access.
    - Investigate the feasibility of entering into agreements with private land owners to gain the rights of public access, while protecting the right of property owners.
    - Support the planning and construction and extension of dual use paths by LGAs in accordance with the Dual Use Path Guidelines.
    - Seek to ensure that the boundaries between reserves and private properties are clearly defined by road, dual use path or substantial fencing.
    - Identify areas where private development of foreshore reserves has occurred and liaise with property owners and relevant authorities to remove illegal developments.
    - In conjunction with WAHC, LGAs and CALM, promote and develop the concept of heritage trails in the scenic or historic areas of the waterway to assist in the development of public awareness of the estuarine environment.
    - Support the provision of unobtrusive sign-posting on public reserves, by the relevant authorities in accordance with recognised standards.
    - Support the provision of foreshore facilities by LGAs to provide access for the disabled.
    - Ensure ongoing public consultation on matters relating to public access.

- Consider the possibility of providing equestrian access through bridle trails.

5.4.6 *Urban Development*

NEED FOR ACTION

Local government town planning schemes determine the zoning/reservation of land, thereby controlling use of the land within municipal boundaries. There are significant areas of urban zoned land within the PIMA management area, but there are few town planning scheme provisions or controls over development and use of land to protect the environment.

Development control provisions which do protect the estuary include the landscape protection zone in the City of Mandurah's Town Planning Scheme, drainage and effluent control policies adopted by Councils and building set backs.

Much of the land near the waterway is already developed for residential purposes. In established areas, residential densities are relatively low (10-12 dwellings per hectare), however in some newer development proposals the tendency is to increase densities to take advantage of the higher property values which occur near the waterway. In more remote locations there has been a tendency toward larger lots (over 2000 m^2) to avoid the requirement to provide deep sewerage.

Generally developments and subdivision proposals which are likely to impact on the management areas, are referred to PIMA for consideration and comment by the approving authority, including LGAs and DPUD.

When foreshore reserves near high density development include sensitive areas such as wetlands and wildlife habitats, there is a need to undertake particular care to plan for their protection. Where extensive recreation areas exist near the foreshore they should be developed to attract people from the surrounding neighbourhood, thereby reducing pressure on sensitive areas.

When new development occurs near the waterway, there will be increased use of nearby foreshore reserves. This may involve more human intrusion into conservation areas or increased use of limited foreshore recreation areas. When developers benefit from the presence of foreshore reserves, they should contribute to the upgrading of the reserves as a condition of subdivision. This should include the preparation and implementation of an approved management plan in accordance with LGA and WWC policies.

Management problems sometimes occur where urban areas adjoin foreshore reserves because neighbours may adopt de facto ownership of the reserve. This may include dumping rubbish, constructing direct access to the foreshore for boats, and the construction of private facilities including barbecues, poultry yards, gardens and stables. This difficulty can be minimised by planning a reserve, which may be bounded by a road, dual use path or specially designed fence. Early consultation between planning agencies, approving authorities and PIMA can maximise opportunities to achieve satisfactory designs and facilitate prompt development approvals.

RECOMMENDATIONS

52. Approving agencies to seek early consultations with PIMA when considering the subdivision or development of land within the management area to determine waterway management requirements (<u>DPUD</u>, LGAs).

53. Ensure that any subdivision or development in newly developed or undeveloped waterway locations has regard for (<u>DPUD</u>, Dev):

    - the nature of nearby foreshore reserves, whether conservation or recreation based;

    - the capacity of the foreshore to sustain heavier use;

- the degree of protection provided for foreshore areas; and

- the inclusion in town planning schemes of landscape protection areas identifying vegetation and landforms which must be protected to maintain landscape values.

54. Ensure that residential developments near the waterway include adequate foreshore reserves which are developed and managed in accordance with WWC Foreshore Management Policy (WWC, PIMA).

5.4.7 *Commercial Developments*

NEED FOR ACTION

Commercial developments include the construction of facilities and provision of services which are undertaken for the purpose of generating income or profit. Generally, commercial developments on the waterway should be associated with water based recreation, tourism or marine service industries.

Commercial developments near the foreshore can exacerbate existing parking problems. In addition, there may be a public perception that particular commercial developments alienate parts of the foreshore. It is not considered practical to veto all developments or maintain the entire foreshore as an unchanging environment, however there is a need to ensure that commercial development avoids environmentally sensitive areas including conservation reserves or marshlands.

Suitable areas should be associated with recreation nodes and be clearly identified. If proposals involve the use of Crown Land, they should be advertised and public comments considered before applications are determined.

Proper planning and development of the waterway should provide opportunities for facilities which will enhance the community use of the waterway without affecting its living systems or public access and amenity. These opportunities should result in a wide range of facilities, including limited tourist accommodation and high standard restaurants, tea rooms and kiosks with associated boat, canoe, yacht and bicycle hire outlets.

In addition, there is a need to provide for marine industry sales, fuel sales and effluent holding tank pump out facilities.

All proposals for commercial developments should be made on the basis that they are capable of returning economic rents and pay rates and taxes appropriate to their activity. The revenue from these sources may return to consolidated revenue or ideally assist in funding future management. They may also enable local government to generate funds which will assist in the management of foreshore reserves under their control. The high cost of maintaining the environment is not widely recognised and should be brought to the community's attention.

RECOMMENDATIONS

55. Ensure that commercial developments do not occur in areas reserved for conservation or waterway management purposes (DPUD, LGAs, DOLA, PIMA).

56. Have input to ensure that commercial developments only occur in suitable locations which are chosen after careful consideration of social, environmental and physical planning criteria, including (DPUD, PIMA, LGAs):

    - availability of the essential services required by the development including water, sewerage, electricity and telephone;

    - likelihood of the development having an adverse impact on neighbouring residential areas because of noise, traffic and parking;

    - intent of the LGA town planning scheme as it relates to adjacent areas;

- impact of the development on the amenity of the existing landscape and natural environment;

- effect the development may have on the hydrology of the floodway and flood plain, and risk of flooding to the development;

- every proposal for commercial development should be considered on its individual merits. It should also be considered in context to take into account cumulative impacts; and

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

57. Refer proposals which involve over-water structures, or developmental dredging, or those which abut areas which are subject to System 6 Recommendations, to the EPA for environmental impact assessment (DPUD, LGA, PIMA).

Existing commercial developments should be encouraged to meet similar standards as a condition of any approval to redevelop their facilities.

5.4.8 *Dredging*

NEED FOR ACTION

A consultative committee appointed by the EPA has prepared dredging guidelines. These guidelines provide for both maintenance of existing channels and basins and development dredging for new proposals. All dredging proposals are to be judged on their merits in the context of the guidelines.

Maintenance dredging is dredging required to maintain existing navigation channels and boat harbours and where it is intended to restore former water conditions. Development dredging is dredging undertaken to construct facilities including the extension of existing facilities. The possible use of dredging to provide water suitable for recreation is outlined in Section 3.3.5 relating to recreation. Development dredging has already been used to increase tidal flushing through the Sticks Channel and is proposed in the construction of the Dawesville Channel. Both these operations have been proposed to improve water quality.

Development dredging and any dredging which involves the disposal of dredge material within the waterway shall be subject to the appropriate level of environmental assessment determined by the EPA. The assessment should include impact on river hydrology and biota and the impact of dredge spoil, stability of the final river profile, future silting and the need for and funding of ongoing maintenance. Obviously some parts of the waterway will be more sensitive to degradation as a result of dredging than others.

RECOMMENDATION

58. Implement the dredging guidelines prepared by the EPA as an environmental protection policy under the Environmental Protection Act 1986 (EPA, PIMA).

5.4.9 *Canal Developments*

NEED FOR ACTION

There are five existing canal developments in the management area, namely Yunderup Canals, Murray Waters (Windslee), Murray Lakes and Waterside Mandurah. Another canal estate, Port Mandurah, has recently been completed on the land north-west of the Old Mandurah Traffic Bridge.

The earlier developments were undertaken with little environmental assessment and Yunderup Canals, which were completed over 15 years ago, are now experiencing water quality problems. The Murray Lakes development was opposed by the EPA because of predicted water quality problems and the development was refused by the (then) SPC, however this determination was overturned by the Town Planning Appeals Tribunal.

Management problems exist because canal waterways require periodic maintenance to retain navigable channels and protect water quality. This maintenance is expensive and is difficult to fund; the canal managers (LGA) should establish a separate rate on canal properties to cover costs. Proposals have been made to empower DMH to charge a rate on canal properties which could be used to fund maintenance.

It should be noted that Section 3.3 of the Waterways Conservation Act, (as amended by) No 97 of 1982 excludes all artificial waterways, including canal developments from management areas established under the Act. Responsibility for managing these areas remains the responsibility of the LGA until the one included in the management area by Order in Council.

Canal developments often have significant environmental impacts. Wetlands with significant wildlife and landscape values often provide convenient sites for canal development and their use results in loss of habitats. As outlined above, canal developments will result in water quality problems if they are sited in particular locations or are poorly designed.

The environmental assessment of designs is difficult because of inadequate information and a lack of experience in Western Australian conditions. Assessment problems are made more difficult because of environmental changes which will occur as a result of the Dawesville Channel.

RECOMMENDATIONS

59. Monitor the environment of all existing canal developments to increase overall knowledge of these artificial waterways (PIMA, Dev, EPA).

60. Establish a mechanism to ensure funds are available to undertake maintenance work on canal developments when required (LGAs, DMH).

61. Assess future developments on land zoned for canals with reference to increasing knowledge of the impact of existing canal estates and the implications of the proposed Dawesville Channel (EPA, DPUD, PIMA, LGAs).

5.4.10 *Flood Plain Management*

NEED FOR ACTION

Much of the land within the management area is subject to periodic flooding which must influence planning and development decisions. Flooding is a natural occurrence, but it causes problems when flood prone land is inappropriately developed. In addition, some developments may cause flooding upstream if they interfere with natural flood flows.

The WAWA has undertaken a comprehensive flood study of the Murray and Serpentine Rivers which included drafting plans showing the extent of the flood plain, documenting historical and statistical flood events and reviewing topographic, hydrologic and hydraulic details. The WAWA Flood Plain Maps show:

- the 1:100 year flood level which indicates areas with a flood return period of 100 years, or which can expect flood 1 year in every 100 years;
- the flood way, which is the river bed and the surrounding areas which carry the full force of flood waters; and
- the flood fringe, which includes land which will be flooded at least 1 year in 100 years, but does not carry flood flows.

The WAWA has prime responsibility for flood plain management, because it is the only body with the resources and expertise to address the issue. However, it has no development control power and its role is one of investigation and advice. Other agencies, including LGAs, DPUD, PIMA and the State Emergency Service, deal with emergencies during floods. Under existing arrangements the WAWA acts as a consultant and advises planning authorities on matters affecting the passage of floods along the rivers and flood plains. The decisions on land planning and development proposals are made by planning authorities.

Filling of the flood plain may affect conservation areas.

RECOMMENDATIONS

62. Investigate the need for legislative changes in conjunction with the consolidation of the Water Authority Acts and amendments to other planning Acts, to ensure that suitable co-ordination exists between planning authorities and the Water Authority for sound flood plain management (WAWA).

63. Prepare guidelines to assist agencies involved in the planning and management of flood prone land (WAWA, DPUD).

64. Undertake studies to prepare and update flood prone land maps and include all designated flood lands required for the proposed guidelines (WAWA).

65. Prepare flood plain management plans for the river system. These should consider factors such as flood behaviour, including risk and effects of future development, conservation of the natural environment, and planning issues (WAWA, DPUD, LGA, PIMA).

5.4.11 *Water Transport*

NEED FOR ACTION

One ferry and several hire and drive operators work around the waterway and are used by local residents and tourists. The Department of Marine and Harbours surveys and licenses commercial craft for particular uses.

The ferry operates from Administration Bay which is serviced by limited car parking bays, while one hire boat operator works from the Mandurah Marina, which may be redeveloped in the near future. Other hire and drive operators work from Novara and Dawesville. Because of the increasing boat and motor vehicle traffic near Mandurah, there is need for more strategically located sites for ferry and hire boat operations.

Commercial ferries, houseboats and hire boats with sleeping facilities should include fittings which ensure the proper storage and disposal of effluent.

RECOMMENDATIONS

66. Improve facilities for boats and ferries (LGA, PIMA, DMH) by supporting the:

    - raising of the old traffic bridge which limits boat access; and

    - provision of car parking, public toilets and sewage pump out facilities.

    Where appropriate the developers of waterside facilities should contribute to the cost of providing these facilities.

67. Provide suitable sites for hire and drive operators at appropriate locations around the estuary (LGA, PIMA, DMH).

68. Ensure that proposals to develop new commercial boating facilities undergo proper investigations to avoid environmental problems and user conflicts (PIMA, EPA, DMH, LGA).

5.4.12 *Living on Boats*

NEED FOR ACTION

There are a number of people living on boats around the estuary including recognised hire vessels, privately owned houseboats and power boats. There are conflicts because of effluent disposal problems and the inappropriate use of mooring sites. While hire vessels are fitted with effluent storage tanks and are serviced by pump out facilities, this requirement does not extend to private vessels. Legislation is required to limit the amount of time people can live on a boat.

RECOMMENDATIONS

69. Ensure that all boats which contain living facilities include effluent holding tanks, bilge tanks and pump out fittings (DMH, PIMA).

70. Ensure that effluent pump out facilities are included in the design of nominated marina facilities around the inlet (LGA, PIMA).

71. Seek Cabinet approval to gazette a regulation limiting the residential use of boats (HD, WWC, PIMA).

5.4.13 *Planning for Climatic Change*

NEED FOR ACTION

As outlined in 2.6, scientists around the world agree that the accumulation of greenhouse gases will lead to significant climatic change. The rate of change is still a matter of debate, but it is agreed that average air temperatures may rise, annual rainfall may decrease in the South West, and sea levels will rise.

If these changes occur they will result in the loss of low lying land including foreshore reserves, flooding and damage to buildings in low lying areas, reduced terrestrial plant growth, and reduced stream flows. As these effects cannot be predicted precisely, waterway planning should be conservative.

RECOMMENDATIONS

72. Seek wider and more elevated areas of foreshore reserve to limit losses in the event of sea level rises (DPUD, LGA, PIMA).

73. Discourage the development of buildings and other permanent structures below 1.5 m AHD (WAWA, PIMA).

74. Ensure that all advice provided by PIMA relating to development proposals near the waterway contains a statement warning developers of the predictions of climatic change and sea level rises (PIMA).

5.5 *TOURISM*

OBJECTIVE - Provide for a range of tourist facilities which are compatible with the conservation of the waterway and benefit from an estuarine location.

5.5.1 *Provision of Tourist Facilities and Activities*

NEED FOR ACTION

Tourism is an important and growing industry in Western Australia and the Peel-Harvey system is one of the district's most important tourist attractions.

The region's large and diverse waterbird population provides an attraction to tourists and with careful management this activity could be expanded. However, the elements of the environment which are attractive to tourists must be protected. Sensitive development of facilities is one of the tourism industry's major challenges.

Tourist facilities may be perceived by local residents as competing with them for the use of the waterway. For this reason, tourist development proposals should be designed to service both tourists and day visitors.

The Mandurah Tourism Development Plan identifies a number of problems affecting the industry.

The Tourism Commission is restricted to marketing Western Australia as a tourism destination and to supporting the provision of new tourist facilities.

Potential developers are under no obligation to contact the WATC when developing tourism proposals, although most do. Developers planning tourist developments near the waterway should be encouraged to contact PIMA at an early stage to ensure that their proposal identifies and avoids environmental problems.

Tourists are heavy users of the waterway and if not controlled may have adverse environmental effects. PIMA should develop a tourist information programme as part of the overall education programme.

RECOMMENDATIONS

75. Limit foreshore tourist facilities to those providing direct services to tourists. Facilities providing support services to the tourist industry, e.g. administrative buildings, should be located away from the foreshore (DPUD, LGA).

76. Identify areas where tourist developments may occur without loss of the waterway environment (PIMA).

77. Prepare an information booklet and map detailing attractions of the waterway for tourist and day visitors and advising of the need to protect the waterway environment (PIMA).

78. Encourage developers of tourist facilities to seek advice about waterways management issues before preparing development proposals (PIMA).

79. Require tourist operations proposing to conduct tours near conservation areas to seek approval from the relevant authority. Any tourist operator working in conservation reserves must be licensed by the Department of Conservation and Land Management (PIMA).

5.6 *FISHING*

OBJECTIVE - Manage the fish resources of the waterway for the benefit of the community.

5.6.1 *Professional Fishing Industry*

NEED FOR ACTION

Professional fisherpeople target fin fish such as mullet and cobbler, and crustaceans such as prawns and crabs. Entry to the industry is restricted and licences are not transferable except under special circumstances. There are 30 licensed units which are active and many make only a marginal living from the fishery. Because of this and the latent capacity associated with the unutilised licences, the Fisheries Department is investigating possible mechanisms to restructure the industry. The recent extension of the government/fishing industry buy back scheme to restricted entry fisherpeople offers a better opportunity to make this readjustment. Alternatively, if a reduction of numbers is not acceptable or cost effective, it may be desirable to adopt a policy allowing for a fishery made up of permanent part time fisherpeople.

Mandurah is also the base of operations of a number of other fisherpeople. Many of the estuarine fisherpeople use beach seines from the beaches north and south of Mandurah as do fisherpeople based at Mandurah that do not have estuarine access. There are also a small number of vessels operating as trawlers off Mandurah, as beam netters for prawns in the estuary mouth and/or gill netting, and long line boats between Bunbury and Rockingham. With the current and imminent controls, the number of those boats could be expected to decline in the near future.

Mandurah is also used as a seasonal anchorage by western rock lobster fisherpeople. Up to 14 boats were used at Mandurah during 1986, taking 204 tonnes during the 1986-87 season (Barker, 1989).

5.6.2 *Recreational Fishery*

NEED FOR ACTION

The Peel-Harvey system is the focus of a large recreational fishery, for both locals and tourists. Besides line fishing there are considerable prawn and crab resources which are taken by a variety of hand held nets.

The amount of recreational fishing pressure has increased considerably in the Peel-Harvey system within the last decade. The increased pressure has meant that even if the available resource has not declined, individual catch shares have probably done so. Therefore a major issue facing the Department is how to equitably distribute the available resource within this user group and between user groups, by introduction of further measures such as bag limits, closed areas and closed seasons.

Within the recreational fishing community, some degree of friction already exists between haul and gill net and the line fisherpeople. Although net fisherpeople do take many species which are not available to line fisherpeople, there is some degree of overlap. There is also overlap between recreational and professional fisherpeople (Lenanton, 1979).

5.6.3 *Interaction of the Professional and Recreational Fisheries*

NEED FOR ACTION

There is real and continuing pressure within the community to prohibit the use of recreational netting and stop, or phase out, all professional fishing in estuaries and off beaches. Addressing this issue will be a primary task for the Fisheries Department over the next decade, and the Peel-Harvey system and adjacent beaches will be one of the first areas to be considered.

The produce caught by professional fisherpeople supplies a real requirement for fresh fish in the local community by those not willing or able to catch it themselves. These professionals also often target a component of the fish stock which is not available to the average angler or even recreational net fisherpeople.

Although the structural readjustment proposal outlined above recognises that some realignment of the professional fishery is socially desirable, the assumption that the entire resource available should automatically and over time be assigned to the recreational fisherpeople should be thoroughly examined. For example, an enquiry into the Swan-Canning system determined it was desirable that a small scale full time professional fishery of 12 boats should continue to operate and a similar level of effort could be seen as appropriate to the Peel-Harvey system.

A Fisheries management officer will examine these issues of resource availability and its allocation between user groups in 1988 and 1989 (Lenanton, 1986).

RECOMMENDATIONS

80. Reduce the number of professional fishing units using the mechanisms outlined in the "Need for Action", to a number which can operate viably on the waterway (DF).
81. Consider the waterway's capacity to sustain both professional and amateur fisheries when determining the "ideal" number of professional fishing units (DF).
82. Develop an education programme which emphasises the need for regulation and maintenance of habitats and breeding areas (PIMA, DF).
83. Continue research on (DF, PIMA):
    - species taken by commercial and amateur fisherpeople;
    - the impact of commercial and amateur fishing activities on fish stocks in the estuary; and
    - the effects of changes to the waterway environment on fish and shellfish and their habitats.

5.7 *RECREATION*

OBJECTIVE - Encourage a range of recreation opportunities that reflect and complement the waterway environment.

5.7.1 *Recreational Use and Facilities*

NEED FOR ACTION

In providing recreational opportunities and facilities on or adjacent to a waterway it is important to recognise that people have a variety of expectations and requirements. Planning must consider these requirements and the environment's capacity to sustain use, and then determine priorities and suggest which areas are best made available for recreation.

Recreation nodes should be connected by linear parks along the foreshore. These areas should provide facilities and activities for both the local and regional community.

As the population of the region increases and water quality improves, there will be a need for more sites for water based club activities such as rowing, sailing, power boating, canoeing etc. Sites suitable for club facilities should be identified to avoid future conflict.

The WWC and PIMA have conducted recreational use surveys of the waterway in 1982 (Schwinghammer, 1982) and 1987 (Thurlow and Chalmers, 1990). The surveys were conducted to determine who recreates on the waterway, how they use it, attitudes toward management issues and future management proposals.

The 1987 survey indicated that 60% of weekend users live in the Perth Metropolitan Area, 20% in Mandurah, 32% Rockingham, 2.3% Pinjarra, 1.5% are from interstate and 0.5% from Waroona. However, it is likely the weekday use of the area by people from the Peel district is higher. The majority (63%) of the visitors were day trippers and 37% stayed for one night or more. Most people surveyed (66%) had visited the site once or more in the previous month and 93% planned to recreate in the area.

The area is heavily used by family groups - 55% of visitors are in family groups, while 23% are accompanied by friends and 19% by family friends. These figures demonstrate that the waterway is considered of recreational importance to family groups.

Counts of vehicles and trailers at boat ramps throughout the 1987 survey weekend indicated that Sunday morning is the time of highest use. The count revealed that there were 660 boats on the waterway at 11.00 am that morning. This level of use results in some crowding which reduces people's enjoyment of the waterway and 20% of respondents expressed concern about crowding of the foreshore and boat ramps.

When asked the main reason for visiting the waterway, the following responses were given:

Main Activity Undertaken	% of respondents
Relaxing	19.9
Crabbing/prawning	19.6
Socialising	8.6
Swimming/paddling	7.8
Barbecuing/picnicking	7.6
Enjoying view/scenic driving	6.0
Powerboating	5.9
Fishing from boat	5.1
Fishing from shore	4.6
Crabbing/prawning from shore	3.7

When asked which activities were undertaken during the visit, people listed the activities shown below. The total exceeds 100% because respondents were able to list more than one activity.

Activities Undertaken	% of respondents
Crabbing/prawning from boat	49.3
Relaxing	46.9
Barbecuing/picnicking	38.9
Enjoying view/scenic driving	37.2
Socialising	34.1
Swimming/paddling	24.6
Crabbing/fishing from shore	19.2
Sunbathing	15.2
Birdwatching	14.5
Line fishing from shore) Line fishing from boat)	12.6

The most appealing and least appealing aspects of people's visits were also surveyed and were shown to be as below.

Most Appealing Aspect	% of respondents
Foreshore	27.9
Quiet peaceful	27.7
View/picturesque	25.8
Crabbing/prawning	22.5
Calm safe water	19.8
Accessible	14.6
Boat ramp	12.8
Fishing	8.9
Close to home	7.6
Lots to do	6.8

Least Appealing Aspect	% of respondents
Smell	27.3
Water quality	21.4
No parking	18.8
Toilets	16.8
Litter/pollution	16.1
Crowding	11.8
Boat ramp	9.9
People's behaviour	8.9
Depth channel	7.6
Playground foreshore	6.3

Consideration of these results indicates the need for improved water quality, more foreshore reserves with picnic and toilet facilities, and places for people to socialise and relax. Safe places for swimming and paddling will become more important when water quality improves.

There is also a need to provide more boat ramps with adequate parking and existing boat ramps could be redeveloped to enable quicker boat handling. There is a need for overflow car and trailer parking areas for use during busy periods.

Bad and illegal behaviour by some boat users was of concern to many people and there is need for boat user education and a closer enforcement of Marine Regulations.

Horse riding is a popular recreational activity in the Peel district. However, the unmanaged use of horses could result in environmental damage or conflict with other recreational users. The management of horses should be addressed during the planning for the Peel-Harvey Regional Park.

RECOMMENDATION

84. Identify areas where recreation reserves can be created or increased in area and upgraded to provide for existing and future demands (PIMA, MSR, DPUD, LGA).

85. Improve water quality to encourage swimming and if appropriate create areas of deeper water suitable for swimming (PIMA, MSR, EPA, WWC, DPUD).

86. Improve picnic area design to create better areas for relaxing and social interaction within small groups (LGAs, MSR, PIMA).

87. Identify sites suitable for the development of recreation club activities (LGAs, PIMA, MSR).

88. Monitor trends in recreational use and participation through surveys, observation and public consultation to determine requirements for future recreation (MSR, PIMA, LGA, WWC).

89. Prepare a brochure which identifies recreational areas and facilities, and encourage the public to use those areas most suitable for particular activities (MSR, LGA, PIMA).

90. Integrate hire and drive operations with other foreshore activities and provide facilities (toilets, parking, picnic facilities, seating and shade) to serve all foreshore users (LGAs, PIMA, Dev, MSR).

91. Identify areas which are suitable for hire and drive operations in foreshore management plans (PIMA, LGA, MSR).

92. Identify areas which may be used by horse riders and prepare guidelines for their use (PIMA, LGA, MSR).

5.8 *NAVIGATION AND BOATING SAFETY*

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

5.8.1 *Boating Safety and Facilities*

NEED FOR ACTION

The Department of Marine and Harbours is responsible for all matters relating to navigation in navigable waters including the Peel-Harvey waterway.

Broadly, this means ensuring that all navigable waters remain open and safe for boating, and includes specific activities such as dredging of navigation channels, removal of wrecks and other structures and the installation, operation and maintenance of navigation aids.

DMH may temporarily close some areas in emergencies or for particular aquatic events, and boating may be restricted in gazetted areas of the main navigation channels. But, generally, DMH is not prepared to close a waterway or restrict the type of craft that may operate in navigable waters. However, in some cases it may be appropriate to close navigable waters for conservation purposes.

The Peel-Harvey system is the largest natural inland waterway in WA and is used by a large number of recreational, professional fishing and commercial craft. Thurlow and Chalmers (1990) revealed that the waterway was occupied by 660 boats on the morning of Sunday, 17 January 1987. During the study, 17% of respondents to the questionnaire expressed concern about water safety issues. The most frequent concerns were the need for policing regulations (21%) and the quality of navigation channels (12%).

The need for more ramps, lack of parking and condition of boat ramps were the main issues of concern. To cover costs a 'user pays' system for public boat ramps should be considered. Complaints regarding lack of parking occurred mostly at Dawesville and Furnissdale boat ramps.

Public safety is a major factor when considering the use of the waterway. Strategies which may be used include:

- Gazettal of areas for specific use.
- Setting of speed limits.
- Surveying of hire boats, ferries and other commercial craft.
- Installation, operation and maintenance of navigation aids and boat ramps.
- Use of safety equipment in boats and on shore.
- The closure of certain areas either for a particular use such as swimming or in emergencies such as flooding.
- Control of public jetties.

RECOMMENDATIONS

93. Prepare a strategy for the systematic upgrading of existing boat ramps to enable their most efficient use (PIMA, LGA, DMH).

94. Undertake engineering and environmental investigations to identify the location of additional boat ramps which will reduce congestion at existing facilities. Where appropriate developers of waterside land should contribute to the cost of providing boat ramps and associated facilities (DMH, PIMA, LGA).

95. Support the enforcement of WA Marine Regulations relating to boating safety (PIMA, DMH).

96. Consider the establishment of special use areas having regard for (DMH, PIMA, DPUD):

    - Boating safety.
    - Recreational use.
    - Impact on the foreshore including vegetation bank stability.
    - Compatibility with the overall river plan for the area.

97. Extend the existing mechanism so that navigable waters may be closed for conservation and maintenance objectives as well as for safety reasons (DMH, PIMA, CALM).

98. Encourage and expand the recently introduced voluntary training programmes for boating operators (DMH).

99. Ensure installation of fire fighting equipment at all major jetties (DMH).

5.9 *MANAGEMENT*

OBJECTIVE - Ensure that a legislative and administrative base, and appropriately funded bodies and structures exist to achieve the primary objectives of this Management Programme.

5.9.1 *Co-ordination*

NEED FOR ACTION

Section 35 of the Waterways Conservation Act requires that PIMA undertake its planning and management operations in accordance with a management programme. However, it does not bind other agencies with management responsibilities associated with the waterway including DMH, CALM, DPUD, DF, WAWA and relevant LGAs.

Successful management relies upon co-ordination of agencies and co-operation between agencies. This is best achieved by the establishment of administrative arrangements with and between agencies. Section 1.3 outlines the roles of relevant agencies.

RECOMMENDATIONS

100. Prepare and implement procedures for referral and consideration of development proposals so that the interests of all relevant agencies are considered (DPUD, PIMA, all relevant authorities).

101. Prepare and implement procedures for the referral and consideration of all land use management plans and town planning schemes so that they may be considered by relevant authorities before adoption (DPUD, LGAs, PIMA).

5.9.2 *Emergency Procedures*

Spillages of petroleum products and hazardous chemicals occur in the waterway catchment from time to time. The management of such spills is the responsibility of several agencies. Poor communication may lead to delays in the treatment of spills and result in pollution of the waterway which may have been avoided.

The correct procedure for managing spills of dangerous materials is defined in "Western Australian Hazardous Materials Emergency Management Scheme (Draft Provisional) (WAHMEMS)", produced by the West Australian State Emergency Service. The command structure for implementing the scheme is shown in Figure 9. PIMA is advised of hazardous material spills in the catchment by the Regional Counter Disaster Advisory Committee. Working under the direction of the Committee, PIMA staff have responsibility to protect the waterway.

The WWC has produced a Draft Emergency Procedures Manual (DEPM) which outlines how it will operate as part of the WAHMEMS system. In addition, PIMA has prepared a Contingency Plan for Dealing with Oil Spills in the Peel-Harvey Area (CPDOSPHA) which outlines resources, staff equipment, etc. This document requires minor amendment so that it has the same format as DEPM.

RECOMMENDATIONS

102. Amend the CPDOSPHA so that its format is similar to DEPM (PIMA, WWC).

103. Acquire the equipment recommended in the DEPM and store in an appropriate manner (PIMA, WWC, Treasury).

104. Ensure that all PIMA staff are familiar with emergency procedures and are trained in the use of the equipment (PIMA).

105. Amend CPDOSPHA to reflect the requirement to react to emergencies throughout the entire catchment (PIMA, WWC).

106. Ensure that all Waterways Commission staff are familiar with DOSHWA procedures for handling dangerous materials (WWC, PIMA, DOSHWA).

Mary Street Lagoon Boat Ramp

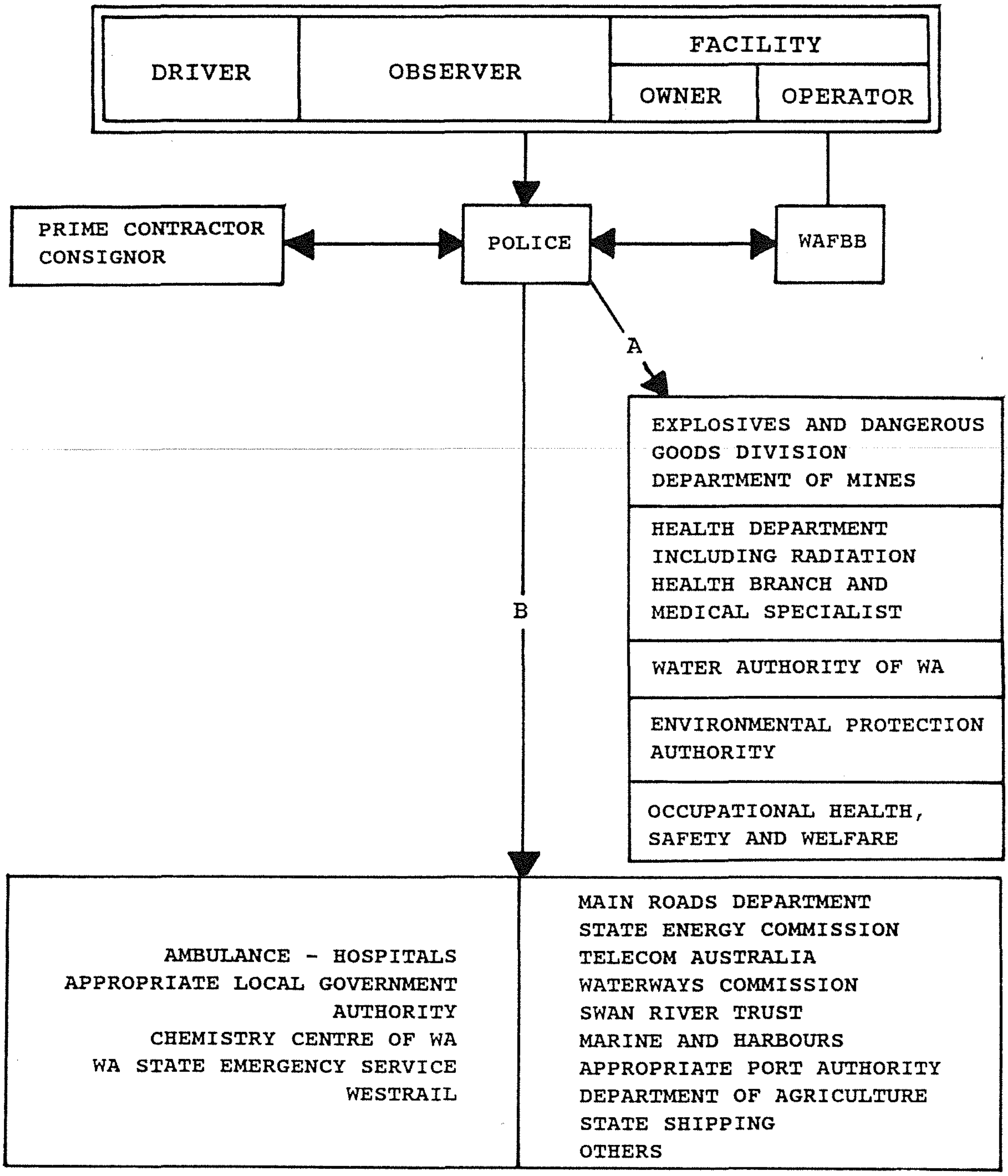


FIGURE 9

COMMAND STRUCTURE FOR IMPLEMENTING THE WESTERN AUSTRALIAN HAZARDOUS MATERIAL EMERGENCY MANAGEMENT SCHEME (from WASES 1990)

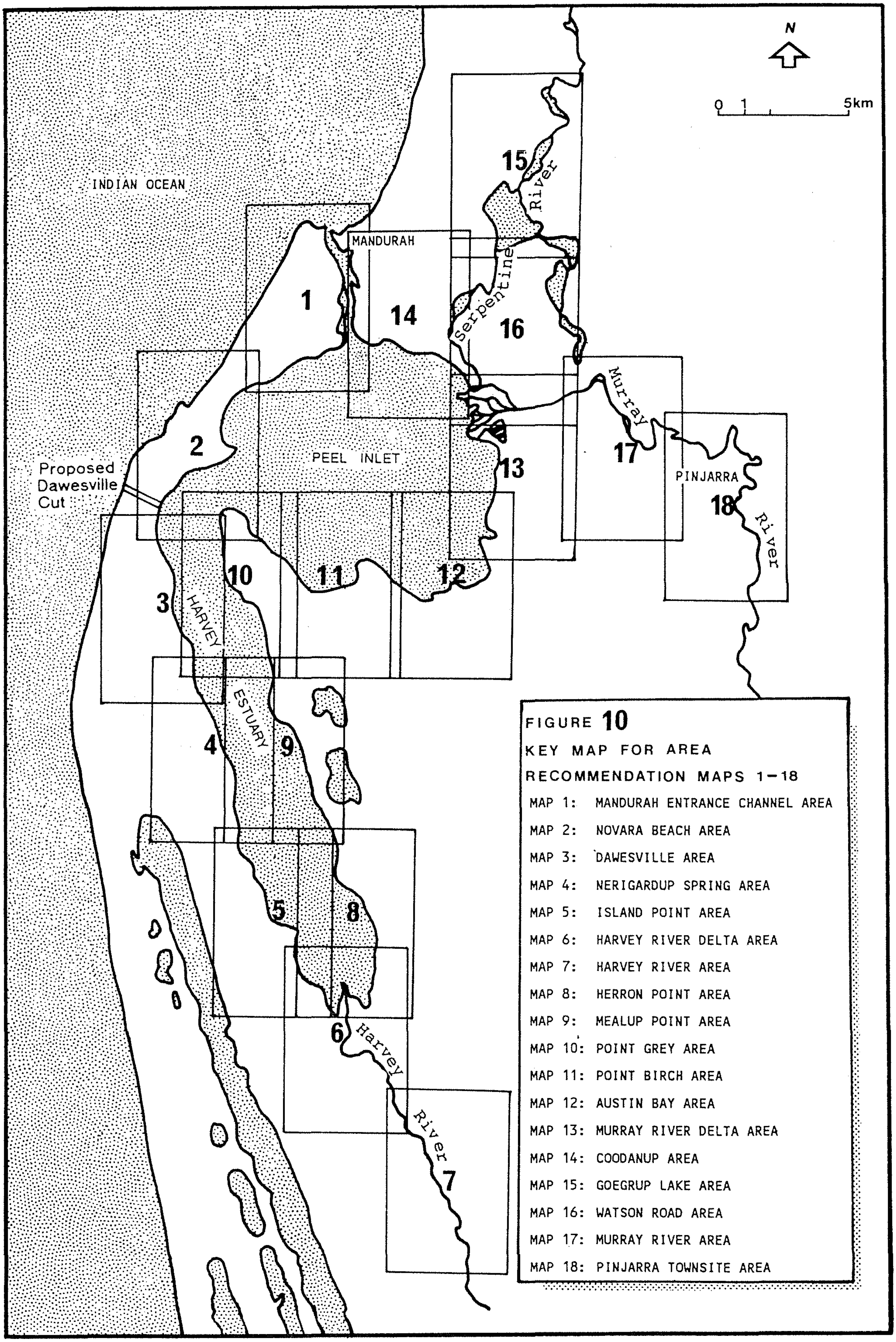


FIGURE 10
KEY MAP FOR AREA RECOMMENDATION MAPS 1–18

MAP 1: MANDURAH ENTRANCE CHANNEL AREA
MAP 2: NOVARA BEACH AREA
MAP 3: DAWESVILLE AREA
MAP 4: NERIGARDUP SPRING AREA
MAP 5: ISLAND POINT AREA
MAP 6: HARVEY RIVER DELTA AREA
MAP 7: HARVEY RIVER AREA
MAP 8: HERRON POINT AREA
MAP 9: MEALUP POINT AREA
MAP 10: POINT GREY AREA
MAP 11: POINT BIRCH AREA
MAP 12: AUSTIN BAY AREA
MAP 13: MURRAY RIVER DELTA AREA
MAP 14: COODANUP AREA
MAP 15: GOEGRUP LAKE AREA
MAP 16: WATSON ROAD AREA
MAP 17: MURRAY RIVER AREA
MAP 18: PINJARRA TOWNSITE AREA

CHAPTER 6

AREA RECOMMENDATIONS

6.1 *INTRODUCTION*

This chapter deals with recommendations concerning planning, development and use of specific areas of the waterway and its foreshores. The areas which are shown on Figure 10 have been investigated as part of two separate studies including:

- The Study of the Western Foreshore of the Peel-Harvey Estuary.

- The Study of the Eastern and Northern Foreshores of the Peel-Harvey Estuary.

The detailed analysis of the resources, planning issues and recommendations is shown on a series of 62 photomaps with associated text which can be examined at the offices of the Waterways Commission, Peel Inlet Management Authority, City of Mandurah and Shire of Murray. The photomaps have been divided into two sections, Photomaps 1-16 covering the Western Foreshore Study and Photomaps 17-62 covering the Northern and Eastern Foreshores Study. Recommendations relating to the Serpentine and Murray Rivers and the associated lake systems are considered as part of the Northern and Eastern Foreshores Study.

The information and recommendations on Photomaps 1-62 are shown in simplified form on Maps 1-18 following. For ease of reading the maps have been presented with their associated planning considerations and Area Recommendations on pages following each map.

Area Recommendations, where location specific, have been shown on the maps in blue. Also shown in blue are the locations of the proposed "Waterways Protection Precinct", "Bank Revegetation Precinct" and "Public Access Precinct". These three precincts are explained in detail in General Recommendations 23, 26 and 51 respectively.

A map legend is provided at the back of the document on a fold-out sheet for easy interpretation of Maps 1-18.

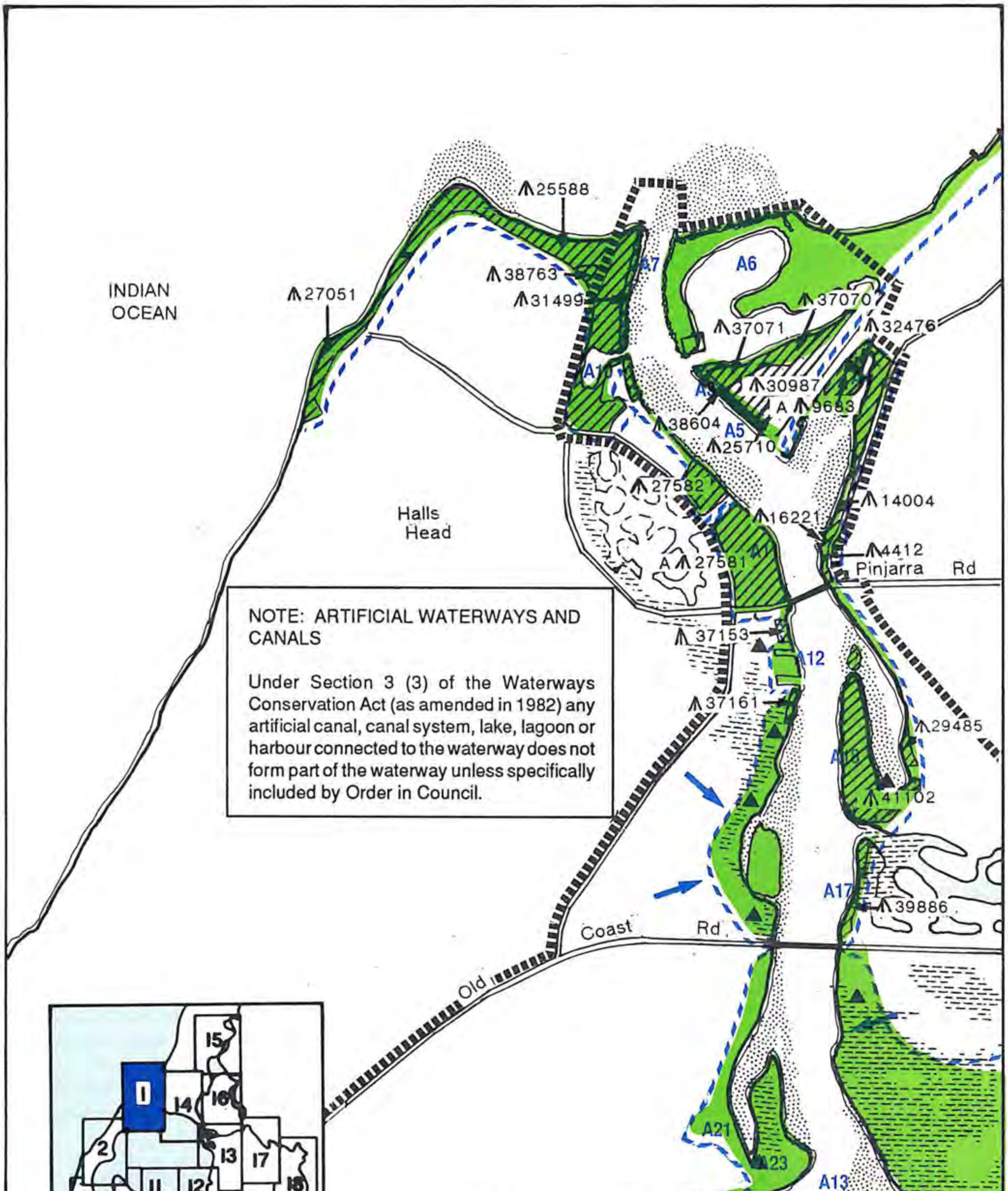
This chapter identifies planning considerations for each map area including:

- biophysical resources
- human use and conservation areas
- land tenure
- existing land use
- future land use needs
- opportunities for land use activities
- restraints such as land capability.

Recommendations are then developed regarding initiatives required to achieve the objectives of this review.

Where practicable recommendations are stated in broad terms so that agencies responsible for their implementation enjoy maximum flexibility in their decision making. The agencies responsible for implementation are shown at the end of each recommendation. Abbreviations for these agencies are listed on a fold-out sheet at the back of the document.

Pelicans - Novara boat ramp



INDIAN OCEAN
Halls Head
NOTE: ARTIFICIAL WATERWAYS AND CANALS
Under Section 3 (3) of the Waterways Conservation Act (as amended in 1982) any artificial canal, canal system, lake, lagoon or harbour connected to the waterway does not form part of the waterway unless specifically included by Order in Council.
25588
27051
38763
31499
A6
37070
37071
32476
30987
9683
38604
A5
25710
27582
16221
14004
4412
Pinjarra Rd
27581
37153
A12
37161
29485
41102
A17
39886
Old Coast Rd
A21
A23
A13
A25
A26
Channel Island
8185
A20
City of Mandurah
Shire of Murray
PEEL INLET
0 500m
A19
MAP 1

6.2 MAP 1

MANDURAH ENTRANCE CHANNEL AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
38604	Recreation	0.8530	CM
25588	Recreation	9.7199	CM
38763	Yacht Club & premises	0.8019	CM
31499	Access to Breakwater	2.7145	No
9633	Recreation	5.4633	CM
37070	Recreation/Parkland	4.5282	CM
30987	Camping/Caravan Park	3.9863	CM
37071	Office Accommodation	0.4069	WWC DMH
25710	Parking	0.6634	CM
32476	Health Services	0.8075	MPH
27582	Caravan Park	3.4520	CM
A27581	Recreation	7.0535	CM
37153	Public Recreation	0.3616	CM
37161	Public Recreation	0.6924	CM
41102	Foreshore Management and Conservation	N/D	WWC
39886	Foreshore Management	2.2107	No
37161	Public Recreation	0.6924	CM
29485	Public Recreation	2.1052	CM
8185	Recreation	N/D	CM
4412	Access to Jetty	0.0800	CM
14004	Recreation	1.4493	CM
16221	Baths Site	0.1770	CM

2. Need for foreshore wall maintenance.

3. Littering the inlet.

4. Maintenance of ornamental lagoon.

5. Need to upgrade jetty facilities.

6. Ocean entrance and channel maintenance requirements.

7. The need to rationalise the administration and maintenance of Mary Street lagoon.

8. Erosion of the foreshore in specific locations.

9. Degraded appearance of the Mandurah Marina and adjacent foreshore.

10. Mosquito breeding areas as shown on the photomap.

11. Existing high water mark titles and the need to acquire foreshore and nature reserves during the subdivision application process.

12. The presence of the only deep water-land interface in the Peel-Harvey estuarine system.

13. The presence of extensive areas of marshland of high conservation value.

14. The need to protect wildlife and landscape values and provide for future public access.

15. Some areas of wide shallow estuary margins and seagrass beds.

16. Recent development of the Port Mandurah Canal Estate and the bisection of the Leighton Road.

17. Possible future development of canal estates.

18. The need to acquire foreshore reserves as a condition of subdivision.

19. The need to conserve the Mandurah Inlet Channel Delta wetlands.

20. The existence of a newly created island namely Boundary Island (25 ha).

21. During previous environmental assessment of the Creery Wetland area for canal development the EPA accepted an area be set aside for conservation which is less than the Waterways Protection Precinct (EPA Bulletin 126). The System 6 Red Book recommendation for C50 recommends the same area as Bulletin 126.

22. Degradation of samphire marshland as a result of uncontrolled vehicle access.

Area Recommendations

A.1 Continue maintenance programme for foreshore walls on a share cost basis with local authority (PIMA, CM, SM).

A.2 Investigate methods to control and clean up litter in foreshore areas adjacent to city centre (CM, PIMA).

A.3 Plan and provide for the establishment of a Public Information Centre and associated Waterways Management Offices on reserve 38604 (WWC, DMH, DF).

A.4 Prepare and implement a maintenance plan for the Cultural Centre ornamental lagoon (CM).

A.5 Upgrade the existing jetty facilities to reduce the risk of pollution from oil spills (DMH).

A.6 Investigate the relocation of the professional fishing fleet to Mandurah Ocean Marina (DMH, PIMA, CM, SWDA).

A.7 Support the maintenance of a permanently navigable entrance channel to the Peel Inlet and provide a permanent sand by-pass system (DMH, PIMA, CM).

A.8 Investigate the feasibility of revenue raised from Mandurah Ocean Marina funding the channel maintenance programme (DMH, SWDA, CM).

A.9 Undertake environmental and engineering costing investigations associated with dredging (DMH, PIMA).

A.10 Rationalise the administration and maintenance of the Mary Street lagoon (CM, DMH).

A.11 Investigate the extent of erosion and required protection works to maintain the foreshore, between the old traffic bridge and the fun park, as a swimming beach (PIMA, CM).

A.12 Redevelop Mandurah Marina to ensure public access to the foreshore, the provision of a public ferry terminal and the establishment of a public sewage pump out facility (DMH, PIMA, CM).

A.13 Prepare an overall concept plan for the future development of the Mandurah Inlet Channel, taking into consideration the Mandurah Bike Plan (CM, PIMA, DMH).

A.14 Provide environmental advice to CM and DPUD in the planning of any canal estate (PIMA, CM).

A.15 Acquire appropriate foreshore reserves as a condition of any rezoning or subdivision (PIMA, CM, DPUD).

A.16 The developer of any land adjoining the inlet should prepare and implement a foreshore management plan to protect and rehabilitate samphire marshlands (Dev, PIMA).

A.17 Vest reserve 39886 in the City of Mandurah for recreation (DOLA, CM).

A.18 Prepare and implement a management plan for reserve 41102, Soldiers Cove. Consider future vesting of the reserve in NPNCA for conservation in the context of the proposed Peel-Harvey Regional Park (WWC, NPNCA, CALM).

A.19 Create a reserve for Boundary Island. Prepare and implement a vegetation programme for the island to provide recreational opportunities and wildlife habitat. Consider future vesting of the island in NPNCA for conservation and recreation in the context of the proposed Peel-Harvey Regional Park (DOLA, PIMA, NPNCA, CALM).

A.20 Review vesting of reserve 8185 with consideration of vesting in NPNCA for conservation in the context of the proposed Peel-Harvey Regional Park (DOLA, CM, NPNCA).

A.21 Establish a reserve for recreation and foreshore management purposes and vested in the City of Mandurah (DOLA, DPUD, CM).

A.22 Developer to prepare and implement a detailed foreshore management plan approved by CM and PIMA as a condition of subdivision (Dev, DPUD, CM, PIMA).

A.23 Establish a conservation reserve to include enclosed shallows and vest in NPNCA (DOLA, DPUD, PHCDC, NPNCA, CALM). Prepare a management programme for the reserve to protect conservation values (CALM).

A.24 Consider the appropriate location and source of funding for a walking trail when preparing a detailed management plan for this area (CALM).

A.25 Provide a dual use path in accordance with City of Mandurah Plan and dual use path guidelines (CM, PIMA).

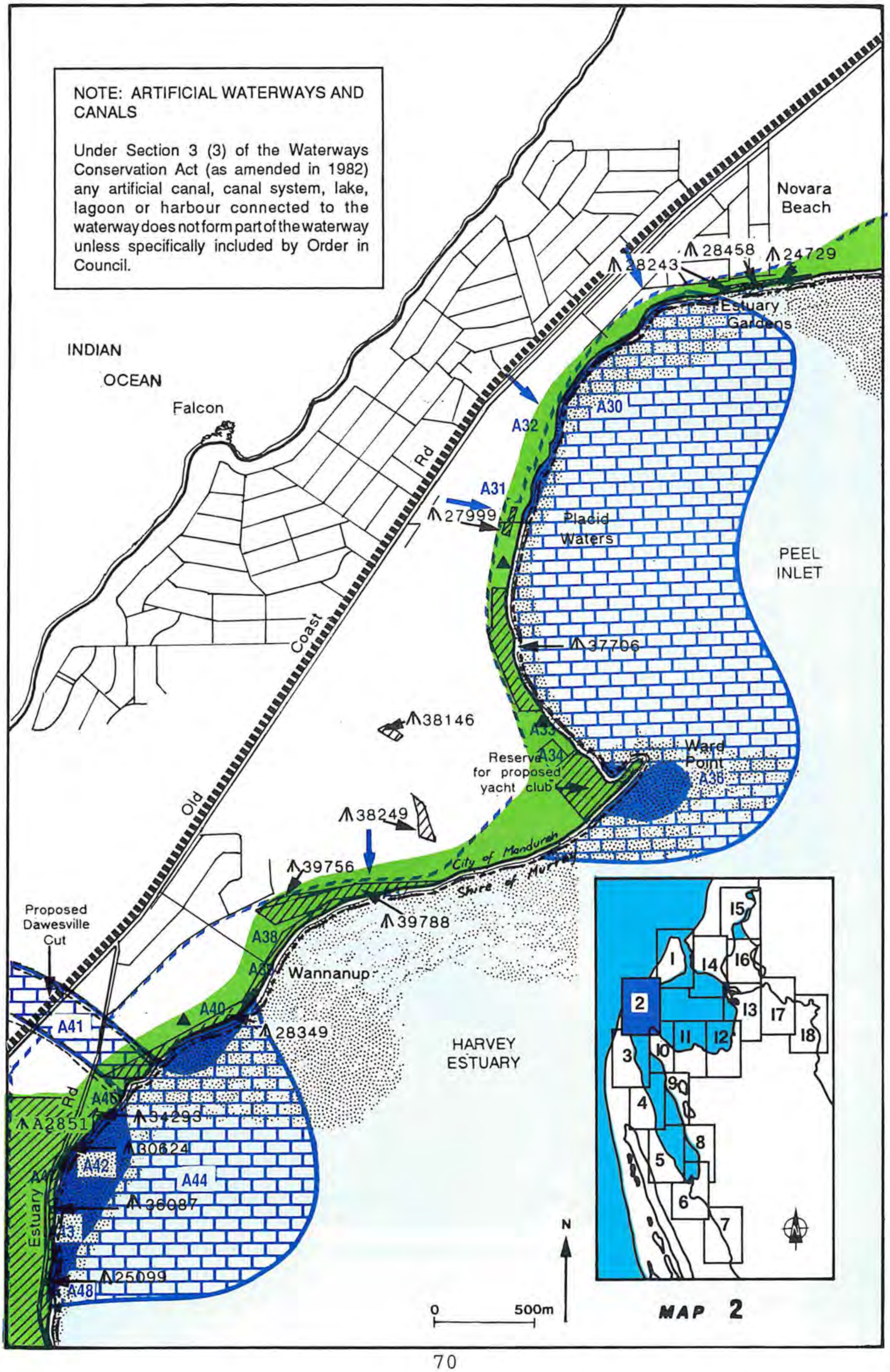
A.26 Construct a fence and firebreak between development and proposed conservation reserve as a condition of subdivision (Dev, CALM, CM).

A.27 Carry out works in accordance with the Mosquito Control Strategy (HD, PIMA, CM).

A.28 Implement General Recommendations 23 and 51 relating to the Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).

Mandurah Ocean Marina

Creery Island - part of System 6 Recommendation C50 and reserve 8185


NOTE: ARTIFICIAL WATERWAYS AND CANALS

Under Section 3 (3) of the Waterways Conservation Act (as amended in 1982) any artificial canal, canal system, lake, lagoon or harbour connected to the waterway does not form part of the waterway unless specifically included by Order in Council.
INDIAN OCEAN
Falcon
Novara Beach
28458
24729
28243
Estuary Gardens
A30
A32
A31
27999
Placid Waters
PEEL INLET
Old Coast Rd
37706
38146
A33
A34
Reserve for proposed yacht club
Ward Point
A36
38249
39756
City of Mandurah
Shire of Murray
39788
Proposed Dawesville Cut
A38
A39
Wannanup
A40
A41
28349
HARVEY ESTUARY
Rd
A46
A2851
54293
30624
A42
A44
36087
Estuary
A43
25099
A48
N
0
500m
MAP 2

6.3 MAP 2

NOVARA BEACH - DAWESVILLE

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
A24729 Recreation	0.5453	No
28458 Recreation	0.3326	CM
28243 Recreation	0.3490	CM
27999 Recreation	0.9230	CM
37706 Public Recreation	6.0265	CM
38249 Public Recreation	0.8203	No
38146 Public Recreation	1.0290	No
39756 Public Recreation	0.5838	No
39788 Public Recreation	5.3786	No
28349 Recreation	3.5056	No
34293 Recreation	0.3913	CM
36087 Boat hire	0.0330	CM
25099 Storage	0.1442	CM
A2851 Recreation/Camping	120.04	CM

2. An expected increase in demand for foreshore space as a result of the subdivision and development of land to the north-west, which is separated from the estuary by the proposed conservation reserve.

3. Wide shallow estuary margins with limited capacity for recreational use.

4. Inadequate boat launching facilities near 28243.

5. Degraded shoreline vegetation and beaches at Novara as a result of beach cleaning.

6. Valuable fringing vegetation comprising *Casuarina*, *Melaleuca* and *Juncus*, south-west of Novara.

7. Areas of sparse sea grass and macroalgae drifting onto beaches under some wind conditions.

8. The need to rationalise foreshore reserves and acquire additional reserves during the subdivision and development process.

9. The need to retain a vegetation buffer between unsewered development in the Pleasant Grove Estate and the estuary.

10. The need to provide deep water access and sheltered beaches to cater for growing urban populations in the neighbourhood.

11. The existence of under developed recreation areas.

12. The possibility of major environmental changes associated with the construction of the Dawesville Channel including the generation of large quantities of dredge spoil associated with the need to connect the channel to deep water.

13. The need to address the issue of equestrian access across the proposed Dawesville Channel.

14. The presence of relatively deep water close to the foreshore toward the southern end of the area and wide shallow estuarine margins to the north.

15. Poor road alignment of Estuary Drive.

16. Reserve A2851 of conservation interest to CALM.

Area Recommendations

A.29 Amalgamate reserves 24729, 28458, 28243 and adjoining Vacant Crown Land to create a reserve for recreation and foreshore management and vest in the City of Mandurah (<u>DOLA</u>, CM).

A.30 Undertake environmental, engineering and costing investigations associated with possible dredging and filling near the Novara foreshore to extend foreshore reserve as shown. Where appropriate private developers should be encouraged to contribute to the cost of these developments (<u>PIMA</u>, CM, DMH, SWDA).

A.31 Acquire an appropriate foreshore reserve as a condition of subdivision of location 91 (<u>DPUD</u>, CM, PIMA).

A.32 Plan for dual use path in accordance with guidelines and construct as resources become available (<u>CM</u>).

A.33 Acquire 28.07 POS, shown on the plan prepared by TS Martin for subdivision of Murray Locations 109, Pt 1339 and 124 for Pleasant Grove Pty Ltd and dated January 1980 and incorporate into reserve 37706, as a condition of subdivision. In addition, incorporate adjoining VCL into extended reserve

37706 and vest in CM for recreation and foreshore management purposes (DPUD, DOLA, CM).

A.34 Acquire a Special Use Reserve of 2.8 hectares at Pt Ward and vest for recreation in the CM (DPUD, DOLA, CM).

A.35 Prepare and implement a management plan for the above-mentioned areas as a condition of subdivision (Dev).

A.36 Undertake environmental, engineering and costing investigations associated with dredging and filling near Olive Road and Point Ward to extend foreshore reserve. Where appropriate private developers should be encouraged to contribute to the cost of these developments (PIMA, DMH).

A.37 Incorporate adjoining VCL into reserves 39756 and 39788, amalgamate and vest in the City of Mandurah to prepare a management plan (DOLA, CM, PIMA).

A.38 Acquire additional foreshore reserve as a condition of rezoning or subdivision of location Pt 1130 (DPUD, CM, PIMA).

A.39 Close existing boat launching area at the bottom of Estuary Place, move car park back from the foreshore and rehabilitate area, after new boat ramps have been constructed nearer proposed Dawesville Channel (CM, PIMA).

A.40 Incorporate adjoining VCL into reserve 28349 and vest in the City of Mandurah for recreation and foreshore management purposes (DOLA, CM).

A.41 Construct proposed Dawesville Channel (DMH, PIMA).

A.42 Create a foreshore area as shown using spoil from construction of the proposed Dawesville Channel. The design of this work should ensure that it does not reduce the water exchange through the Channel (DMH).

A.43 Modify spoil disposal proposals shown on Figure 6.2 of the ERMP Stage 2 to increase the width of the foreshore area in reserve A2851. The design of this work should ensure that it does not reduce the water exchange through the Channel. Where appropriate private developers should be encouraged to contribute to the cost of these developments (DMH, PIMA).

A.44 Dredge outward from proposed Dawesville Channel to the 1.0 m bathymetric contour to accommodate access to and from the Channel. Where appropriate private developers should be encouraged to contribute to the cost of these developments (DMH, PIMA).

A.45 Incorporate foreshore area created by filling during construction of the proposed Dawesville Channel into the reserve 28349 and prepare management plan for the entire area which provides adequate parking for cars and boat trailers (DOLA, CM, DMH, PIMA).

A.46 Construct dual use path and consider the issue of equestrian access as part of the overall development of Dawesville Channel (CM, DMH, PIMA, Dev).

A.47 Realign Estuary Road if Recommendation A.41 is implemented (CM, PIMA).

A.48 Rehabilitate and protect fringing vegetation in all newly created and existing foreshore areas (PIMA, CM, DMH).

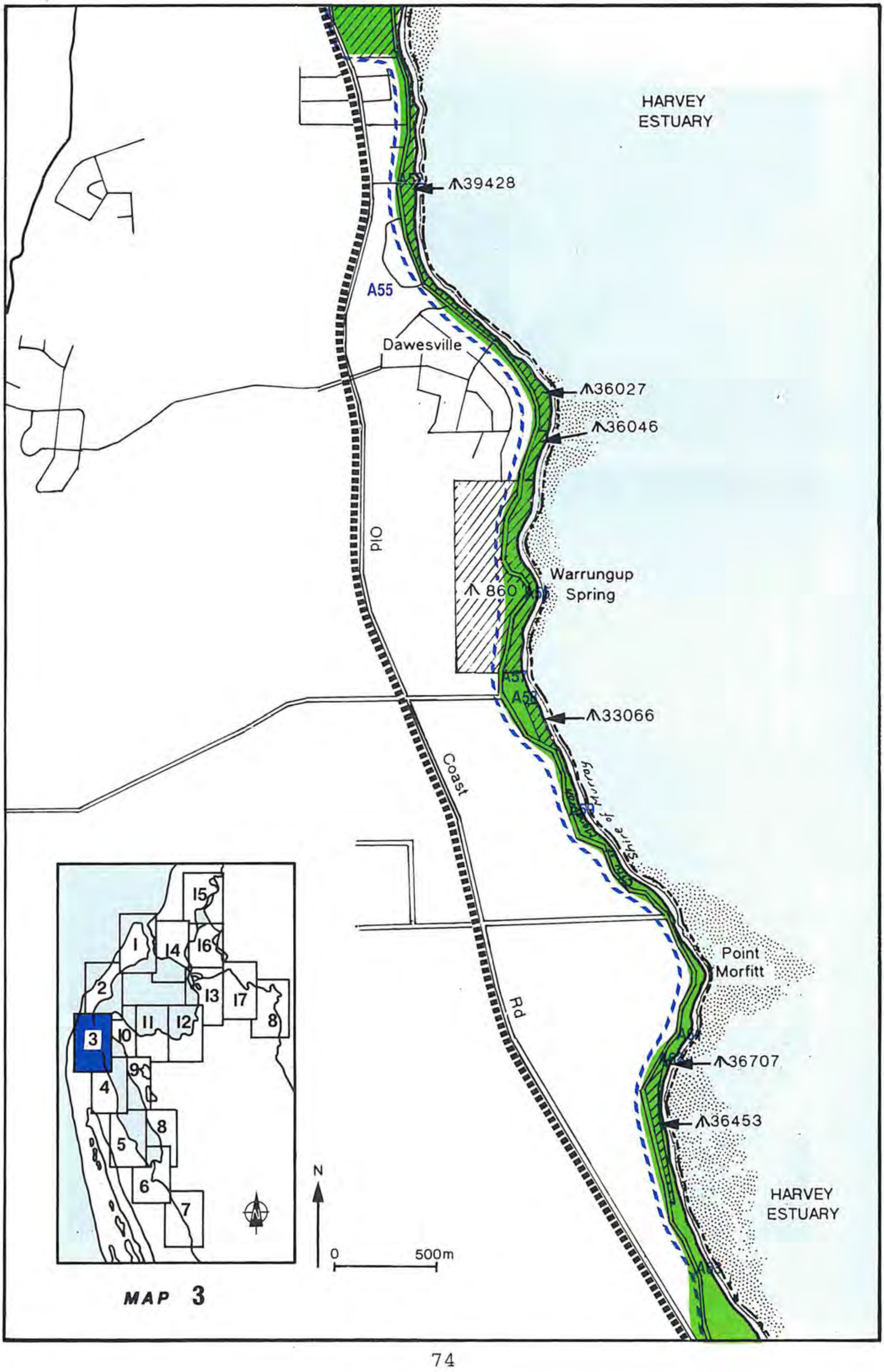
A.49 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).

A.50 Carry out works in accordance with the Mosquito Control Strategy (HD, PIMA, CM).

A.51 Acquire appropriate foreshore reserves as a condition of any rezoning or subdivision (DPUD, PIMA, CM).

Novara foreshore

Ward Point from the air



HARVEY
ESTUARY
Ѧ39428
A55
Dawesville
Ѧ36027
Ѧ36046
Old
Warrungup
Spring
Ѧ 860
Ѧ33066
Coast
Shire of Murray
Point
Morfitt
Rd
Ѧ36707
Ѧ36453
HARVEY
ESTUARY
N
0
500m
MAP 3

6.4 MAP 3

DAWESVILLE AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
36027	Recreation	6.7517	CM
39428	Launching Ramp	0.1423	CM
36046	Boat Hire	0.0200	CM
860	Water Purposes	34.2000	WAWA
33066	Public Recreation	0.4603	No
36453	Public Recreation	3.9960	CM
36707	Boat Hire/Public Facility	0.0600	CM

2. The narrow nature of the foreshore reservation.

3. The high level of recreational activity on the foreshore, particularly at the launching ramp.

4. The degradation of areas of fringing vegetation.

5. The random launching of small yachts and boats and associated environmental problems.

6. Under utilisation of recreational opportunities around Warrangup Spring.

7. Areas of relatively undisturbed fringing vegetation including:

   * *Melaleuca* - *Juncus* complex
   * *Casuarina* - *Juncus* complex
   * *Tuart* - *Juncus* complex
   * *Juncus* complex
   * *Casuarina* complex

   and the need to manage and protect them.

8. The need to improve public access along the foreshore.

9. Wide shallow estuarine margins and the existence of a muddy estuarine bed and sea grasses.

10. The growing need for expanded boat launching and public recreation facilities at Park Ridge.

11. The uncontrolled launching and retrieval of small boats along the foreshore and resulting environmental loss.

12. The need to protect landscape values.

Area Recommendations

A.52 Plan for and upgrade Dawesville boat ramp to enable more efficient use of the facility (PIMA, DMH, CM).

A.53 Identify and construct small boat and yacht launching and storage areas. Liaise with yacht owners to ensure co-operation (PIMA).

A.54 Rehabilitate and protect fringing vegetation (PIMA).

A.55 Ensure that future widening or upgrading of Estuary Road is designed to avoid encroachment on the foreshore reserve (CM, PIMA).

A.56 Plan and redevelop recreation area at Warrangup Spring. Work would include closing the southern end of the access loop and the creation of picnic facilities. Vest reserve 33066 in the CM (DOLA, CM, PIMA).

A.57 Use fill from the Dawesville Channel to form a base for extension of the dual use path in front of private property at Allandale (DMH, PIMA, CM).

A.58 Incorporate VCL in front of Allandale into reserve 33066 and vest in City of Mandurah for recreation and foreshore management (DOLA, CM, PIMA).

A.59 Vest VCL south of Allandale in WWC for foreshore management purposes on an interim basis in accordance with Section 5.3.5 of this document. PIMA to prepare a management plan (DOLA, WWC, PIMA).

A.60 Plan extension to dual use path in accordance with guidelines and extend when resources become available (CM).

A.61 Incorporate adjoining VCL into reserves 36453 and 36707, amalgamate into one single reserve and vest in the City of Mandurah for recreation and foreshore management (DOLA, CM).

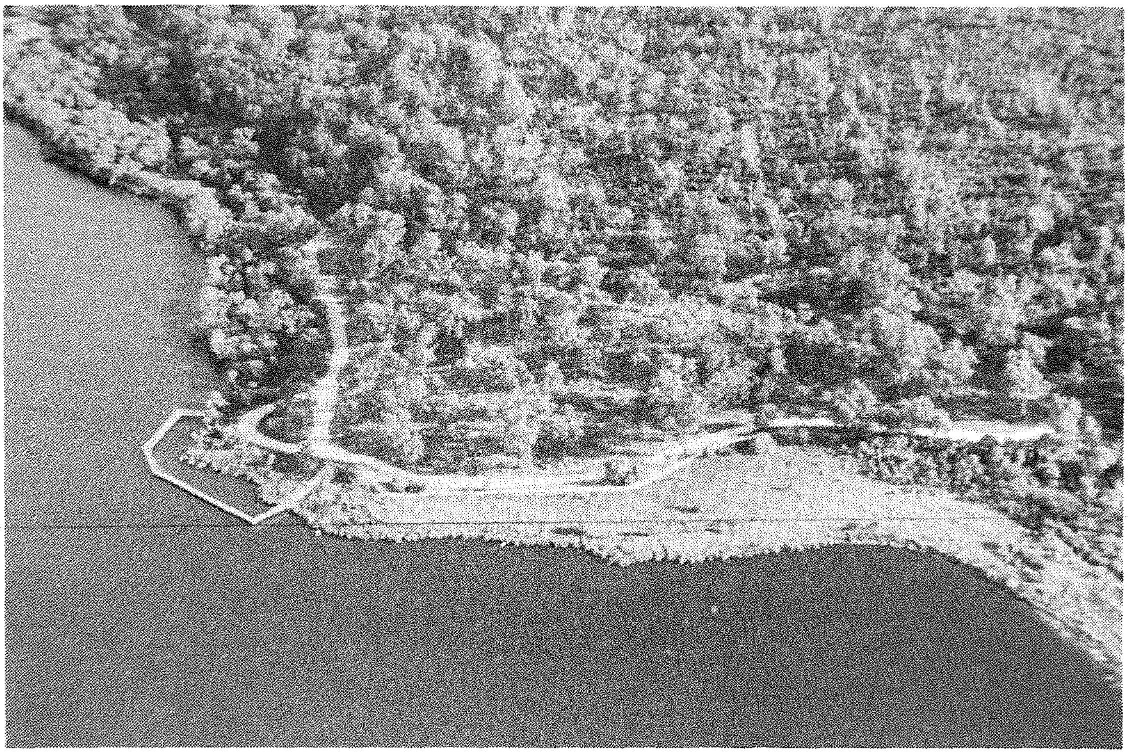
A.62 Develop recreational and boating facilities at the northern end of reserve 36453 (CM, PIMA, DMH).

A.63 Incorporate VCL south of reserve 36453 into reserve 34177 and vest in WWC for foreshore management (DOLA, WWC, PIMA, CM).

A.64 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).

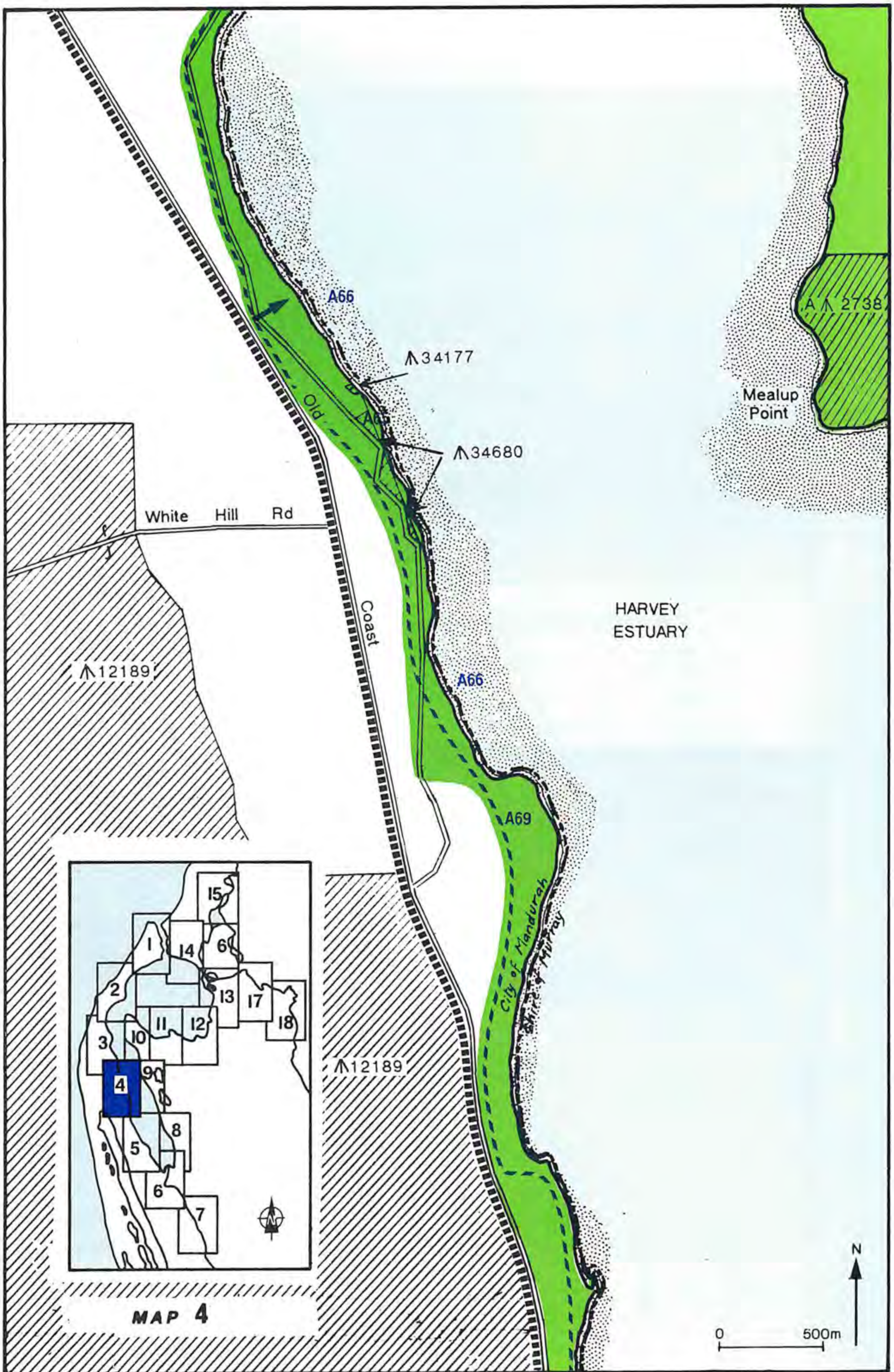
Allandale Homestead

Dawesville foreshore



Warrangup Spring boardwalk with reserve 860 behind

Dawesville boat ramp


A66
Λ34177
Old
A6
Λ34680
White Hill Rd
Coast
Λ12189
A66
A69
City of Mandurah
Shire of Murray
HARVEY ESTUARY
Mealup Point
A Λ 2738
Λ12189
MAP 4
N
0
500m

6.5 MAP 4

NERIGARDUP SPRING AREA

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
34177 Public Recreation	0.2015	No
34680 Public Recreation	1.5252	No
12189 National Park	N/D	NPNCA

2. The existence of relatively undisturbed fringing vegetation and the need to rehabilitate and protect it.

3. The uncontrolled launching and retrieval of small boats along the foreshore and associated environmental loss.

4. The need to provide public access to the foreshore.

5. The existence of freehold properties which extend to the high water mark and the associated need to acquire foreshore reserves.

6. The need to protect landscape values.

7. The possible illegal use of VCL on the foreshore by neighbouring property owners.

8. The presence of wide shallow estuarine margins with a muddy substrate and seagrass beds.

Area Recommendations

A.65 Vest Vacant Crown Land in WWC for foreshore management purposes on an interim basis in accordance with Section 5.3.5 of this document. PIMA to prepare a management plan (DOLA, WWC, PIMA).

A.66 Rehabilitate and protect fringing vegetation (PIMA).

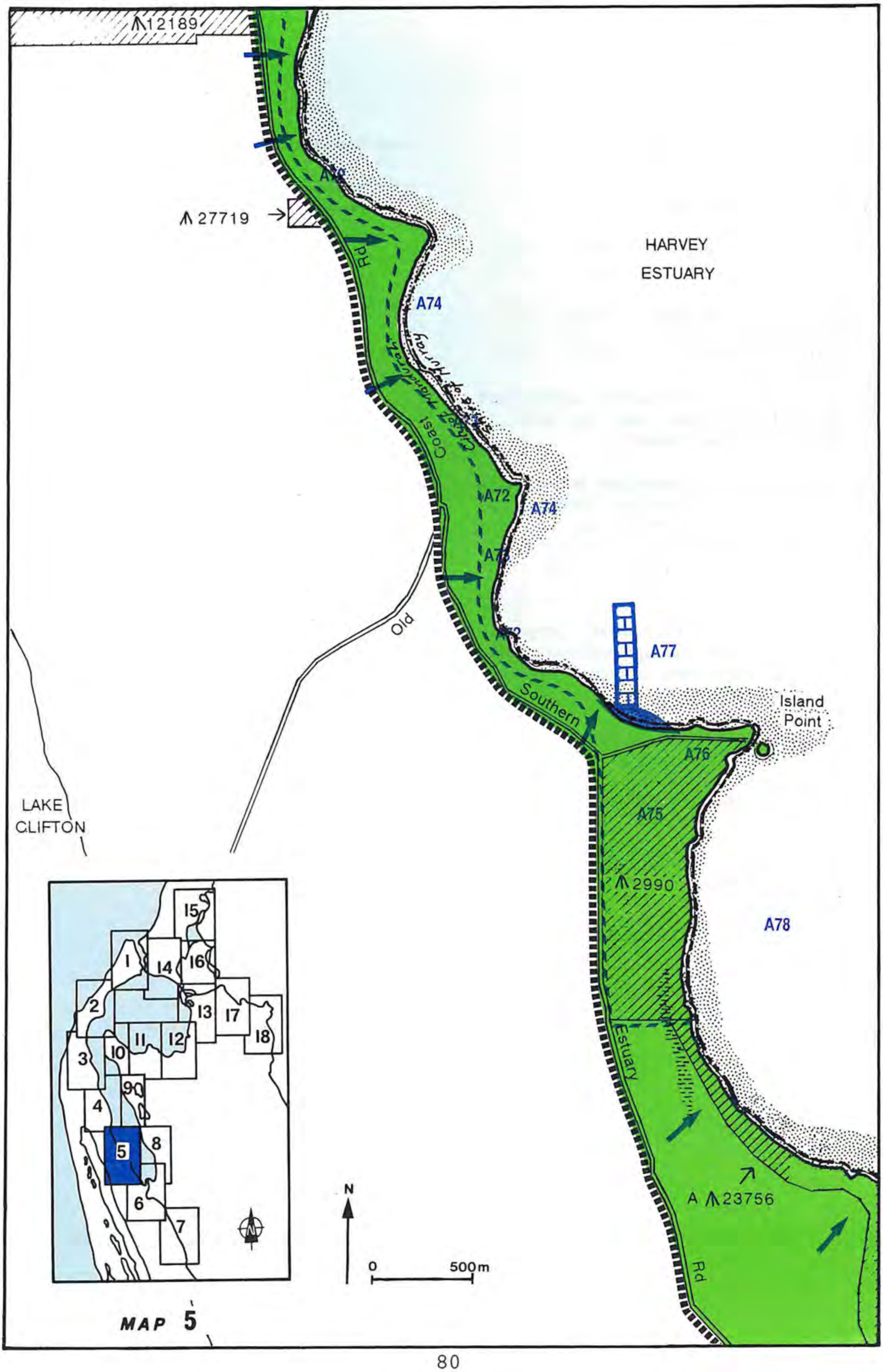
A.67 Provide and maintain a limited number of small boat and yacht storage areas and liaise with boat owners to ensure their use (PIMA).

A.68 Plan dual use pathway in accordance with guidelines and develop as resources become available (CM, PIMA).

A.69 Acquire an appropriate foreshore reserve at any rezoning, subdivision or strata title development of properties with high water mark boundaries (DPUD, DOLA, LGAs, PIMA, Dev).

A.70 Investigate possible use of VCL for unauthorised private use and liaise with land owners to prevent such activity (PIMA, DOLA, CM).

A.71 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC)


12189
27719
HARVEY
ESTUARY
Rd
A74
Coast
A72
A74
Old
A77
Southern
Island
Point
A76
LAKE
CLIFTON
A75
2990
A78
15
1
14
16
2
13
17
18
3
10
11
12
9
4
5
8
6
7
N
0
500m
Estuary
A
23756
Rd
MAP 5

6.6 MAP 5

Island Point Area

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
2990	Recreation/Camping	59.4	CM
27719			
A23756	Nature Reserve	1019.00	NPNCA

2. The existence of freehold properties which extend to high water mark and the need to acquire foreshore reserves.

3. The long term need to provide public access along the foreshore.

4. The need to protect natural vegetation and landscape values.

5. The existence of wide shallow estuary margins and a muddy estuary bed.

6. Areas of reserve 2990 which have potential for recreational use and others with conservation value.

7. The need to identify and protect all bird roosting sites.

Area Recommendations

A.72 Incorporate Vacant Crown Land adjoining the inlet into reserve recommended in A.65 and vest in WWC for foreshore management purposes (DOLA, WWC, PIMA).

A.73 Acquire foreshore reserve at any future rezoning, subdivision or strata title development of lots 36,35,34,57 (DPUD, CM, DOLA, PIMA).

A.74 Rehabilitate and protect fringing vegetation (PIMA).

A.75 Prepare a management plan for reserve 2990 to address issues of recreation, camping, and foreshore management (CM, PIMA).

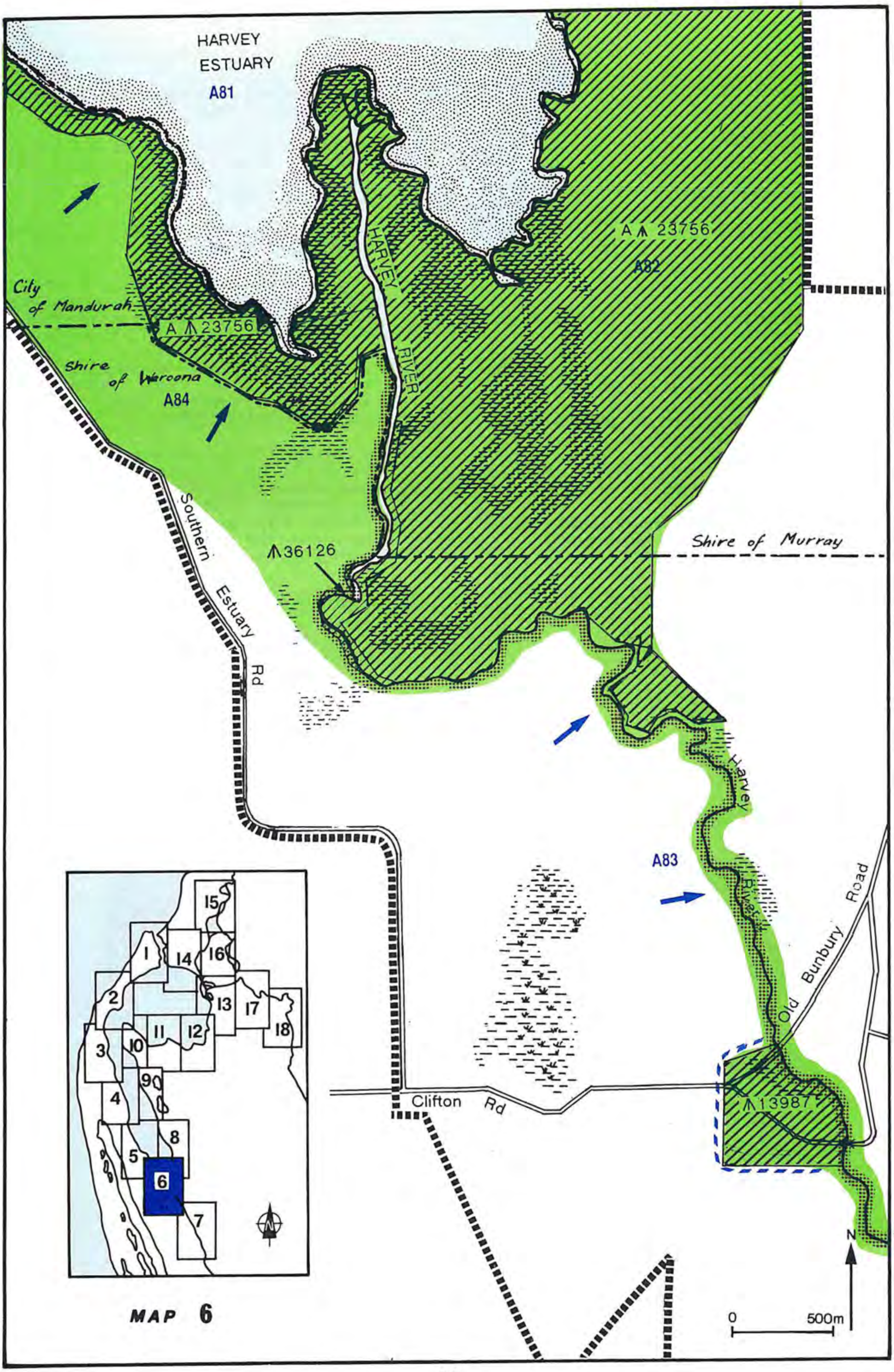
A.76 Initiate long term development and planning of the new reserve for recreation, camping and foreshore management (CM, PIMA).

A.77 If boating pressure increases significantly undertake the environmental, economic and engineering investigations required to determine the feasibility of dredging a channel from the beach to deeper water and use the spoil to renourish the adjoining beach (DMH, PIMA).

A.78 Create a Conservation Reserve south of a line between Island Point and Herron Point. Incorporate all of Harvey Estuary south of this line into the reserve. Vest the reserve in NPNCA. CALM to prepare a management programme (DOLA, NPNCA, CALM).

A.79 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).

Waterway margins provide valuable wildlife habitat


HARVEY ESTUARY
A81
A ⩚ 23756
A82
City of Mandurah
A ⩚ 23756
Shire of Waroona
A84
HARVEY RIVER
Southern Estuary Rd
⩚36126
Shire of Murray
A83
Harvey River
Old Bunbury Road
Clifton Rd
⩚13987
MAP 6
0
500m
N

3.7 MAP 6

HARVEY RIVER DELTA AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
A23756	Conservation of Flora and Fauna	1019	NPNCA
13987	Camping	N/D	SW

2. The inconsistent nature of the boundary of reserve A23756.

3. Neighbouring property which is subject to flooding and the desirability of including flood prone areas in reserve A23756.

4. Degraded state of riverbank vegetation along parts of the Harvey River.

5. The need to consider flood mitigation along the Harvey River.

Area Recommendations

A.80 Acquire foreshore areas when adjoining properties are being rezoned, subdivided or developed for residential purposes (DPUD, DOLA, LGA, PIMA, Dev).

A.81 Create an Estuarine Marine Park south of a line between Island Point and Herron Point. Incorporate all of Harvey Estuary south of this line into the reserve. Vest the reserve in NPNCA. CALM to prepare a management programme (DOLA, NPNCA, CALM).

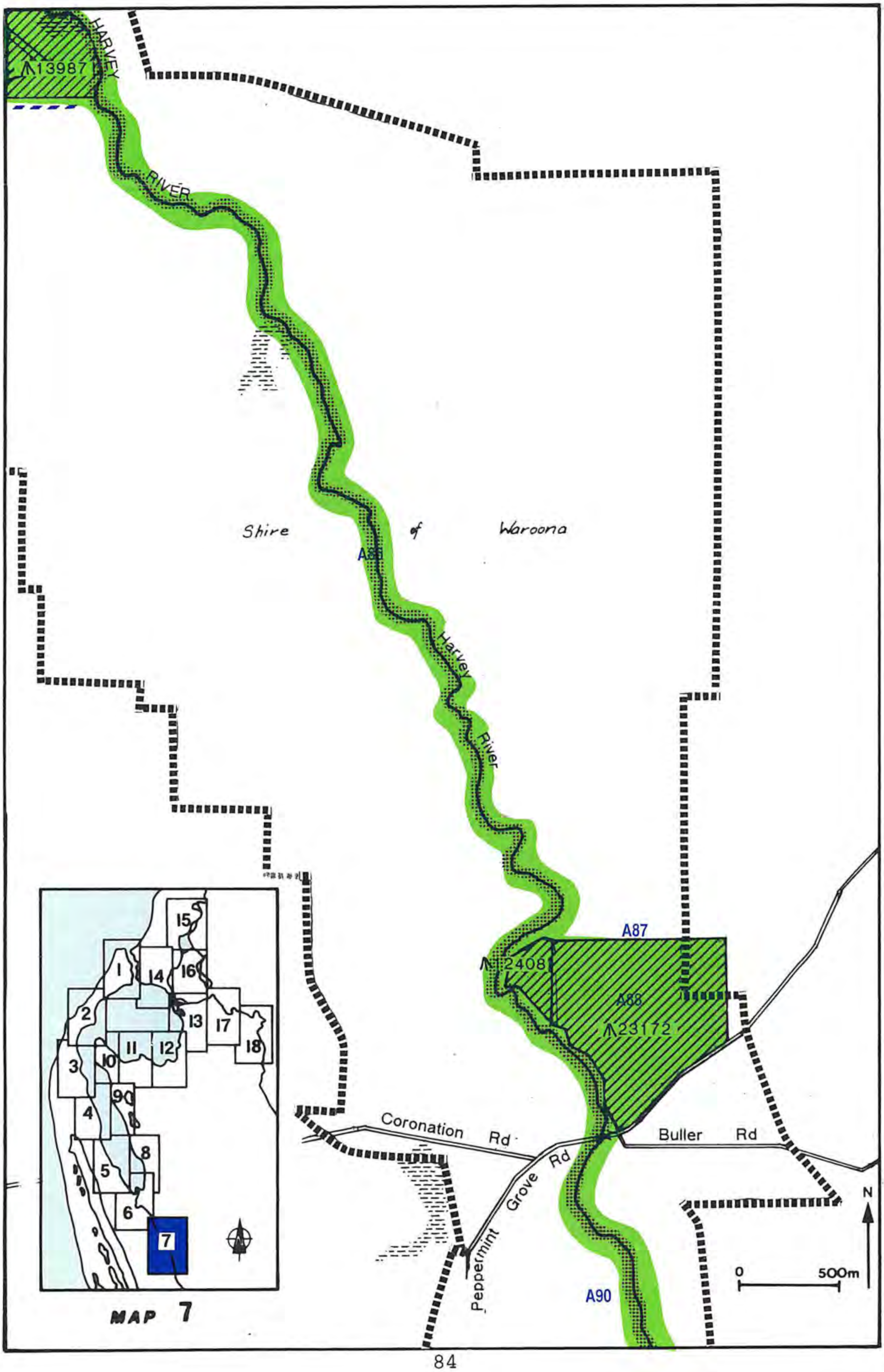
A.82 Prepare and implement a management programme for reserve A23756 (CALM).

A.83 Carry out flood mitigation studies to minimise the effects of flooding along the Harvey River (WAWA, PIMA, CALM).

A.84 Rationalise boundaries of reserve 13987 to provide for existing activities including peat mining and camping and to protect wetland areas (DOLA, SM, PIMA).

A.85 Implement General Recommendations 23, 26 and 51 relating to the Waterways Protection, Bank Revegetation and Public Access Precincts, respectively (PIMA, WWC).

Harvey River delta, part of conservation reserve A23756


HARVEY
13987
RIVER
Shire of Waroona
A88
Harvey
River
A87
12408
A88
23172
Coronation Rd
Buller Rd
Peppermint Grove Rd
A90
N
0
500m
15
1
14
16
2
13
17
3
10
11
12
18
9
4
8
5
6
7
MAP 7

The Bank Revegetation Precinct will ensure protection and revegetation of the Harvey River

6.8 MAP 7

HARVEY RIVER AREA

Planning Considerations

1. The existence of a reserve

	Area ha	Vest Auth
13987 Camping	N/D	SW
12408 Peat Excavation	N/D	DOLA
23172 Camping		SW

2. A System Six area

3. The degraded state of parts of the Harvey River.

4. Peat excavation activities by the Western Australian Cricket Association (WACA) in reserve 12408.

5. Desilting operations and the need to consider flood mitigation along the Harvey River.

6. Reserve 23172 vested with an inappropriate purpose.

Area Recommendations

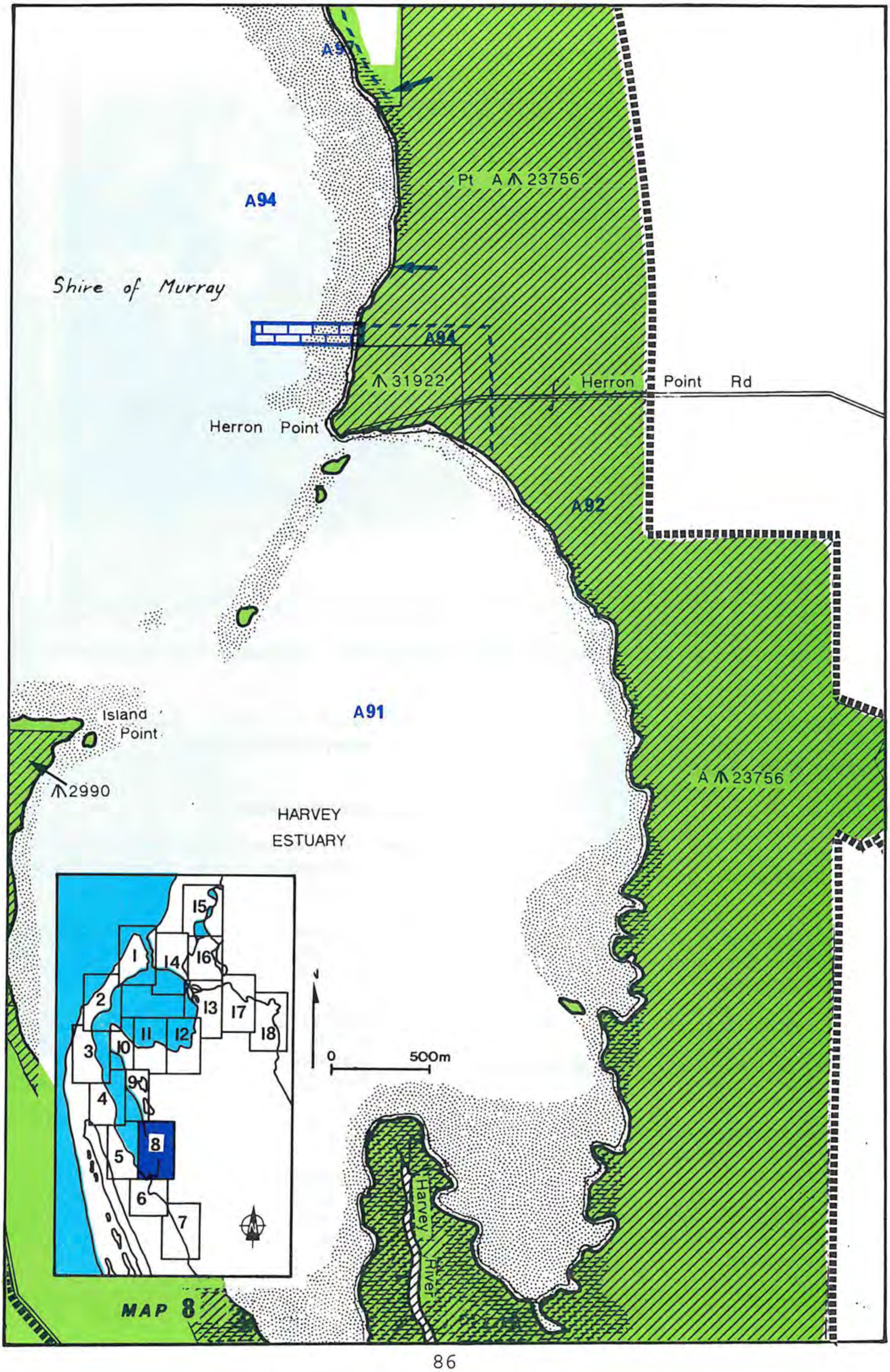
A.86 Carry out flood mitigation studies to minimise the effects of flooding along the Harvey River (WAWA, PIMA, CALM).

A.87 Rationalise boundaries of reserves 12408 and 23172 to meet the needs of the WACA for peat (DPUD, DOLA, WACA).

A.88 Change purpose of reserve 23172 to Nature Conservation or Waterways Management and vest in the appropriate body (DOLA, SW, PIMA, NPNCA, CALM).

A.89 Vesting body to prepare a management plan.

A.90 Implement General Recommendations 23, 26 and 51 relating to the Waterways Protection, Bank Revegetation and Public Access Precincts respectively (WWC, PIMA).


A97
Pt A /\ 23756
A94
Shire of Murray
A94
/\ 31922
Herron Point Rd
Herron Point
A92
Island Point
A91
/\ 2990
A /\ 23756
HARVEY
ESTUARY
15
1
14
16
2
13
17
18
11
12
3
10
9
4
8
5
6
7
0
500m
Harvey River
MAP 8

6.9 MAP 8

HERRON POINT AREA

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
23756 Nature Reserve	1019.00	NPNCA
31922 Recreation	24.1250	SM

2. The inconsistent boundary of reserve 23756.

3. The existence of Vacant Crown Land.

4. The absence of a foreshore reserve.

5. The need for a recreational facility.

Area Recommendations

A.91 Create a Conservation Reserve south of a line between Island Point and Herron Point. Incorporate all of Harvey Estuary south of this line into the reserve. Vest reserve in WWC until Peel-Harvey Regional Park is established. CALM to prepare a management programme (DOLA, NPNCA, CALM).

A.92 Consider A Class status for reserve 23756 and prepare and implement a management plan. Manage in accordance with CALM Interim Guidelines in the short term (DOLA, CALM).

A.93 Rationalise the reserve boundary as a condition of any future subdivision of adjoining land (DPUD, DOLA, NPNCA, CALM, SM).

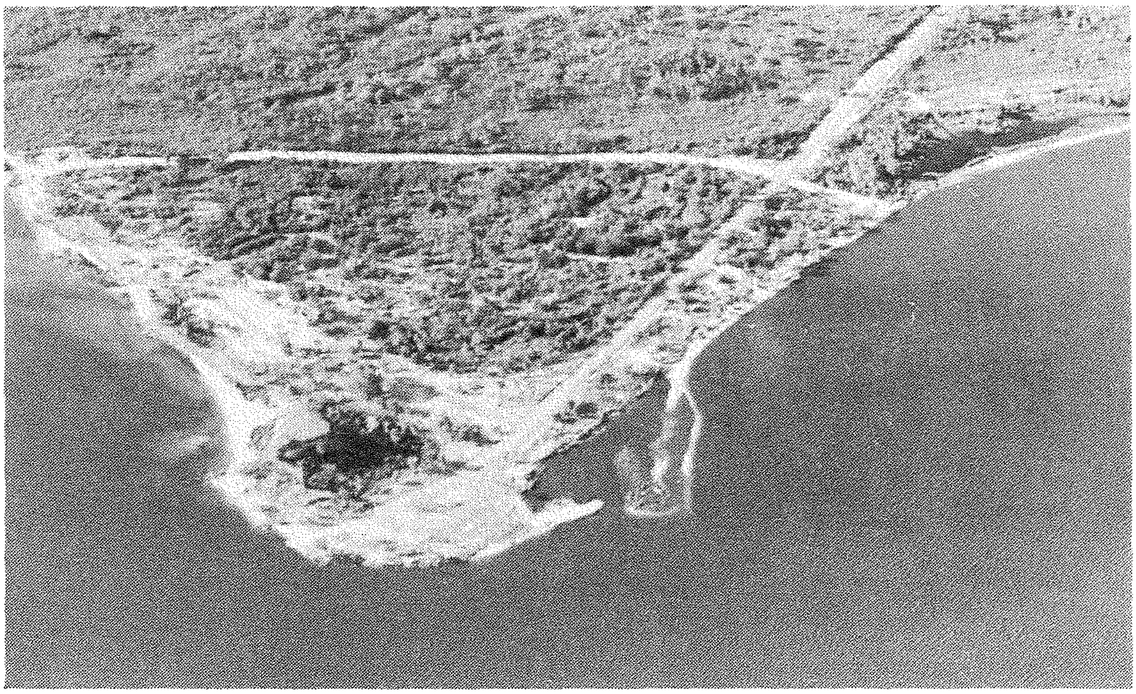
A.94 Incorporate part of reserve 23756 into reserve 31922 to enable a more intensive development of recreational facilities, including a properly constructed boat launching ramp and dredged channel (DOLA, NPNCA, CALM, SM).

A.95 Prepare and implement a management plan for the recreation reserve (SM, PIMA).

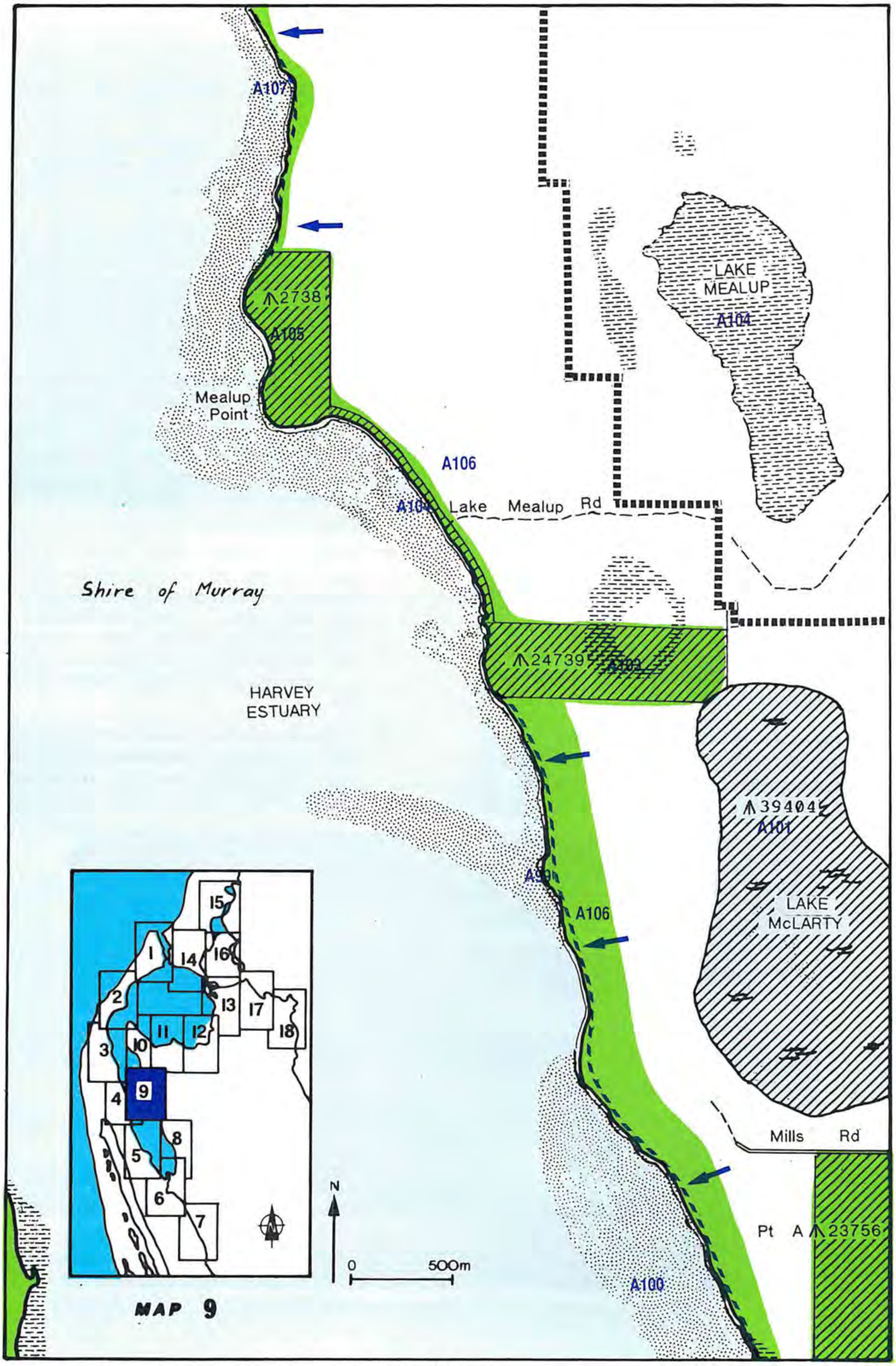
A.96 Acquire land to expand the foreshore reserve as a condition of rezoning or subdivision and incorporate into 23756 (DPUD, PIMA, SM).

A.97 Create a reserve from Vacant Crown Land and vest in the WWC on an interim basis in accordance with Section 5.3.5 of this document. PIMA to prepare a management programme which considers the development of adequate boat launching facilities (DOLA, WWC, PIMA, SM).

A.98 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).



Herron Point recreation reserve 31922



A107
LAKE MEALUP
A104
2738
A105
Mealup Point
A106
A104
Lake Mealup Rd
Shire of Murray
24739
A103
HARVEY ESTUARY
39404
A101
A99
A106
LAKE McLARTY
Mills Rd
Pt A 23756
N
0 500m
A100
MAP 9

6.10 MAP 9

MEALUP POINT AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
2738	Nature Reserve	29.500	NPNCA
24739	Nature Reserve	48.1460	NPNCA
39404	Nature Reserve	184.370	NPNCA
Pt A23756	Nature Reserve	1019.00	NPNCA

2. The existence of Vacant Crown Land.

3. The absence of a foreshore reserve.

4. The presence of a road reserve on the foreshore.

5. Demand for recreational boating facilities.

6. The presence of Lake McLarty.

7. The occurrence of seasonal bushfires.

Area Recommendations

A.99 Create a foreshore reserve from Vacant Crown Land and vest in WWC for foreshore management on an interim basis in accordance with Section 5.3.5 of this document (DOLA, WWC, PIMA).

A.100 Investigate the suitability of the area as a recreational boating facility (PIMA, DMH).

A.101 Prepare and implement a management programme for Lake McLarty. Add Lake Mealup to CALM's land purchase priority list (CALM, PIMA, SM).

A.102 Prepare and implement a fire management programme (CALM, SM, FB).

A.103 Prepare and implement a management programme for reserve 24739 (CALM, DOLA, DPUD, SM).

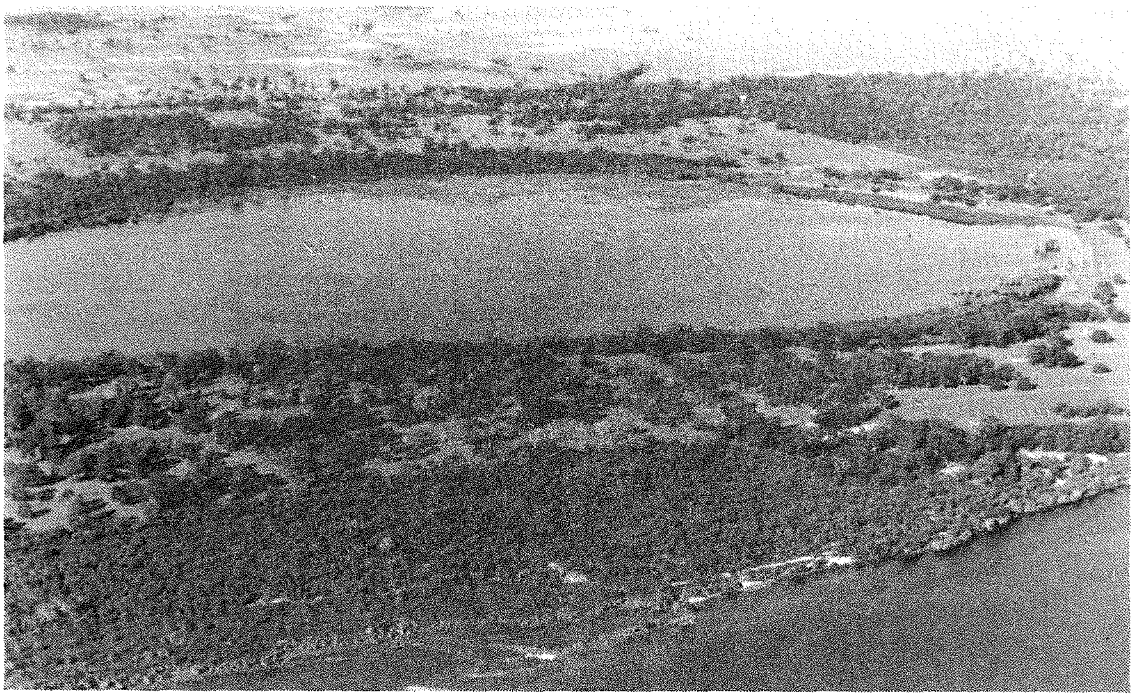
A.104 Add Lake Mealup to CALM's land purchase priority list (DOLA, DPUD, NPNCA, CALM, PIMA, SM).

A.105 Prepare and implement a management programme for reserve 2738 (CALM).

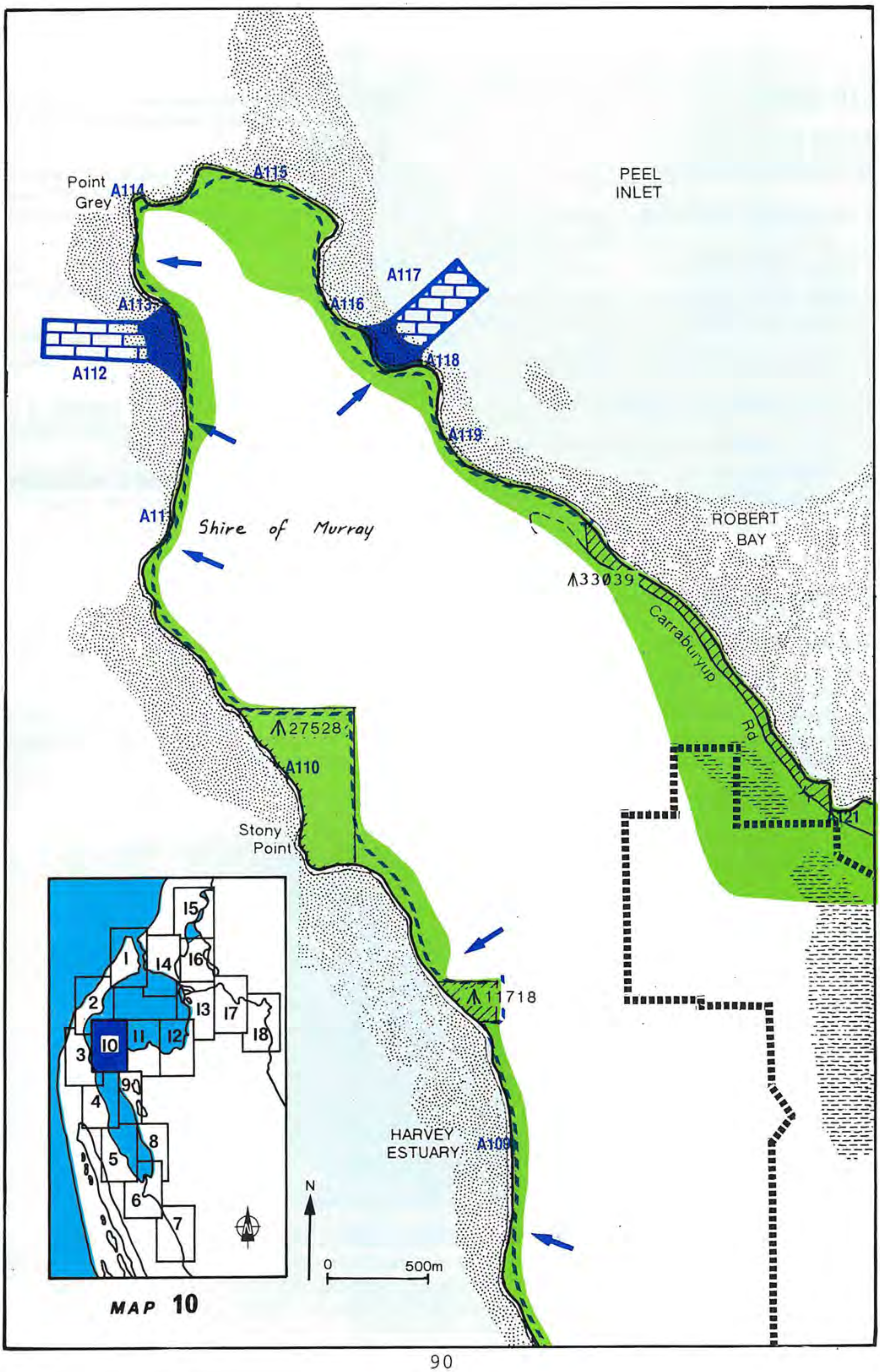
A.106 Acquire land to extend the foreshore reserve as a condition of any future rezoning or subdivision (DPUD, PIMA, SM).

A.107 Incorporate Vacant Crown Land in reserve recommended in A.99 (DOLA, WWC, PIMA).

A.108 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).



Lake McLarty Conservation Reserve 39404


Point Grey
A114
A115
PEEL INLET
A117
A113
A116
A112
A118
A119
A111
Shire of Murray
ROBERT BAY
33039
Carrabury up Rd
27528
A110
Stony Point
11718
HARVEY ESTUARY
A109
15
1
14
16
2
13
17
10
11
12
18
3
9
4
8
5
6
7
N
0
500m
MAP 10

6.11 MAP 10

POINT GREY AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
11718	Recreation	4.0469	No
27528	Recreation	34.1959	No
33039	Recreation	0.9516	SM

2. The existence of Vacant Crown Land.

3. The absence of a foreshore reserve.

4. The presence of a deep water area adjacent to the foreshore.

5. Possible proposals for the future development of Point Grey.

6. Extensive shallow estuarine areas supporting seagrass beds and macro algae growth.

7. The existence of limestone caves.

Area Recommendations

A.109 Create a foreshore reserve from Vacant Crown Land and vest in the WWC for foreshore management on an interim basis in accordance with Section 5.3.5 of this document. PIMA to prepare a management plan (DOLA, WWC, PIMA).

A.110 Vest reserve 27528 in NPNCA. CALM to prepare and implement a management plan (DOLA, NPNCA, CALM).

A.111 Incorporate Vacant Crown Land into reserve recommended in A.109 (DOLA, DPUD, WWC, PIMA).

A.112 If Point Grey is developed for residential use at some time in the future undertake environmental and engineering costing investigations associated with dredging an access channel to the foreshore south of Point Grey (PIMA, DMH, SM).

A.113 If Point Grey is developed for residential use at some time in the future use dredge spoil to expand foreshore area as shown. Incorporate this newly created foreshore area into reserve created in A.109 (DMH, PIMA, DOLA, DPUD, SM).

A.114 Investigate the potential of Point Grey in relation to recreation (PIMA).

A.115 Create a foreshore reserve from Vacant Crown Land. Vest reserve in the Shire of Murray for recreational purposes (DOLA, SM)

A.116 Investigate the suitability of the area as a recreational boating facility in accordance with Section 5.7.1 of this document (PIMA, DMH).

A.117 If Point Grey is developed for residential use at some time in the future undertake environmental and engineering costing investigations associated with dredging an access channel to the foreshore east of Point Grey (PIMA, DMH).

A.118 If Point Grey is developed for residential use at some time in the future use dredge spoil to expand foreshore area as shown. Incorporate this newly created foreshore area into reserve created in Recommendation A.119 (DMH, PIMA, DOLA, DPUD, SM).

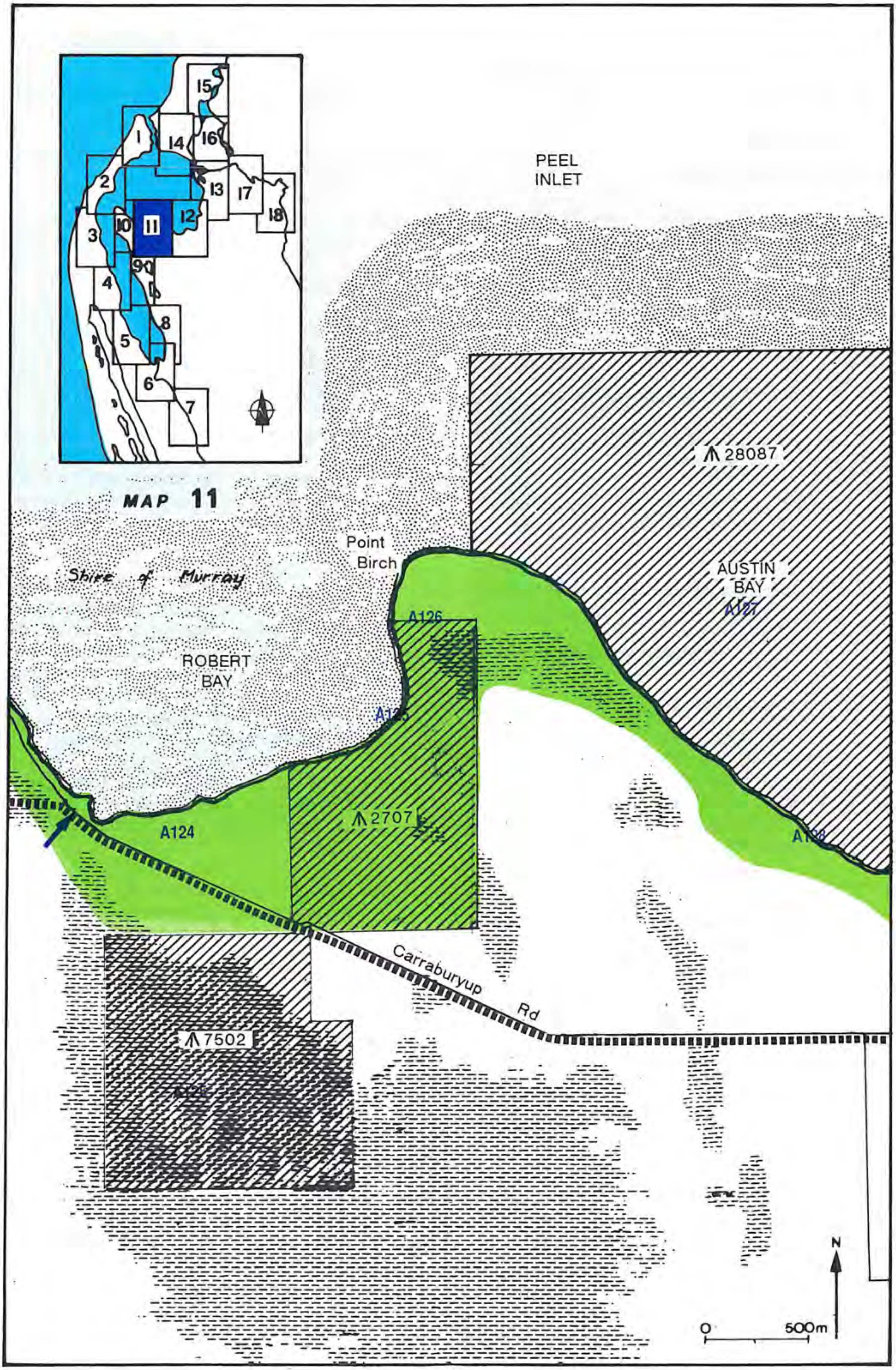
A.119 Create a foreshore reserve from Vacant Crown Land. Vest reserve in the Shire of Murray for recreational purposes (DOLA, SM).

A.120 Prepare and implement a foreshore management programme to combat erosion of shoreline and to protect fringing vegetation (PIMA).

A.121 Incorporate Vacant Crown Land into the Nature Reserve 2707 and vest in NPNCA (DOLA, SM, NPNCA, CALM).

A.122 Acquire land to expand the foreshore reserve as a condition of any rezoning or subdivision (DPUD, PIMA, SM).

A.123 Implement General Recommendations 23 and 51 relating to Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).



MAP 11
15
1
14
16
2
13
17
18
3
10
11
12
9
4
8
5
6
7
PEEL
INLET
28087
Point
Birch
Shire of Murray
AUSTIN
BAY
A126
ROBERT
BAY
2707
A124
Carraburyup
Rd
7502
N
0
500m

6.12 MAP 11

POINT BIRCH AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
7502	Water Purposes	N/D	WAWA
2707	Nature Reserve	104.8238	NPNCA
28087	Nature Reserve	891.4522	NPNCA

2. Austin Bay Nature Reserve 28087.

3. The location of the Nature Reserve boundaries.

4. The existence of a freehold property boundary to the high water mark.

5. The existence of a narrow foreshore reserve joining Point Birch and Boggy Bay.

Area Recommendations

A.124 Incorporate adjoining Vacant Crown Land and reserve 7502 into the Nature Reserve 2707 and vest in NPNCA (DOLA, SM, NPNCA, CALM).

A.125 Incorporate foreshore reserve into Nature Reserve 2707 vested in NPNCA. CALM to prepare a management programme (DOLA, NPNCA, CALM, SM).

A.126 Rationalise the Nature Reserve 2707 boundaries as a condition of future development by extending the western boundary northwards into Robert Bay and incorporate into the Austin Bay Nature Reserve (DPUD, DOLA, NPNCA, CALM, PIMA).

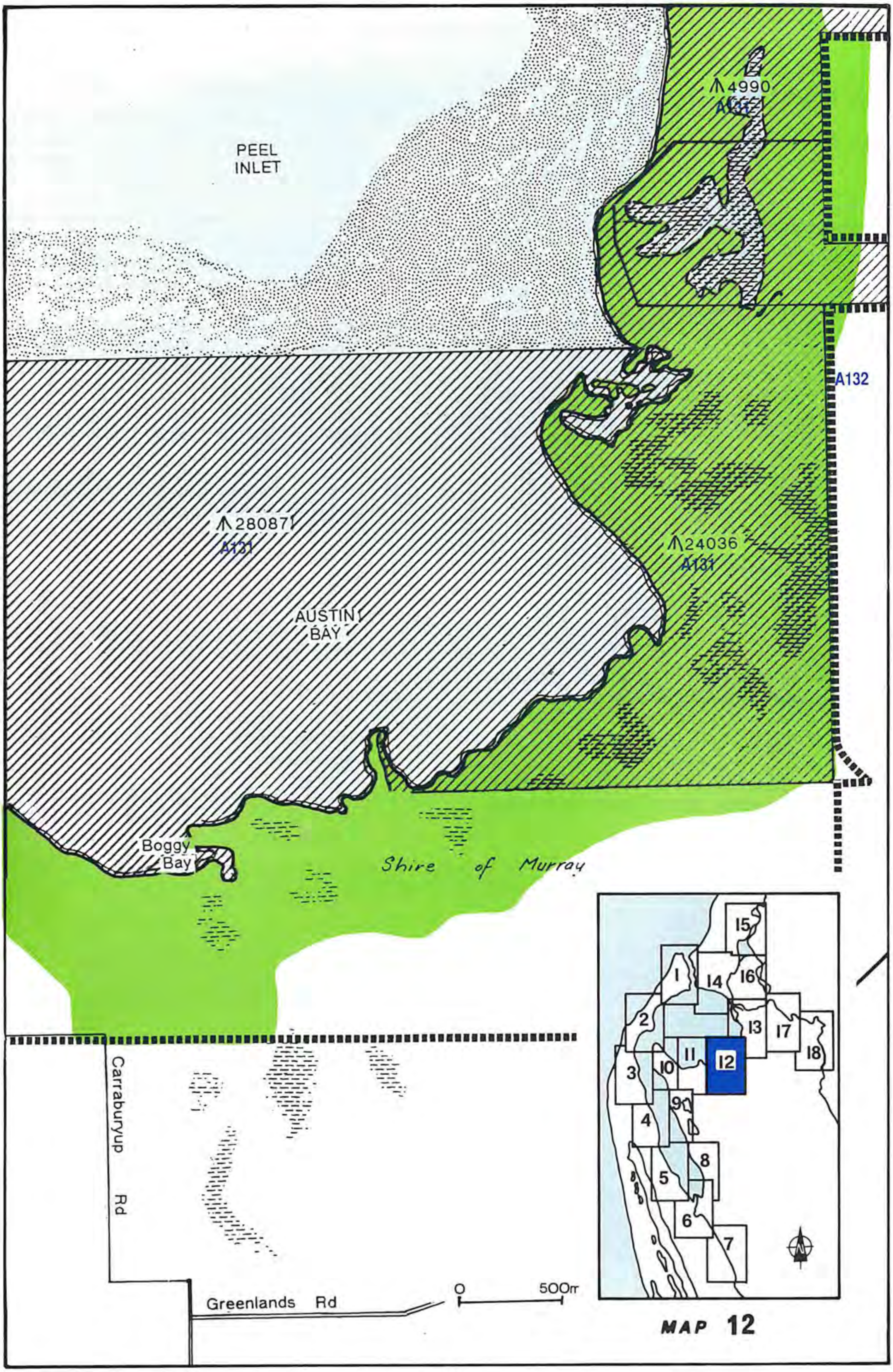
A.127 Prepare and implement a management programme for the ongoing protection of the Austin Bay Nature Reserve 28087 (CALM).

A.128 Rationalise the Austin Bay Nature Reserve boundaries as a condition of future development of adjoining land (DPUD, PIMA, DOLA, NPNCA, CALM).

A.129 Acquire freehold land to be incorporated into the Nature Reserves as a condition of rezoning or subdivision (DPUD, PIMA, SM).

A.130 Implement General Recommendation 23 relating to the Waterways Protection Precinct (PIMA, WWC)

Water reserve 7502 with Point Birch Nature Reserve 2707 above


PEEL
INLET
4990
A131
A132
28087
A131
24036
A131
AUSTIN
BAY
Boggy
Bay
Shire of Murray
Carraburyup Rd
Greenlands Rd
0
500m
15
1
14
16
2
13
17
11
12
18
3
10
9
4
8
5
6
7
MAP 12

6.13 MAP 12

AUSTIN BAY AREA

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
28087 Nature Reserve	891.4522	NPNCA
24036 Nature Reserve	343.4643	NPNCA
4990 Nature Reserve	70.5373	NPNCA

2. Austin Bay Nature Reserve 28087.

3. The location of the Nature Reserve boundaries.

4. The existence of a freehold property boundary to the high water mark.

5. The possible future development of a poultry industry.

6. Drainage channels.

Area Recommendations

A.131 Prepare and implement management programmes for the ongoing protection of the Nature Reserves 28087, 24036 and 4990 (CALM, NPNCA).

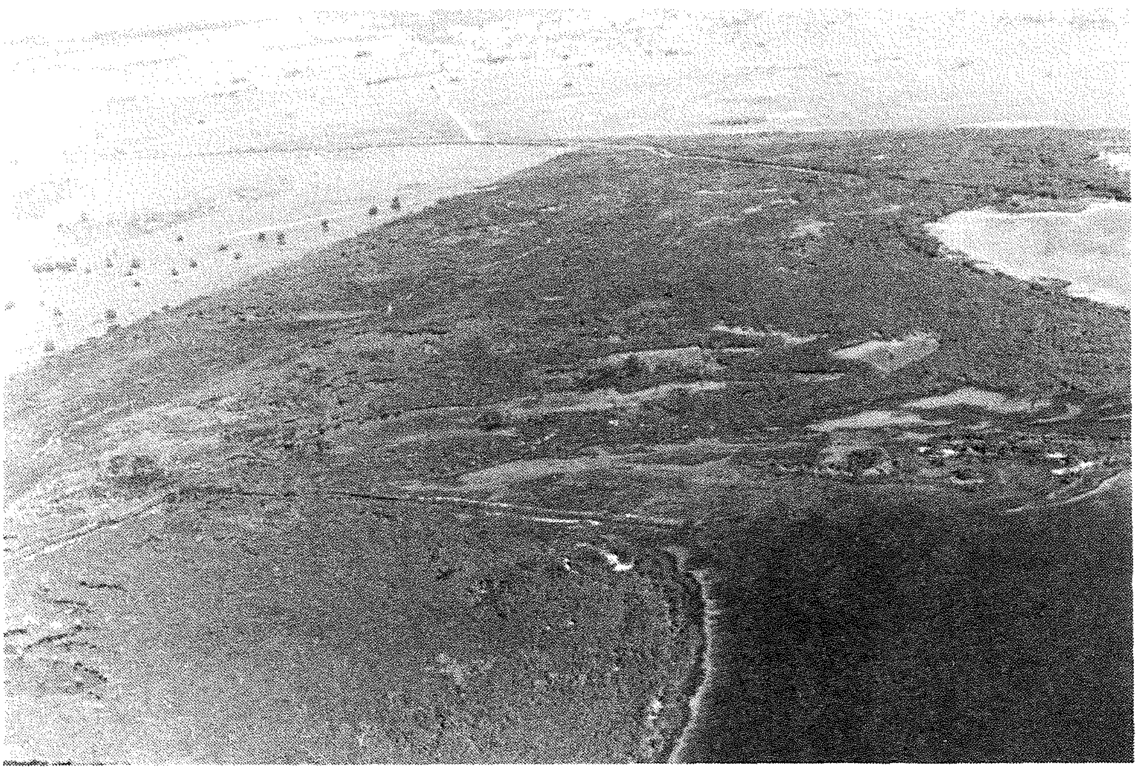
A.132 Rationalise the boundaries of the Nature Reserves as a condition of future development of adjoining land (DPUD, PIMA, DOLA, NPNCA, CALM).

A.133 Acquire freehold land to be incorporated into the Nature Reserves as a condition of future rezoning or subdivision (DPUD, PIMA, SM).

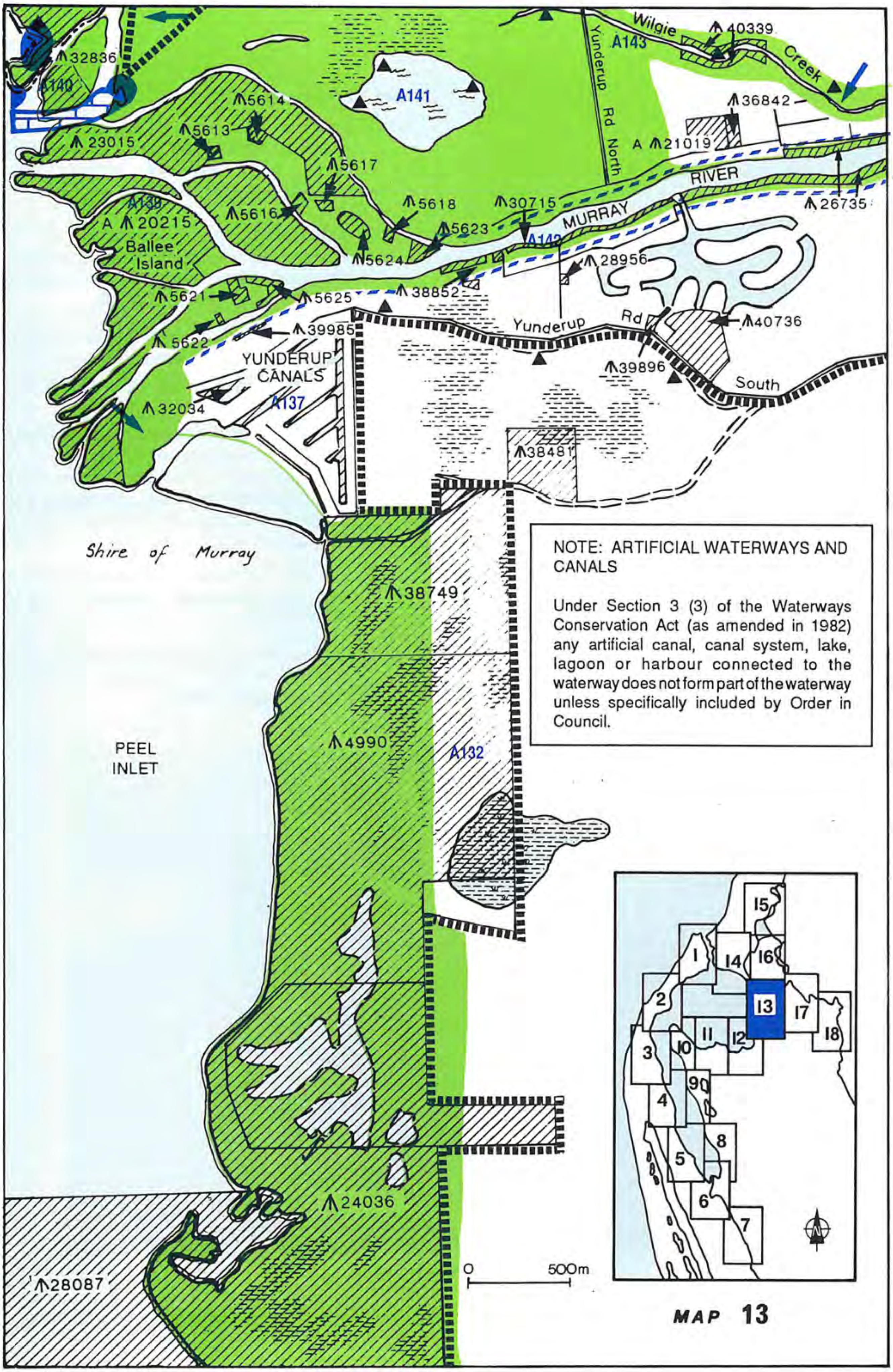
A.134 Prepare and implement an industry nutrient management programme for the protection of the waterways before any land use proposals producing high nutrient output are approved (WWC, PIMA, SM).

A.135 Invoke general recommendations regarding drainage channels (PIMA, WAWA, SM).

A.136 Implement General Recommendation 23 relating to the Waterways Protection Precinct (PIMA, WWC).



Austin Bay Nature Reserve


Wilgie Creek
A143
Yunderup Rd North
A141
32836
A140
5614
5613
23015
36842
A 21019
5617
RIVER
MURRAY
A139
A 20215
Ballee Island
5616
5618
30715
5623
26735
A142
5624
28956
5621
5625
38852
5622
39985
Yunderup Rd
40736
YUNDERUP CANALS
A137
32034
39896
South
38481
Shire of Murray
38749
NOTE: ARTIFICIAL WATERWAYS AND CANALS
Under Section 3 (3) of the Waterways Conservation Act (as amended in 1982) any artificial canal, canal system, lake, lagoon or harbour connected to the waterway does not form part of the waterway unless specifically included by Order in Council.
PEEL INLET
4990
A132
24036
28087
0
500m
15
14
16
1
2
13
17
18
11
12
10
3
9
4
8
5
6
7
MAP 13

6.14 MAP 13

MURRAY RIVER DELTA AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
38749	Nature Reserve		NPNCA
4990	Nature Reserve	70.5373	NPNCA
24036	Nature Reserve	343.4643	NPNCA
23015	Camping/Recreation	2.0234	SM
5613	WA Naturalists Club	0.4047	WAN
5614	Government Reqs	0.6247	No
5616	Water Supply	0.5160	MWR
5617	Public Utility	0.5767	No
A20215	National Park	78.5090	SM
5625	Recreation	1.2343	No
32034	Recreation	10.0062	SM
39985	Public Recreation	0.1234	No
5621	Recreation/Parklands	1.2898	No
5622	Public Utility	0.1973	No
32836	Recreation	16.8673	CM
5618	Public Utility	0.2428	No
5624	Scout Camp	1.9974	SAW
5623	Recreation	1.3734	SM
30715	Recreation	1.4660	SM
38852	Public Recreation	2.0268	SM
5625	Recreation	1.2343	No
40339	Public Recreation	4.8973	No
21019	Recreation	2.8429	SM
36842	Public Recreation	0.6500	No
26735	Public Recreation	7.2890	SM
40736	Recreation	5.0498	SM
39896	Public Recreation	0.2469	SM

2. The location of the Nature Reserve boundaries.

3. Mosquito breeding area.

4. Maintenance dredging of the Yunderup Canals entrance channel.

5. Water quality problems at Yunderup Canals.

6. A series of island reserves.

7. Existence of flood prone land and WAWAs floodway.

8. Future engineering requirements for dredging the entrance to the Serpentine and Murray Rivers to maintain safe boating access.

9. Fragmentation of reserve along Wilgie Creek.

10. Degraded condition of riverbank vegetation in reserves 37994, 40339, 39896.

11. Degraded condition of riverbank vegetation in reserve 38852.

12. The existence of an ephemeral salt lake.

13. Public access in reserve 30715.

14. Erosion of the river bank.

15. River foreshore in private ownership resulting from riparian boundaries.

16. Inadequate boating facilities in the Yunderup District.

17. The need to provide for the long term dredging of the Yunderup Canals entrance channel.

Area Recommendations

A.137 Undertake environmental engineering investigations associated with the ongoing dredging of the Yunderup Canals entrance channel (SM, PIMA, DMH). Disposal site options include:

- pumping to the south of the bund wall on Wellya Pool;
- removal from the immediate vicinity to a disposal site to be determined;
- other options may be considered.

A.138 Prepare and implement a management programme to ameliorate water quality problems in the canal (Dev, SM, PIMA, WWC).

A.139 During Peel-Harvey Regional Park investigations assess the environment of reserve A20215 to determine if it is suitable for national park purposes (DOLA, SM, NPNCA, CALM).

A.140 Undertake environmental and engineering investigations associated with dredging the river entrances (PIMA, DMH, SM). Spoil disposal site options for consideration include:

- pumping to the foreshore at Coodanup to extend the foreshore reserve;
- pumping to the estuary to create an artificial island;
- pumping to private property in the river delta to create a flood free development site.

A.141 Prepare and implement a management programme for the ongoing protection of the salt lake (PIMA, SM).

A.142 Identify and emphasise the public access way in reserve 30715 (PIMA).

A.143 Acquire appropriate foreshore reserves as a condition of any rezoning or subdivision to form a continuous reserve along Wilgie Creek (DPUD, PIMA, DOLA, SM).

A.144 Encourage the owners of private waterfront properties to maintain the river bank and surrounding areas (PIMA, SM).

A.145 Undertake investigations to determine a site for a boating facility in the Yunderup district (PIMA, WWC).

A.146 Carry out works in accordance with Mosquito Control Strategy (HD, PIMA, SM).

A.147 Implement General Recommendations 23 and 51 relating to the Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).

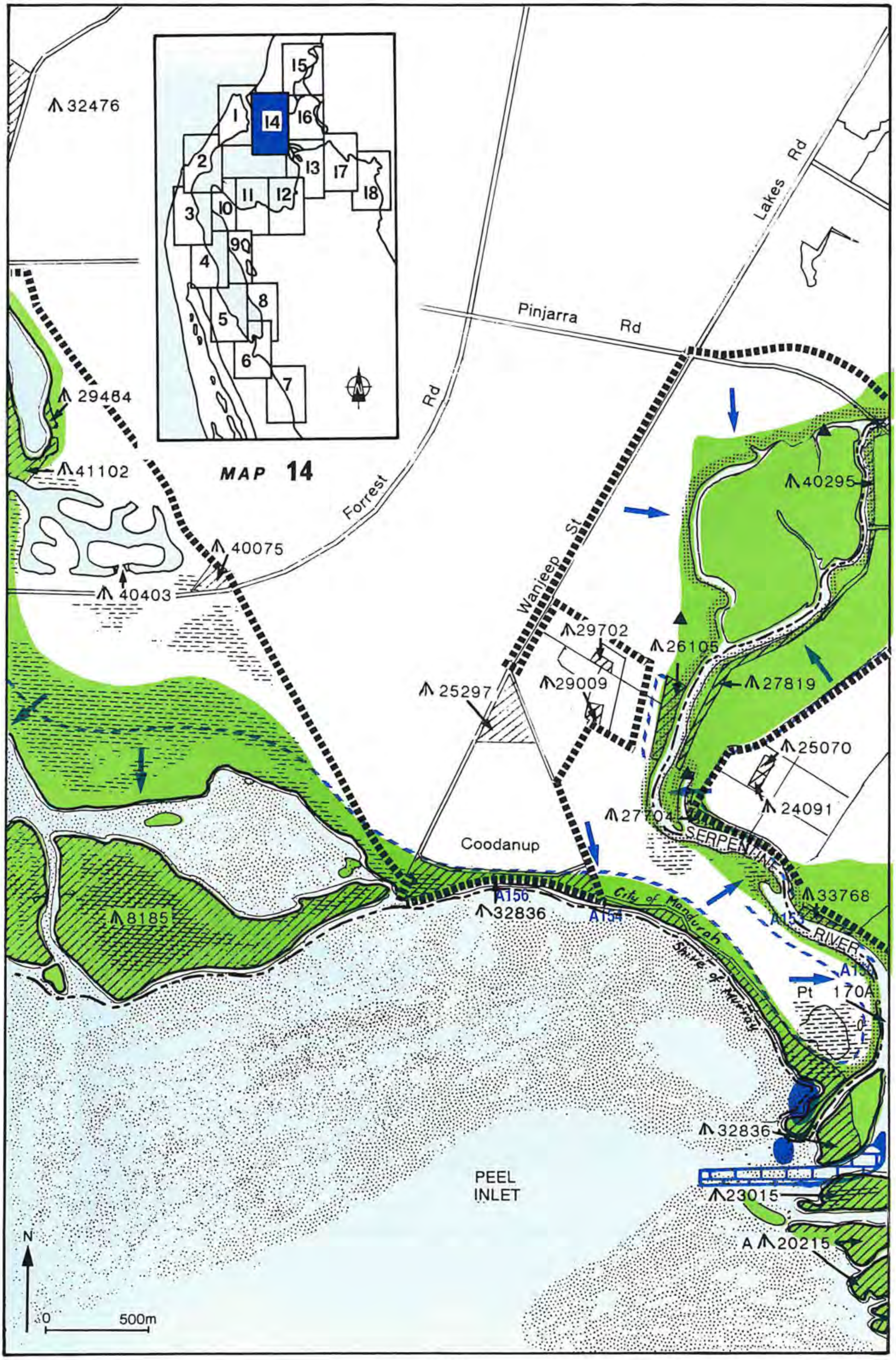
A.148 Ensure that the development of any flood prone land is in accordance with WAWA's recommendations (DPUD, WAWA).

A.149 Prepare and implement a management plan for reserve 38749 (CALM).

Jannela Island reserve 32836

Yunderup Canals, with Wellya Pool in the foreground and the Murray River above

Cooper's Mill has been restored on the banks of the Serpentine River



MAP 14
32476
29464
41102
40075
40403
Forrest
Rd
Pinjarra
Rd
Lakes
Rd
Wanjeep
St
40295
29702
26105
29009
27819
25297
25070
24091
27704
Coodanup
SERPENTINE
RIVER
33768
A156
32836
A154
A153
City of Mandurah
Shire of Murray
8185
Pt
170A
32836
PEEL
INLET
23015
A 20215
N
0
500m

6.15 MAP 14

Coodanup Area

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
32836 Recreation	16.8673	CM
23015 Camping/Recreation	2.0234	SM
20215 National Park	78.5090	SM
40295 Public Recreation	2.062	SM
26105 Recreation	0.9839	No
27819 Recreation	1.4782	No
27704 Recreation	6.8797	SM
25070 Public Recreation	0.7850	SM
24091 Public Recreation	0.7951	SM
26105 Recreation	0.9839	No
27819 Recreation	7.8742	No
27704 Recreation	6.8797	SM
33768 Recreation	0.7284	No
32836 Recreation	16.8673	CM
29702 Public Recreation	1.3608	No
29009 Public Recreation	0.9814	No
25297 Recreation	5.0105	No
29485 Public Recreation	2.1052	CM
41102 Foreshore Mngt	N/D	WWC
40403 Recreation	0.0174	No
8185 Recreation	N/D	CM

2. Existence of private land between reserve 26105, reserve 27819 and river.

3. Erosion of river banks.

4. Algae management problem.

5. The existence of waterbird habitats.

6. Erosion of shoreline.

7. The need to provide an access channel for weed harvesting equipment and recreational boating to the Beacham Road area.

8. The degradation of fringing foreshore vegetation.

9. Insufficient foreshore reserve.

10. River and foreshore in private ownership resulting from riparian boundaries.

11. Extensive shallow estuarine areas supporting seagrass beds and macroalgae growth.

12. Possible future development of canal estate.

13. Degradation of samphire marshland by uncontrolled vehicle and pedestrian access.

14. The existence of a System Six Area.

15. Areas of wetland habitat.

16. Mosquito breeding areas.

17. The existence of drainage channels that cross foreshore reserves.

18. Existence of flood prone land and WAWA floodway.

Area Recommendations

A.150 Acquire an appropriate foreshore reserve as a condition of rezoning or subdivision of Pt Lot 170A Nairns and Lot 171 Furnissdale (DPUD, PIMA).

A.151 Undertake investigations to upgrade the drainage systems (PIMA, WAWA, CM).

A.152 Prepare detailed management plans for the Serpentine and Murray river systems to address issues of conservation, flood management, navigation, erosion control and recreational use (PIMA, CM, SM).

A.153 Acquire private land on the river bed and incorporate into existing reserves (DPUD, DOLA, CM).

A.154 Undertake environmental and engineering costing investigations associated with dredging an access channel to Beacham Road. Use any dredge spoil to renourish Coodanup Beach (PIMA, DMH, CM).

A.155 Upgrade algae harvesting and control programme in accordance with General Recommendation 18.

A.156 Prepare and implement a foreshore management programme to combat erosion of shoreline, protect fringing vegetation and investigate the desirability of public access in the area (PIMA).

A.157 Provide environmental advice to CM and DPUD in the planning of any canal estate or subdivision near the foreshore (PIMA).

A.158 The developer of any land adjoining the waterway to prepare and implement a foreshore management programme to rehabilitate and protect samphire marshland (Dev, PIMA).

A.159 The developer of any land adjoining the waterway should contribute funds to an algal control programme (Dev, PIMA).

A.160 Carry out works in accordance with Mosquito Control Strategy (HD, PIMA, CM).

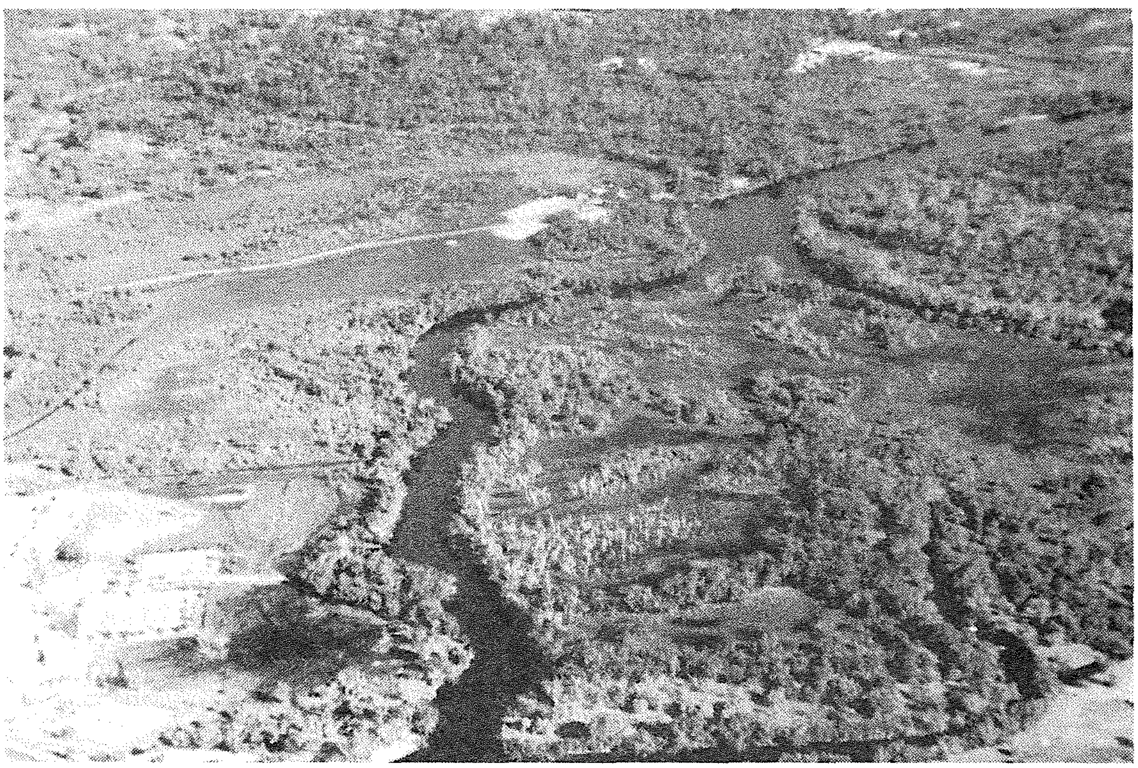
A.161 Ensure the development of any flood prone land is in accordance with WAWA recommendations (DPUD, WAWA).

A.162 Apply the Waterways Protection Precinct General Recommendation 23 to all islands within the waterway (PIMA, WWC).

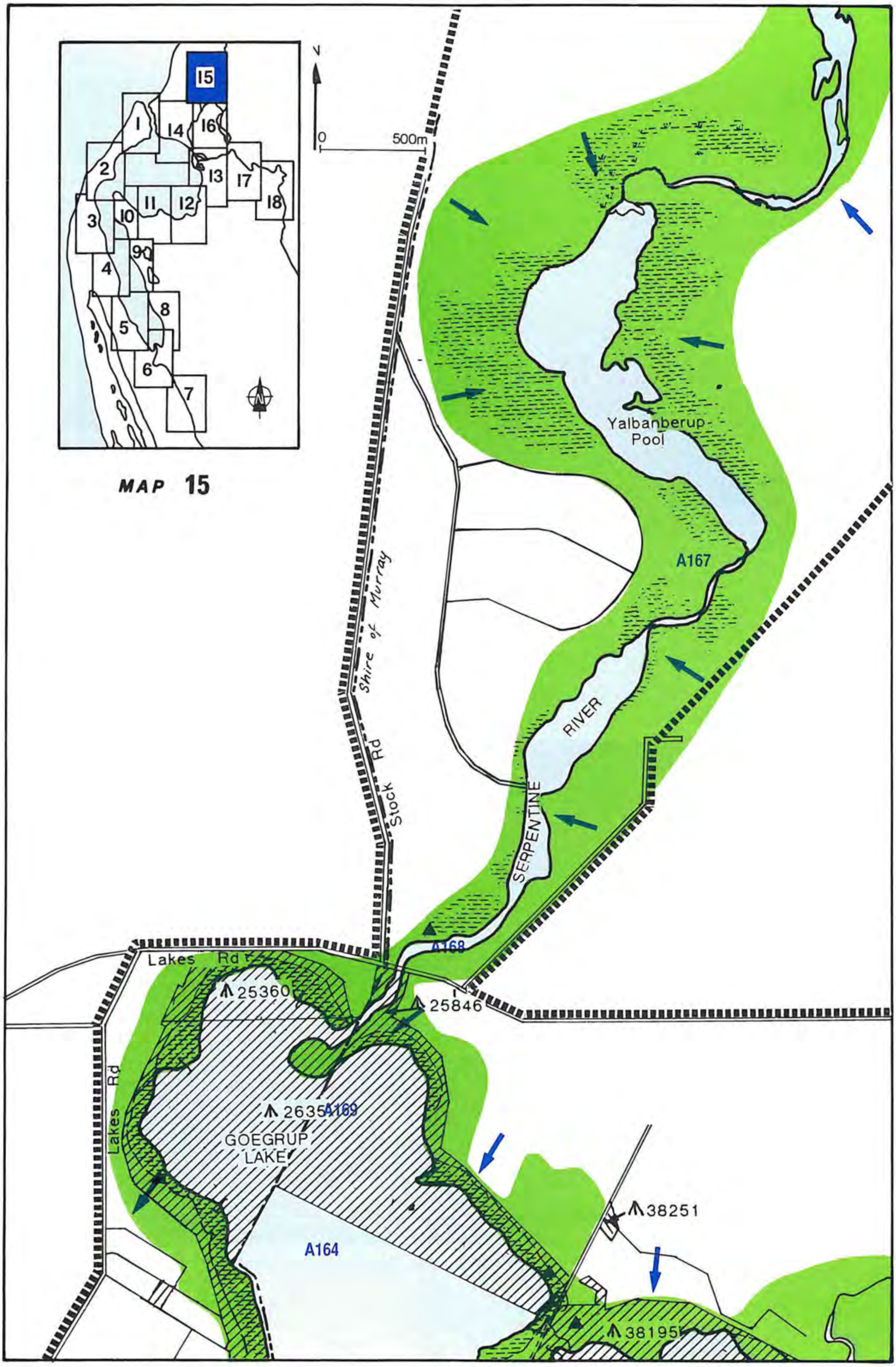
A.163 Implement General Recommendations 23, 26 and 51 relating to Waterways Protection, Bank Revegetation and Public Access Precincts, respectively (PIMA, WWC).

Melaleuca cuticularis (salt water paperbark)

Murray-Serpentine River Delta



Serpentine River downstream from Pinjarra Road



MAP 15
0
500m
Yalbanberup Pool
A167
RIVER
SERPENTINE
Shire of Murray
Stock Rd
A168
Lakes Rd
Lakes Rd
25360
25846
2635
A169
GOEGRUP LAKE
A164
38251
38195

6.16 MAP 15

GOEGRUP LAKE AREA

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
38195 Public Recreation	65.0987	No
26351 Public Recreation	187.1042	No
26535 Public Recreation	0.9073	CM

2. Potential for increased boating pressure from recreational boating users.

3. Existence of extensive shallow estuarine areas supporting seagrass beds and macroalgae growth.

4. Potential algal growth.

5. Estuarine foreshore areas in private ownership.

6. The existence of areas of important wetland habitats.

7. Existence of flood prone land and WAWA's floodway.

8. Existence of mosquito breeding areas.

Area Recommendations

A.164 Investigate the necessity of an algae harvesting and control programme (PIMA).

A.165 Vest reserve 38195 in NPNCA for nature reserve purposes.

A.166 Implement soil conservation and vegetation clearing regulations (DA, PIMA, SM, CM).

A.167 Create a reserve for nature reserve purposes and vest in NPNCA. Prepare and implement a management plan (DOLA, CALM).

A.168 Investigate the recreational potential of the waterways above Barragup Bridge (PIMA).

A.169 Investigate the conservation value of Goegrup Lake and the adjacent lake systems. Consider vesting environmentally valuable areas in NPNCA in the context of the proposed Peel-Harvey Regional Park (CALM, NPNCA).

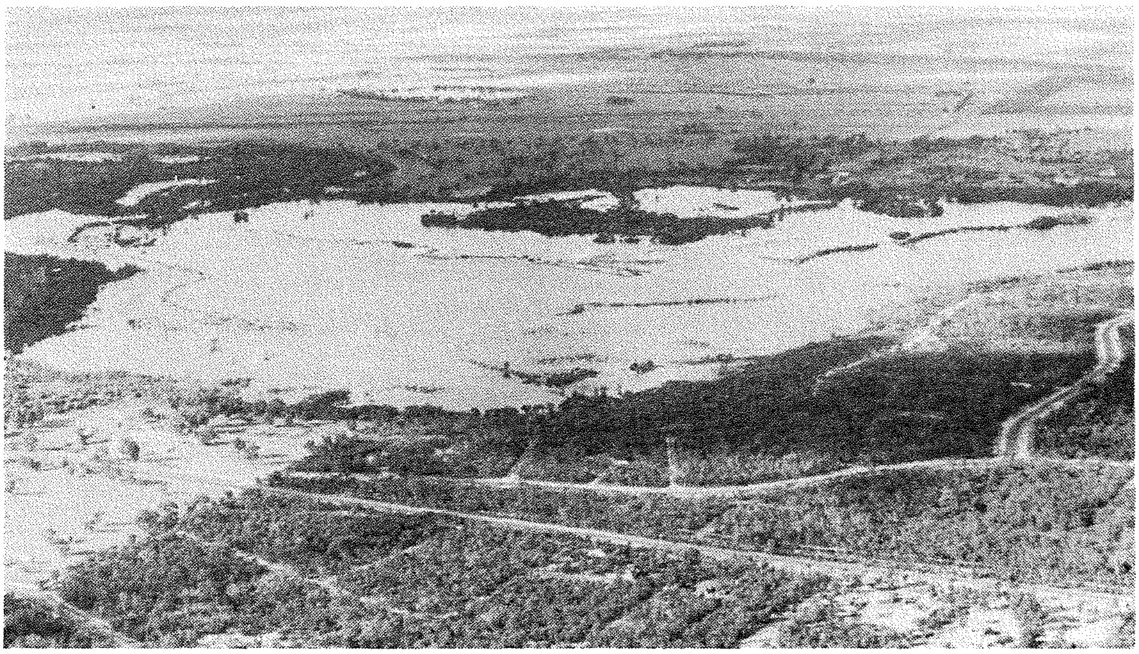
A.170 Ensure the appropriate vesting and management of foreshore reserves (DPUD, DOLA, WWC, PIMA).

A.171 Carry out works in accordance with Mosquito Control Strategy (HD, PIMA, CM).

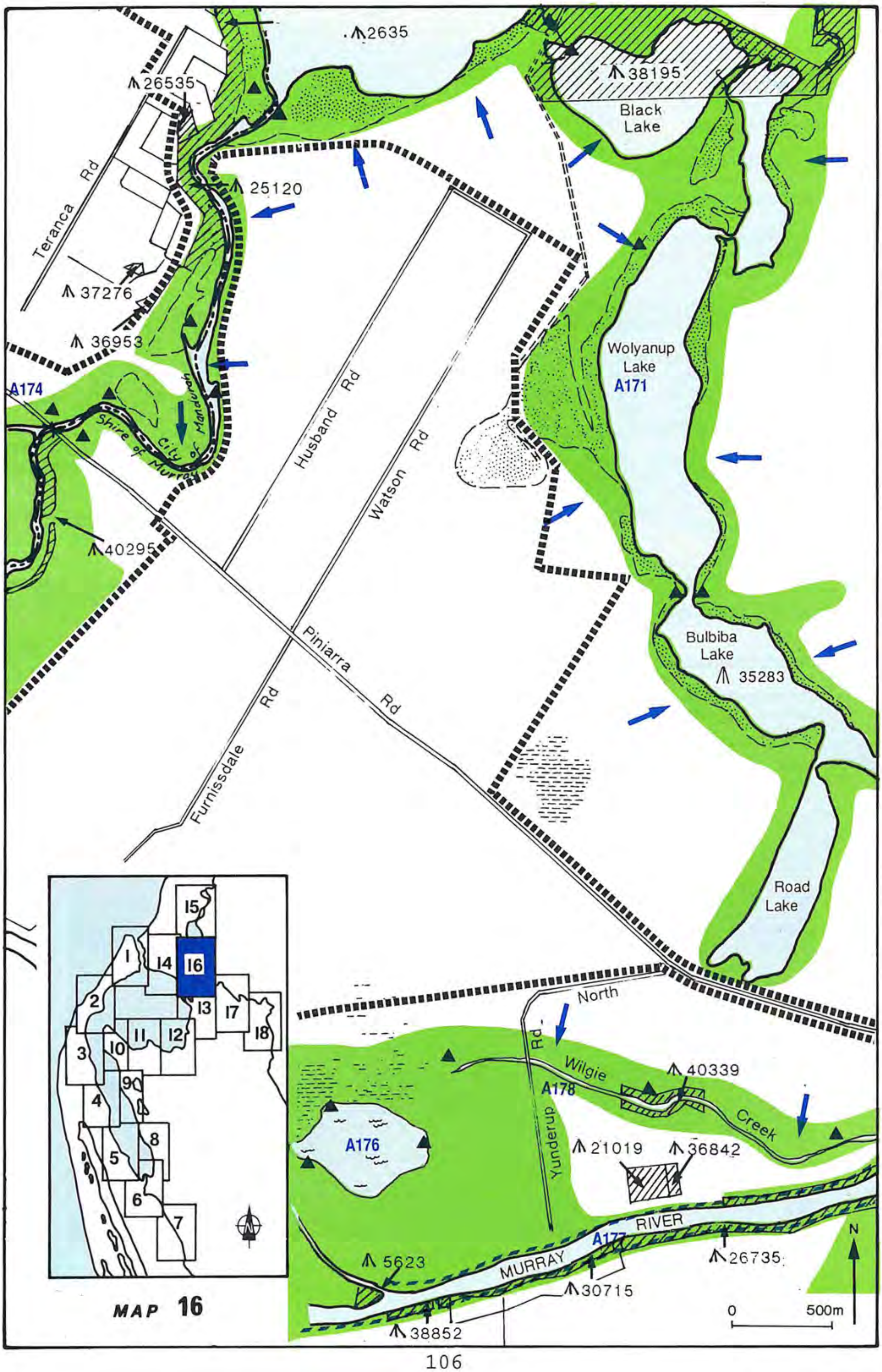
A.172 Acquire appropriate foreshore reserves as a condition of any rezoning or subdivision (PIMA, DPUD).

A.173 Ensure that any development on flood prone land is in accordance with WAWA's recommendations (DPUD, WAWA).

A.174 Implement the General Recommendation 23 relating to the Waterways Protection Precinct (PIMA, WWC).



Lake Goegrup


2635
38195
Black Lake
26535
25120
Teranca Rd
37276
36953
A174
Shire of Murray
City of Mandurah
Husband Rd
Watson Rd
Wolyanup Lake
A171
40295
Piniarra Rd
Furnissdale Rd
Bulbiba Lake
35283
Road Lake
North Yunderup Rd
Wilgie Creek
A178
40339
A176
21019
36842
MURRAY RIVER
A177
5623
30715
26735
38852
0
500m
N
MAP 16

6.17 MAP 16

WATSON ROAD AREA

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
38195 Public Recreation	65.0987	No
26351 Public Recreation	187.1042	No
26535 Public Recreation	0.9073	CM
25120 Recreation	0.7016	No
40295 Public Recreation	2.0625	SM
36953 Public Recreation	0.0497	No
5623 Recreation	1.3734	SM
30715 Recreation	1.4660	SM
38852 Public Recreation	2.0268	SM
40339 Public Recreation	4.8973	No
21019 Recreation	2.8429	SM
36842 Public Recreation	0.6500	No
26735 Public Recreation	7.2890	SM
35283 Public Recreation	81.8219	No

2. The extension of freehold Lot 215 into the lake bed.

3. Potential for increased boating pressure from recreational boating users.

4. Existence of extensive shallow estuarine areas supporting seagrass beds and macroalgae growth.

5. Estuarine foreshore areas in private ownership.

6. The existence of areas of important wetland habitat.

7. River and foreshore in private ownership resulting from riparian boundaries.

8. The existence of a bird park and possible pollution potential.

9. Degraded condition of riverbank vegetation in reserve 38852.

10. The existence of an ephemeral salt lake.

11. Public access in reserve 30715.

12. Fragmentation of reserve along Wilgie Creek.

13. Degraded condition of riverbank vegetation in reserves 37994, 40339, 39896.

14. Mosquito breeding areas.

15. Existence of flood prone land and WAWA floodway.

Area Recommendations

A.171 Vest reserves 32726 and 35283 in NPNCA for nature reserve purposes and prepare and implement a management plan (DOLA, CALM).

A.172 Refer all development applications to PIMA for advice (DPUD, CM, SM).

A.173 Implement soil conservation and vegetation clearing regulations (DA, PIMA, SM, CM).

A.174 Monitor the ongoing activity of the Bird Park and acquire a wider foreshore reserve as a condition of any further subdivision (PIMA).

A.175 Prepare and implement a riverbank management programme (PIMA, CM).

A.176 Prepare and implement a management programme for the ongoing protection of the salt lake (PIMA, SM).

A.177 Identify and emphasise the public access way in reserve 30715 (PIMA).

A.178 Acquire appropriate foreshore reserves as a condition of any subdivision to form a continuous reserve along Wilgie Creek (PIMA, DPUD, DOLA, SM).

A.179 Encourage the owners of private waterfront properties to maintain the river bank and surrounding areas (PIMA, SM).

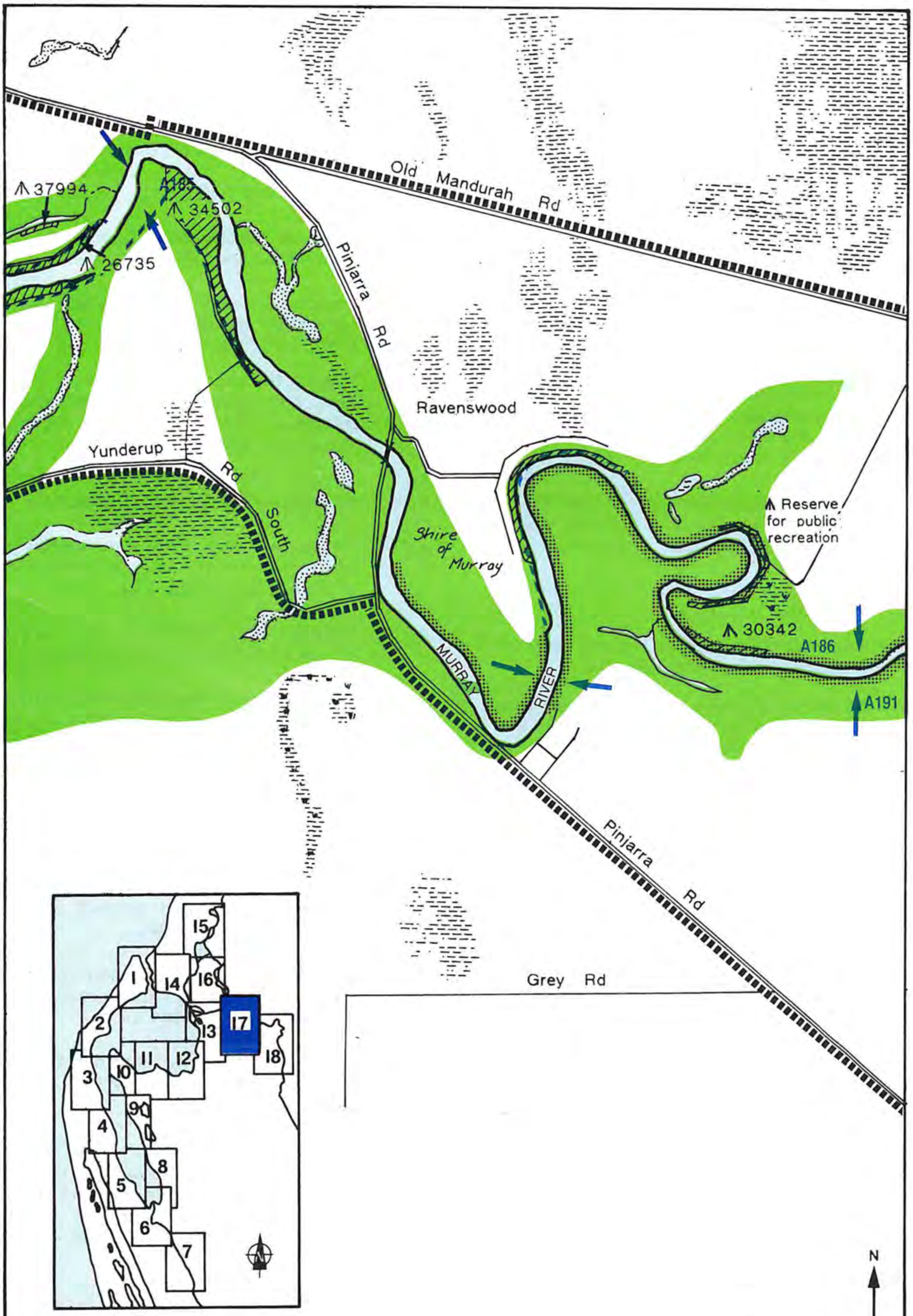
A.180 Support the ongoing nutrient control programme (PIMA, WWC).

A.181 Acquire appropriate foreshore reserves as a condition of any rezoning or subdivision (PIMA, DPUD).

A.182 Carry out works in accordance with Mosquito Control Strategy (HD, PIMA, SM).

A.183 Implement the General Recommendations 23 and 51 relating to the Waterways Protection and Public Access Precincts, respectively (PIMA, WWC).

A.184 Ensure that the development of any flood prone land is in accordance with WAWA's recommendations (DPUD, WAWA).



37994
A185
34502
26735
Old Mandurah Rd
Pinjarra Rd
Ravenswood
Yunderup Rd South
Shire of Murray
MURRAY RIVER
Reserve for public recreation
30342
A186
A191
Pinjarra Rd
Grey Rd
15
1
14
16
2
17
13
11
12
18
3
10
9
4
8
5
6
7
N
0
500m

MAP 17

6.18 MAP 17

MURRAY RIVER AREA

Planning Considerations

1. The existence of reserves

		Area ha	Vest Auth
34502	Public Recreation	7.1047	No
37994	Public Reserve	1.2875	No
26735	Public Recreation	7.2890	SM
40109	Foreshore Management and Recreation	3.5916	WWC
30342	Recreation	4.6134	SM
Nil	Public Recreation	2.7822	SM

2. Unvested land covering the public boat haven and foreshore reserve.

3. River and foreshore in private ownership resulting from riparian boundaries.

4. Erosion and associated loss of riverbank vegetation.

5. Conflict of use for recreation by canoeists, power boats, swimmers.

6. Demand for canoe camping areas adjacent to the river.

7. Existence of flood prone land and WAWA's floodway.

8. Existence of mosquito breeding areas.

9. Existence of foreshore reserves which have been cleared of vegetation, are subject to river bank erosion and have restricted public access.

Area Recommendations

A.185 Vest reserve 34502 in WWC for foreshore management. PIMA to prepare and implement a management plan for reserves 34502 and 40109 to ensure public access along the foreshore, appropriate revegetation and management of the river banks (DOLA, WWC, PIMA).

A.186 Investigate the feasibility of establishing locations for short and medium term canoe camping (PIMA, SM, MSR).

A.187 Prepare and implement a management programme to address the recreation and conservation issues pertaining to the erosion of the river bank and to the resolution of the usage of the foreshore reserves (PIMA, MSR, SM).

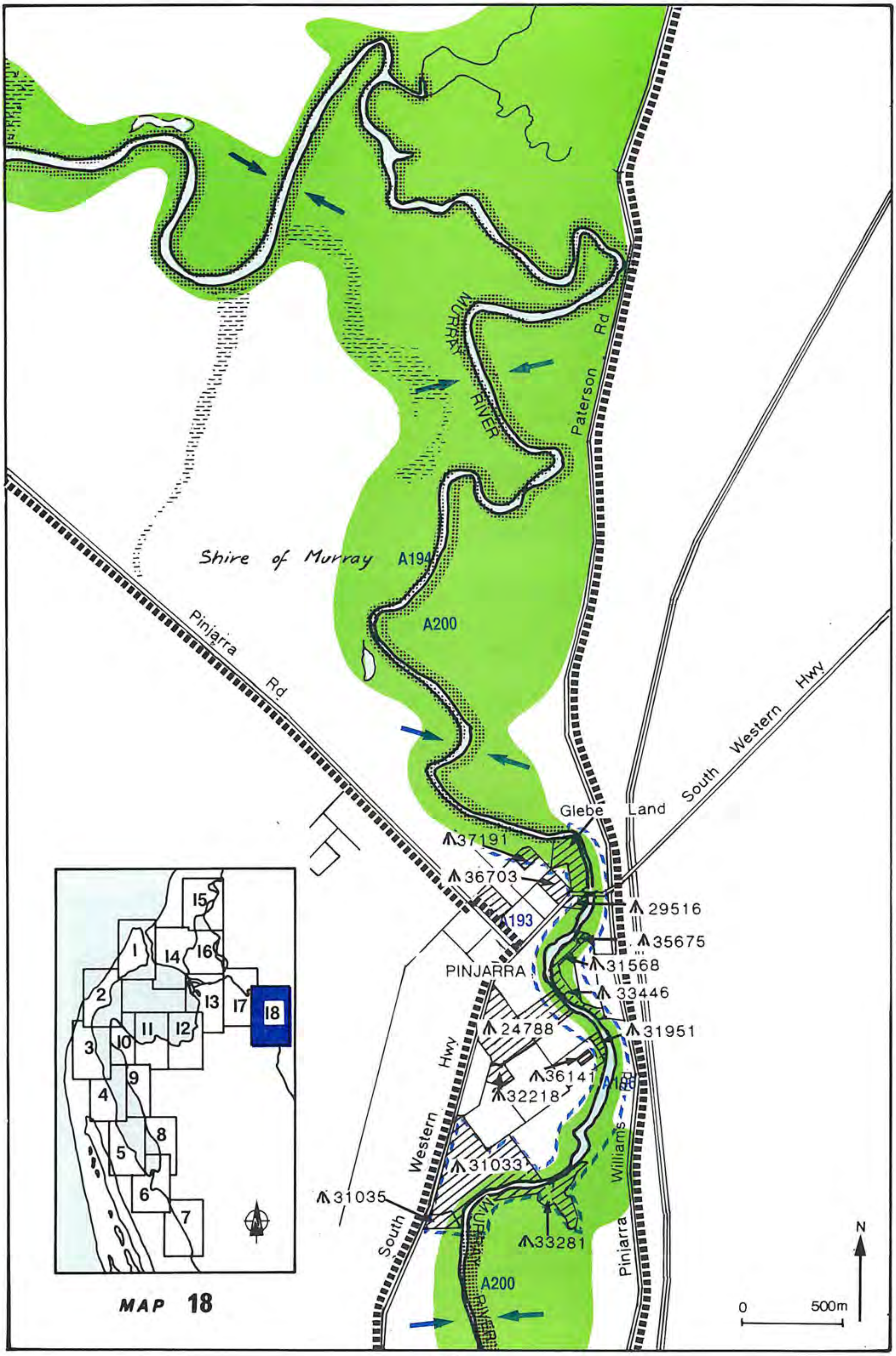
A.188 Acquire appropriate foreshore reserves as a condition of any future rezoning or subdivision (DPUD, PIMA, SM).

A.189 Carry out works in accordance with Mosquito Control Strategy (HD, PIMA, SM).

A.190 Ensure that the development of any flood prone land is in accordance with WAWAs recommendations (DPUD, WAWA).

A.191 Implement General Recommendations 23 and 26 relating to the Waterways Protection and the Bank Revegetation Precincts, respectively (PIMA, WWC).

Murray River downstream of Pinjarra. A thin band of trees remains along the river. The Bank Revegetation Precinct (recommendation 26) covers these areas.



MURRAY RIVER
Paterson Rd
Shire of Murray
A194
A200
Pinjarra Rd
South Western Hwy
Glebe Land
37191
36703
A193
29516
35675
31568
33446
PINJARRA
24788
31951
36141
32218
A196
31033
31035
33281
Williams
Pinjarra
A200
MURRAY RIVER
N
0
500m
15
1
14
16
2
13
17
18
11
12
3
10
9
4
8
5
6
7
MAP 18

6.19 MAP 18

PINJARRA TOWNSITE AREA

Planning Considerations

1. The existence of reserves

	Area ha	Vest Auth
37191 Sewerage Pumping Station	0.5844	MWR
36703 Historical Building	1.1688	
29516 Memorial Park	0.5749	SM
26081 Public Building	0.5188	CP
22134 Rest Room (CWA)	0.1948	No
31568 Public Recreation	1.4161	SM
33446 Public Recreation	1.2368	SM
24788 School Site	9.0119	ME
32218 Public Recreation	0.7747	SM
31951 Public Recreation	0.7420	SM

2. Erosion and associated loss of riverbank vegetation.

3. Demand for canoe camping areas adjacent to the river.

4. Proposed boat launching facilities at Forrest Street.

5. Pollution of the river from the commercial centre.

6. Existence of flood prone land and WAWA floodway.

7. The possible future subdivision of the adjoining farmland.

8. Use of river for power boat racing.

9. The presence of Water Authority sewage treatment plant.

Area Recommendations

A.192 Investigate the feasibility of establishing locations for short and medium term canoe camping (PIMA, SM, DSR).

A.193 Investigate the feasibility of establishing a boat launching facility at Forrest Street (PIMA, DMH).

A.194 Develop recreational boating facilities that emphasise the use of non-powered craft (PIMA, SM).

A.195 Investigate the establishment of a nutrient monitoring programme (PIMA, WWC).

A.196 Monitor the pollution input from the commercial centre and the drag strip to the waterway (PIMA, SM).

A.197 Implement General Recommendations 23 and 51 relating to the Waterways Protection and Public Access Precincts, respectively (PIMA, WWC)

A.198 Ensure that the development of any flood prone land is in accordance with WAWA's recommendations (DPUD, WAWA).

A.199 Acquire appropriate foreshore reserves as a condition of any rezoning or subdivision (DPUD, PIMA).

A.200 Implement General Recommendation 26 relating to the Bank Revegetation Precinct (PIMA, WWC).

Murray River

CHAPTER 7

IMPLEMENTATION AND MONITORING

7.1 *INTRODUCTION*

The preparation of this Management Programme generated 106 general and 200 area recommendations which are listed below. General recommendations relate to a large part or all of the waterway while area recommendations relate to specific locations.

Implementation of this Management Programme is the responsibility of PIMA. However, it is the statutory responsibility of other authorities to undertake the work outlined in many of the recommendations. Where other authorities have the prime role, PIMA will act to instigate and co-ordinate activity to achieve relevant objectives.

The resources required to implement recommendations vary. Many can be carried into effect during PIMA's day to day decision making processes and field operations. Others will require specific decisions to allocate staff time and other resources to particular projects. Some recommendations can be implemented quickly and cheaply while others require extensive research, the preparation of complex plans or management operations.

The large number of recommendations and complicated processes involved in their implementation requires a clear and ordered strategy to define priorities and audit effectiveness.

7.2 *PROGRAMME MANAGEMENT*

Western Australian government agencies now operate on a programme management basis. Programme management is a tool which is used to integrate the planning, budgeting and evaluation of programmes and clearly links programmes to government policy objectives. Performance indicators are established to relate the results achieved during the year to resources used (efficiency) and compare them with the results obtained (effectiveness). The progress waterway management authorities make in implementing their management programmes will provide a useful performance indicator in the programme management process.

7.3 *IMPLEMENTATION*

It is intended that the yearly planning and works programmes for the Peel Inlet Authority Management Area will be developed by PIMA, with the assistance of WWC in accordance with this Management Programme. Priorities will be developed in a planned way to achieve management programme objectives and obligations.

General recommendations are listed below in numerical order 1-106. The agencies responsible for implementation are listed with the lead agency underlined. The listing indicates if the recommendation can be implemented as part of PIMA's day to day operations and whether it will involve a one-off decision or an on-going commitment. The relative dollar costs were estimated. High cost projects are those which would require a special budget allocation, medium cost projects are those which could be funded from PIMA's normal annual budget while low cost projects are those which can be achieved through administrative procedures.

Each recommendation has been assigned a priority for implementation, taking into account the relative cost and urgency of the action required. High priority projects are those which are considered urgent and can be implemented within normal budgetary constraints. Medium priority projects are those which have a medium or high urgency combined with a high implementation cost. All others have a low priority. The level of priority will be used as a guide in undertaking works.

TABLE 1 IMPLEMENTATION OF GENERAL RECOMMENDATIONS

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
AGENCY CO-OPERATION AND PUBLIC PARTICIPATION				
1	WWC	PIMA to liaise with WWC to advise Minister on appropriate repres-entatives	High	On-going
2	WWC	"	Medium	On-going
3	PIMA, WWC	PIMA to liaise with relevant authorities	Medium	On-going
4	PIMA	"	Medium	On-going
5	PIMA	PIMA to refer meeting minutes to LGAs	Low	On-going
6	PIMA	PIMA to refer develop-ment proposals to relevant authorities	Medium	On-going
7	PIMA	PIMA to liaise with LGAs	Medium	On-going
8	PIMA, DPUD, LGAs	PIMA to liaise with DPUD and LGAs	Medium	On-going

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
9	PIMA, DOLA, LGAs	PIMA to liaise with DOLA and LGAs	Medium	On-going
10	PIMA	PIMA to advertise public comment period for management plans	Medium	On-going
11	PIMA	PIMA to advertise	Medium	On-going
12	WWC	PIMA to develop an education programme	Medium	On-going
13	PIMA, WWC	PIMA to develop an education programme	Medium	On-going
CONSERVATION AND ENVIRONMENTAL PROTECTION				
14	PIMA, WWC	PIMA to support the building of the Dawesville Channel. PIMA to continue water quality monitoring	High	One-Off
15	PIMA	PIMA to advise on all developments, town planning schemes etc in the catchment	Medium	On-going

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
16	PIMA, CM, SM, SW	PIMA to investigate the impacts of living on vessels on the estuary in order to develop a policy	High	One-Off
17	PIMA, LGA, CALM, DPUD	PIMA to produce an education leaflet, carry out replanting operations and discourage the public from removing foreshore vegetation	Medium	On-going
18	PIMA, WWC	PIMA to introduce the use of the newly acquired suction weed harvester and to investigate further improvements	Medium	One-off
19	DPUD, PHCDC, CALM, EPA, PIMA, LGAs	PIMA to liaise with all relevant authorities	High	One-off
20	PHCDC, DPUD, DOLA, LGAs	PIMA to implement Area Recommendations	High	On-going
21	DPUD, CALM,PHCDC	PIMA to liaise with DPUD, CALM and PHCDC	High	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
22	PIMA, PHCDC	PIMA to liaise with PHCDC	Medium	One-off
23	PIMA	PIMA to carry out tasks outlined by definition of the Waterways Protection Precinct	Medium	One-off
24	PIMA, LGA, DMH	PIMA to identify and monitor areas	High	On-going
25	PIMA, LGAs	PIMA to develop an information leaflet	Low	One-off
26	PIMA	PIMA to carry out tasks outlined by definition of the Bank Revegetation Precinct	High	On-going
27	PIMA, CALM	PIMA to liaise with CALM to determine appropriate propag-ation techniques	Medium	On-going
28	HD, PIMA, LGA	PIMA to liaise with HD and LGAs	Medium	On-going

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
29	DPUD, PIMA, LGA	PIMA to advise developers of the need to consult with the Department of Aboriginal Sites	Low	On-going
30	WAHC	PIMA to carry out investigations to identify sites and support proclamation	Low	One-off
31	WATC, LGA, WAHC	PIMA to identify areas	Low	One-off
LAND USE AND WATERWAY PLANNING				
32	PIMA, WWC	PIMA to provide advice to DPUD during preparation of study	Medium	One-off
33	DPUD, LGAs, CALM, DOLA, PIMA	PIMA to support the Peel-Harvey Regional Park Concept	Medium	One-off
34	DPUD, LGAs, PIMA, DOLA, CALM	PIMA to implement Area Recommendations relating to foreshore reserves	High	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
35	WWC, TREAS	PIMA to liaise with WWC in approach to TREAS to establish a fund	Medium	One-off
36	DPUD, PIMA, LGAs	PIMA to identify and prioritise foreshore areas for vesting	Medium	One-off
37	DPUD, LGAs, PIMA, DOLA	PIMA to identify areas	High	One-off
38	LGA, PIMA, MSR, DPUD, DMH	PIMA to implement Area Recommendations relating to recreational areas	Medium	One-off
39	DPUD, LGAs, PIMA, DOLA	PIMA to undertake investigations to determine the appropriate size of foreshore reserves. Liaise with DPUD, LGA, DOLA	High	One-off
40	DPUD, LGAs, CALM, PIMA	PIMA to identify appropriate management agencies. Liaise with DPUD, LGA, CALM	High	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
41	DPUD, LGAs & other relevant authorities	PIMA to advise on locations for service corridors	Low	On-going
42	DPUD and other relevant government agencies	PIMA to advise on alternative alignments for new services to avoid foreshore areas	Low	On-going
43	DPUD, LGAs, DA	PIMA to liaise with DPUD, LGAs and DA	Medium	On-going
44	LGAs	PIMA to advise LGAs on content of town planning schemes	Medium	On-going
45	LGAs	PIMA to advise LGAs on preparation of landscape plans	Medium	On-going
46	DPUD, PIMA, LGAs	PIMA to liaise with DPUD regarding recreational bodies	Medium	On-going
47	LGAs, PIMA	PIMA to liaise with LGAs to develop guidelines on advertising	Medium	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
48	PIMA	PIMA to liaise with boat owners and carry out appropriate works	Medium	One-off
49	PIMA, DA	PIMA to liaise with DA	Medium	On-going
50	PIMA, WWC	PIMA to liaise with Australian Heritage Commission	Medium	One-off
51	PIMA	PIMA to carry out tasks outlined by definition of the Public Access Precinct	High	On-going
52	DPUD, LGAs	PIMA to liaise with DPUD on development proposals	Medium	On-going
53	DPUD, Dev	Advise LGA and DPUD on development proposals	High	On-going
54	PIMA, WWC	Provide advice to DPUD when assessing applications	High	On-going

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
55	DPUD, LGAs, PIMA, DOLA	PIMA to advise DPUD and LGA on commercial development proposals	High	On-going
56	LGAs, DPUD, PIMA	PIMA to advise DPUD and LGA on commercial development proposals	High	On-going
57	LGA, DPUD, PIMA	PIMA to advise LGA and DPUD of need to refer certain proposals to EPA	Medium	On-going
58	EPA, PIMA	PIMA to inform developers of the need to comply with EPA guidelines for dredging	Medium	On-going
59	PIMA, Dev, EPA	PIMA to carry out water sampling monitoring programmes	Medium	On-going
60	DMH, LGAs	PIMA to support LGAs in developing a rating system	Medium	One-off
61	DPUD, LGAs	PIMA to defer approval of canal developments	High	On-going

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
62	WAWA	PIMA to liaise with WAWA to develop guidelines	Medium	One-off
63	WAWA, DPUD	PIMA to support WAWA in studies being undertaken	Medium	One-off
64	WAWA	PIMA to assist in preparing management plans	High	On-going
65	WAWA, DPUD, LGA, PIMA	PIMA to provide advice to WAWA	Medium	On-going
66	LGA, PIMA, DMH	PIMA to provide advice to LGA and DMH	Medium	One-off
67	LGA, PIMA, DMH	PIMA to advise on suitable locations	Medium	One-off
68	DPUD, PIMA, DMH, LGA	PIMA to advise on all commercial boating developments	Medium	On-going
69	DMH, PIMA	PIMA to advise DMH on the development of guidelines	Medium	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
70	LGA, PIMA, DPUD	PIMA to advise DMH on the development of guidelines	Medium	One-off
71	WWC, PIMA	PIMA to liaise with WWC to advise Cabinet	Medium	One-off
72	DPUD, LGA, PIMA	PIMA to identify areas	Medium	One-off
73	WAWA, PIMA	PIMA to advise on development proposals	Medium	On-going
74	PIMA	PIMA to advise on development proposals	Medium	On-going
TOURISM				
75	DPUD, LGA	PIMA to advise on development proposals	Medium	On-going
76	PIMA	PIMA to identify areas	Medium	One-off
77	PIMA	PIMA to prepare an information booklet	Medium	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
78	PIMA	PIMA to advise on development proposals	Medium	On-going
79	PIMA	PIMA to advise on proposed tourist operations	Medium	On-going
FISHING				
80	DF	PIMA to advise DF	Medium	One-off
81	DF	PIMA to advise DF	Medium	One-off
82	PIMA, DF	PIMA to prepare an education programme in consultation with DF	Medium	One-off
83	DF, PIMA	PIMA to assist DF in research	Medium	On-going
RECREATION				
84	MSR, PIMA, DPUD, LGA	PIMA to identify suitable areas	Medium	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
85	PIMA, EPA, WWC, DPUD, MSR	PIMA to continue research, monitoring and identify areas	High	On-going
86	LGAs, PIMA, MSR	PIMA to advise LGA	Medium	On-going
87	LGA, PIMA, MSR	PIMA to liaise with LGA regarding suitable sites	Medium	One-off
88	WWC, PIMA, LGA, MSR	PIMA to assist WWC in undertaking surveys	Medium	On-going
89	PIMA, LGA, MSR	PIMA to prepare a brochure	Medium	One-off
90	LGAs, PIMA, Dev, MSR	PIMA to advise on proposals	Medium	On-going
91	PIMA, LGA, MSR	PIMA to identify areas	Medium	One-off
92	PIMA, LGA, MSR	PIMA to identify areas	Medium	One-off

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
NAVIGATION AND BOATING SAFETY				
93	PIMA, LGA, DMH	PIMA to liaise with LGA and DMH to prepare a strategy	Medium	One-off
94	PIMA, LGA, DMH	PIMA to liaise with LGA and DMH to undertake investigations	Medium	One-off
95	PIMA, DMH	PIMA to liaise with and support DMH	Medium	On-going
96	DMH, PIMA, DPUD	PIMA to liaise with DMH to identify areas	Medium	One-off
97	DMH, PIMA, CALM	PIMA to liaise with DMH and CALM	Medium	One-off
98	DMH	PIMA to liaise with DMH	Medium	On-going
99	DMH	PIMA to liaise with DMH	Medium	On-going

General Recommendation Number	Responsibility for Implementation	PIMAs Strategy for Implementation	Priority	On-going or One-off Project
MANAGEMENT				
100	PIMA, all relevant authorities	PIMA to liaise with other authorities	High	One-off
101	PIMA, DPUD, all relevant authorities	PIMA to liaise with other authorities	High	One-off
102	PIMA, WWC	PIMA	High	One-off
103	PIMA, WWC, TREAS	PIMA to liaise with WWC to obtain funds for equipment	High	One-off
104	PIMA	PIMA to undertake training programmes	High	One-off
105	PIMA, WWC	PIMA to liaise with WWC	Medium	One-off
106	WWC, PIMA, DOSHWA	PIMA to liaise with DOSHWA	High	One-off

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APPENDIX 1

SYSTEM SIX RECOMMENDATIONS C50 AND C51

C50 *PEEL INLET*

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

Housing developments, a proposed canal development and some recreational activities may affect the area's conservation value.

The Environmental Review and Management Programme for the proposed canal development at the south-eastern end of the inlet channel has been approved by the Environmental Protection Authority and has resulted in the amended boundaries for the recommended area; the foreshore portion is smaller than that proposed in the System 6 "Green Book", and a new area has been included around Soldiers Cove. The area will be affected by the Mandurah By-Pass Road bridge, which is due to be built north of Channel and Creery Islands. There are PWD drains in the south-east of Peel Inlet.

The area is discussed in the Peel Inlet Management Authority's Management Programme, the Mandurah and Districts Planning Study, and the Peel-Harvey Estuary Study which includes a focus on its water catchment area and involves the study of the cause of the algal growth problem together with possible solutions.

The Peel-Harvey Estuary is probably the most important estuary in south-western Australia as a conservation area for water-birds. It has by far the largest pelican population in the region. The estuary also supports large populations of water-fowl such as grey teal; black swans are abundant; and many thousands of resident and migratory waders inhabit the area. Unusual species recorded include glossy ibis, yellow-billed spoonbill and royal spoonbill.

The most important areas as water-bird habitats are the extensive shallows around the southern and eastern shores and the tidal flats and shallows around Channel and Creery Islands. The shore areas in the north of Peel Inlet and bordering the main channel contain samphire flats and marshes important for eastern curlews and whimbrels, and this is one of the few places in the South-West where they can always be seen.

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

The recommended area, together with Harvey Estuary (C51), Lakes McLarty and Mealup (C52), Yalgorup National Park (C54), Clifton MPA (C55) and McLarty MPA (C56), which includes privately owned freehold land, Land Act reserves (including a National Park) and State Forest, constitutes open space of regional significance (see Figure 1, Chapter 4). The area is of regional significance because of its high conservation and recreation values and its proximity to the Perth and Bunbury regions and neighbouring rural districts. Not all land under the various land tenures within the area has conservation and recreation as primary management objectives; to enhance these values the management structure of the area, together with that of C51, C52, C54, C55 and C56, requires co-ordination.

RECOMMENDATIONS

C50.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C50.2 That the purpose of Reserve C8185 be amended to Conservation of Flora and Fauna and that the Reserve be vested in the WA Wildlife Authority.

C50.3 That the area of water surrounding Reserve C8185 at the entrance to Peel Inlet (as shown in Figure 37) be declared an Aquatic Reserve and vested in the WA Wildlife Authority.

C50.4 That Reserves B24036, C2707 and C7502 be cancelled and their respective areas added to Reserve B4990.

C50.5 That the area of water to the west of Reserve B4990 (as shown in Figure 37) be declared an Aquatic Reserve and vested in the WA Wildlife Authority.

C50.6 That, subject to Recommendation C50.5 being implemented, Reserve C28087 be cancelled and its land area added to Reserve B4990.

C51 *HARVEY ESTUARY*

The recommended area is situated to the east of the Old Coast Road, south of Mandurah, and comprises Reserve A23756, for Conservation of Flora and Fauna, vested in the WA Wildlife Authority; Reserve A31922, for Recreation, vested in the Shire of Murray; Reserve C2990, for Recreation and Camping, vested in the Mandurah Road Board; Reserves C36126, for Drainage and Conservation of Flora and Fauna, and C860, for Water, both vested in the Minister for Water Resources; Reserve C2758, for Recreation, Reserve C17318, for Public Utility, and part of Reserves C15028 and C25391, both for Drainage, all not vested; the southern portion of the Harvey Estuary; and Murray Locations 77, 733, 1209, 1275, 1496, 2320, 2986 and parts of Murray Locations 437, 479, 613, 720 and 793, all privately owned freehold land (Figure 38).

The recommended area comes under the Peel Inlet Management Authority's Management Programme, the Mandurah and Districts Planning Study, and the Peel-Harvey Estuary Study which involves the examination of its water catchment area and the cause of the algal growth problem along with possible solutions.

The area provides one of the most important water-bird habitats in south-western Australia. The waters south of Herron Point support large numbers of grey teal, black duck, black swan, red-necked avocet, crested grebe and yellow-billed spoonbill. The delta of the Harvey River is important in late summer, when thousands of ducks congregate on its banks.

Reserve A23756, comprising a large area on the eastern side of Harvey Estuary, supports woodland and open-woodland of jarrah, marri, bull banksia and slender banksia, with some peppermint and Christmas tree. Several low-lying swampy areas contain low woodland of swamp banksia and Moonah paperbark. The vegetation of Reserve A31922 ranges from low open-forest to low open-woodland and is dominated by slender banksia with a mixture of sheoak, bull banksia, Christmas tree, marri and Moonah paperbark. Reserves C2990 and C860 are situated on the western side of the Estuary and are characterised by tall woodland and open-forest of tuart.

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

The recommended area, together with Peel Inlet (C50), Lakes McLarty and Mealup (C52), Yalgorup National Park (C54), Clifton MPA (C55), and McLarty MPA (C56), which includes privately owned freehold land, Land Act reserves (including a National Park) and State Forest, constitutes open space of regional significance (see Figure 1, Chapter 4). The area is of regional significance because of its high conservation and recreation values and its proximity to the Perth and Bunbury regions and neighbouring rural districts. Not all land under the various tenures within the area has conservation and recreation as primary management objectives; to enhance these values the management structure for this area, together with that for C50, C52 and C54-C56, requires co-ordination.

RECOMMENDATIONS

C51.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

C51.2 That the southern portion of Reserve C2990 (see Figure 38) be excised, and that this portion be made a separate Reserve for Conservation of Flora and Fauna, and that the Reserve be vested in the WA Wildlife Authority.

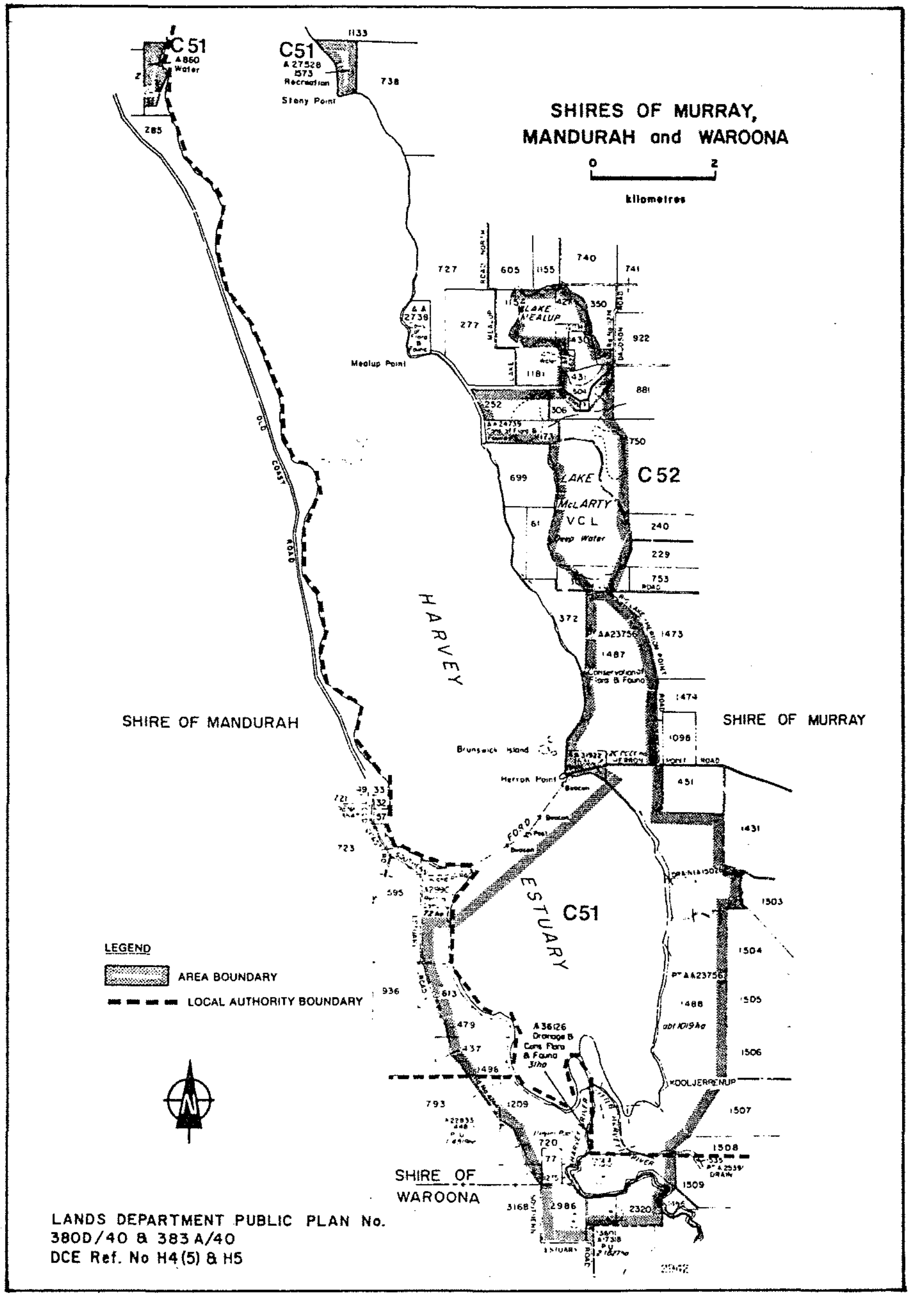
C51.3 That the area of Harvey Estuary south of "Ford" (as shown in Figure 38) be declared an Aquatic Reserve and that the Reserve be vested in the WA Wildlife Authority.

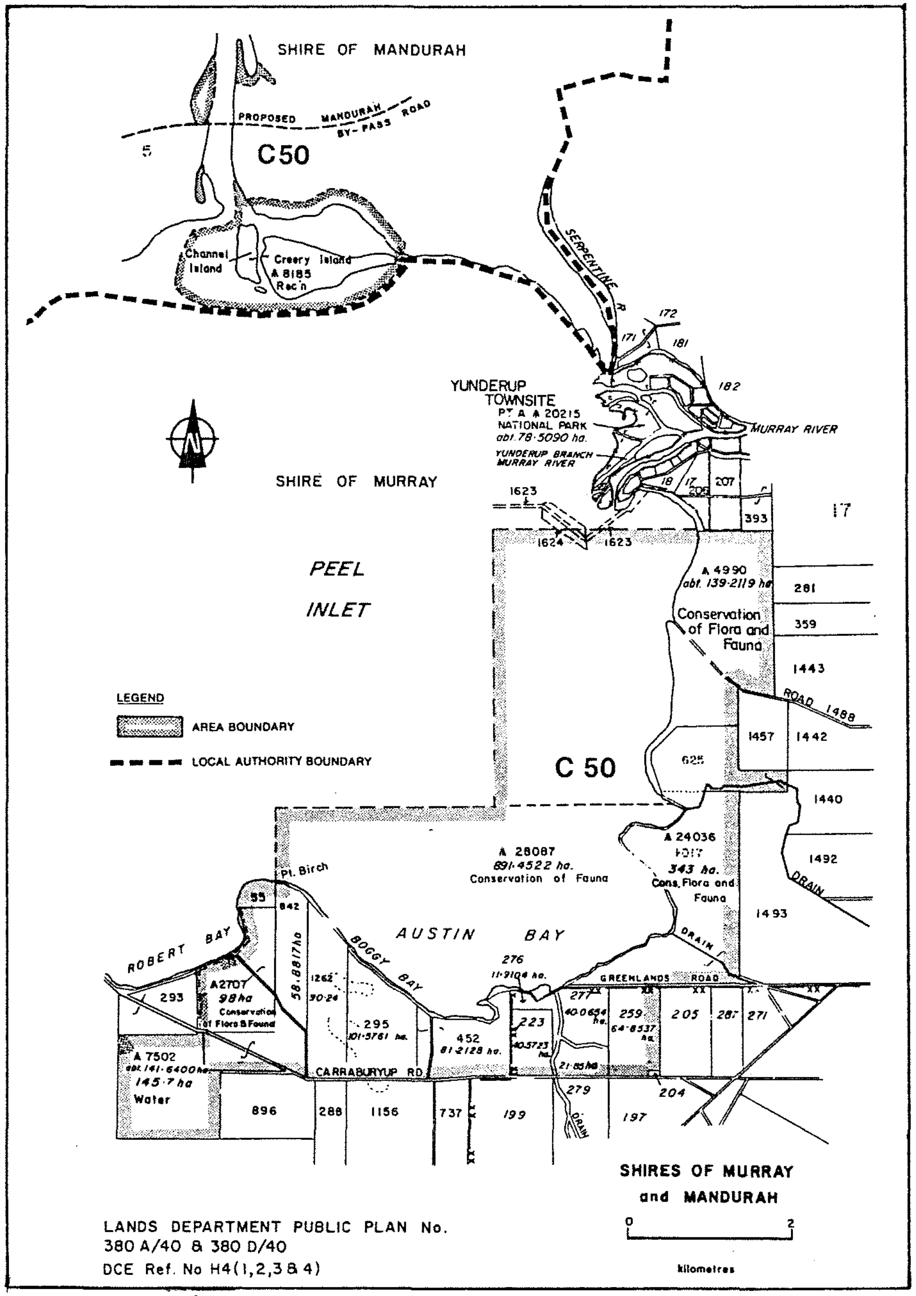
C51.4 That the purpose of Reserve C860 be amended to Parkland and that the Reserve be vested in the Shire of Mandurah.

C51.5 That the purpose of Reserve C27528 be amended to Parkland and that the Reserve be vested in the Shire of Murray.

C51.6 That the purpose of Reserve C17318 be amended to Parkland and that the Reserve be vested in the WA Wildlife Authority.

(DCE, 1983).





System 6 Recommendations C50 and C51.

ABBREVIATIONS

CALM	Department of Conservation and Land Management
CM	City of Mandurah
COP	Commissioner of Police
CPDOSPHA	Contingency Plan for Dealing with Oil Spills in the Peel-Harvey Area
DA	Department of Agriculture
DEMP	Draft Emergency Procedures Manual
Dev	Developer
DF	Department of Fisheries
DMH	Department of Marine and Harbours
DOLA	Department of Land Administration
DOSHWA	Department of Occupational Safety, Health of WA
EPA	Environmental Protection Authority
FB	Fire Brigade
HD	Health Department of Western Australia
LGA	Local Government Authority
ME	Minister for Education
MPH	Minister for Public Health
MRD	Main Roads Department
MSR	Ministry of Sport and Recreation
MT	Minister for Transport
MWR	Minister for Water Resources
NPNCA	National Parks Nature Conservation Authority
PHCDC	Peel Harvey Conservation and Development Committee
PIMA	Peel Inlet Management Authority
RAOU	Royal Australasian Ornithologists Union
SAW	Scout Association of Western Australia
SM	Shire of Murray
SWDA	South West Development Authority
TREAS	Treasury
WAHC	Western Australian Heritage Council
WAHMEMS	Western Australian Hazardous Materials Emergency Management Scheme
WAM	Western Australian Museum
WAN	WA Naturalists' Club
WATC	Western Australian Tourism Commission
WAWA	Water Authority of Western Australia
WWC	Waterways Commission

MAP LEGEND

RESOURCES (GREY)

- Land Act Reserve
- Municipal boundary
- Peel Inlet Management Area boundary
- Identified mosquito breeding site
- Land subject to inundation
- Swamp perennial
- Lake intermittent/shallow water

MANAGEMENT RECOMMENDATIONS

- Public Access Precinct
- Waterways Protection Precinct
- Bank Revegetation Precinct
- Acquire foreshore at future subdivision
- Proposed dredging site
- Proposed dredge spoil disposal site

Note: Area Recommendation numbers are denoted on overlays where recommendations are location specific (e.g. A.1)

Waterways Commission
Peel Inlet Management Authority
LEGEND
MANAGEMENT AREA BOUNDARY
WATERWAYS PROTECTION PRECINCT
PUBLIC ACCESS PRECINCT
BANK REVEGETATION PRECINCT
RECOMMENDATION NOS eg A3
A3
PROPOSED DREDGE SPOIL DISPOSAL SITE
PROPOSED DREDGING SITE
PEEL INLET ENTRANCE
SCALE 1:20,000
YUNDERUP CANALS
SCALE 1:20,000
PINJARRA TOWNSITE
SCALE 1:20,000
INDIAN OCEAN
MANDURAH
PEEL INLET
HARVEY
ESTUARY
SERPENTINE RIVER
MURRAY RIVER
HARVEY RIVER
PINJARRA
COODANUP
YUNDERUP
NOVARA
PLACID WATERS
WANNANUP
CADDADUP
FLORIDA
DAWESVILLE
Proposed Dawesville Channel
Robert Bay
Austin Bay
Boggy Bay
Herron Pt
Island Point
LAKE MEALUP
LAKE McLARTY
NOTE: ARTIFICIAL WATERWAYS AND CANALS
Under Section 3 (3) of the Waterways Conservation Act (as amended in 1982) any artificial canal, canal system, lake, lagoon or harbour connected to the waterway does not form part of the waterway unless specifically included by Order in Council.
Prepared by
ASSOCIATED SURVEYS PTY. LTD.
140 COLIN STREET, WEST PERTH.
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Peel Inlet Management Programme 1992

MINISTER'S FOREWORD

The waterways of Western Australia are among the state's most precious natural assets because of their conservation and recreation values, important fish stocks, and for the attractive focus they provide for residential development. The Government is committed to their long term conservation and management which, to be successful, must be based on careful planning with the full involvement of the community.

In 1982, the Peel Inlet Management Authority (PIMA) released its first Management Programme which provided a framework for its operations for the 1980's. However, the waterway environment and the pressures affecting it have changed dramatically since then and a much higher level of management will be necessary for the future.

In August 1990, PIMA released its Draft Peel Inlet Management Programme Review which was available for public comment for three months. PIMA received 30 detatiled submissions which have now been considered and the information used to complete this Management Programme.

The Peel Inlet and Harvey Estuary Management Strategy (ERMP Stage 2), released in 1988, outlined the work needed to achieve a better nutrient balance in the waterway. This Management Programme complements the ERMP Stage 2 by identifying other management issues and establishing a broad vision for the future. It also addresses the need to balance the competing demands for use and development with the need to conserve a healthy functional estuarine environment. The report contains 306 recommendations which provide a detailed strategy for the management of the waterway environment for the rest of the century.

The challenge now for PIMA is to effectively implement the Management Programme's recommendations and achieve the aim and objectives outlined in this report to the public.

Bob Pearce MLA
Minister for the Environment

SUMMARY

BACKGROUND

The Peel-Harvey Estuary is a major landscape feature and recreational resource of the South West and it includes wildlife habitats of international significance. The public gives high priority to the protection and rehabilitation of the estuarine waters and associated plant and animal communities.

Management of the waterway is the responsibility of the Peel Inlet Management Authority in co-operation with other State and local government authorities and the public.

The first Peel Inlet Management Programme was prepared in 1982 and was reviewed between 1989-91 to take account of population growth and increased development since then.

As a future basis for management PIMA has adopted the following beneficial uses of the waterway:

The waterway provides habitats for a variety of terrestrial and aquatic flora and fauna which should be preserved.

The waterway provides an important scenic feature and focus for leisure activities for metropolitan, regional and tourist populations and it should be accessible to the public.

The waterway serves as an important ocean outfall for a large part of the Swan Coastal Plain, Darling Scarp and hinterland.

The aim of the Management Programme is:

"To balance competing demands for use and development with the need to restore the nutrient balance of the waterway and conserve a healthy functioning estuarine environment for present and future generations."

PIMA is committed to the conservation and enhancement of the quality of the environment and amenity of the waters of the waterway and associated land, and to the control or prevention of pollution of those waters and that land. The onus is therefore on any proponent of development to show that it will not have an adverse impact on the area or on the beneficial uses of the waterway.

Eight broad planning and management issues were identified through consultation with State and local authorities, interested groups and the community.

For each of these issues a primary objective and a series of specific objectives were formulated. The General Recommendations outline the action required to achieve these objectives.

Following the General Recommendations, eighteen specific areas are defined. For each area the major planning considerations (covering biophysical resources, land use and tenure, and land capability) are listed, followed by Area Recommendations.

The Management Programme will be complemented by a number of detailed management plans.

GENERAL RECOMMENDATIONS

The eight planning and management issues and their primary objectives are listed below with a summary of the intent and scope of the General Recommendations arising from them. The recommendations are set out in full on the green pages of the main report and the agencies responsible for implementation are identified.

AGENCY CO-OPERATION AND PUBLIC PARTICIPATION

Primary Objective:

"Ensure that the local community and relevant State and local government authorities are adequately represented on PIMA and have the information and appropriate opportunities needed for effective involvement in the planning and management of the waterway."

The successful management of the waterway depends on co-operation between PIMA, other State and local government authorities and the public.

The recommendations cover:

- State and local government and community representation on PIMA.
- Establishment of administrative procedures to ensure that all planning policies, development proposals and management plans are referred to the relevant authorities.
- Public education programmes designed for specific groups.
- Public participation in decision making.

CONSERVATION AND ENVIRONMENTAL PROTECTION

Primary Objective:

"Minimise pollution of the estuary and protect and rehabilitate its waters, land, wildlife habitats and cultural sites in accordance with the ERMP Stage 2."

Over the past thirty years the leaching of fertilisers into the rivers which flow into the waterway has caused eutrophication of the estuary and deterioration of water quality, with serious effects on biological productivity and diversity, and economic and amenity values.

The Peel Inlet and Harvey Estuary Management Strategy, ERMP Stage 2, proposed a comprehensive strategy to restore water quality. The Management Programme supports those proposals.

The recommendations are directed towards:

- Improved catchment management to reduce fertiliser intake and controlling pollution from point sources.
- Construction of the proposed Dawesville Channel to improve water exchange between the estuary and the ocean.
- Continued harvesting of aquatic weed.
- Protection of important wildlife habitats through regional reservation and local vesting.
- Conservation of waterway margins through restoration and maintenance of fringing vegetation and control of erosion.
- Protection of Aboriginal and European cultural sites.

LAND USE AND WATERWAY PLANNING

Primary Objective:

"Ensure that land use within the Peel-Harvey Catchment maintains or enhances the quality and amenity of the waterway environment."

Effective resource management depends on recognising constraints as well as opportunities. The Management Programme seeks to protect the estuarine environment by identifying the type and level of development and use which can occur in particular areas without loss of natural values or increased management costs.

The recommendations provide for:

- Involvement by PIMA in the preparation of regional plans for development in the management area consistent with protection of its environmental values.
- Reservation and vesting of foreshores.
- Early consultation on proposals for subdivision or development.
- Assessment of proposals for commercial development to ensure that social, environmental and physical planning criteria are met.
- Protection of the landscape values of the area.
- Provision for and management of public access.
- Recognition of the possibility of climatic change and rise in sea levels.

TOURISM

Primary Objective:

"Provide for a range of tourist facilities which are compatible with the conservation of the waterway and which would benefit from an estuarine location."

The Management Programme recognises the importance of tourism in the Peel-Harvey management area and the need to provide for tourist facilities and activities. The recommendations are intended to ensure that there is consultation between planning authorities and potential developers, and that provision for tourists does not result in environmental degradation and loss of the qualities which attract people to the area. A tourist education programme will encourage visitors to understand and enjoy the waterway without spoiling it.

FISHING

Primary Objective:

"Manage the fish resources of the waterway for the benefit of the community."

The Peel-Harvey Estuary supports the most important commercial estuarine fishery in Western Australia and is also heavily used by amateur fishermen throughout the year.

The recommendations are intended to ensure:

- Sustainable and equitable use of the fish resource.
- Minimum conflict between commercial and recreational fishermen.
- Maintenance of water quality and habitats for all stages of fish life.

RECREATION

Primary Objective:

"Encourage a range of recreational opportunities that enhance and complement the waterway environment."

The Peel-Harvey Estuary is a major recreational resource for local people and tourists. Management planning should provide for a wide range of recreational opportunities while ensuring that intensive or inappropriate uses do not result in environmental loss.

The recommendations provide for:

- Identification of recreation reserves and sites for water-based activities.
- Improvement of facilities for foreshore users in identified areas.
- Research on recreation demand and trends.

NAVIGATION AND BOAT SAFETY

Primary Objective:

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

While management and control of boating is primarily the responsibility of the Department of Marine and Harbours, the Management Programme recognises that design and provision of boating facilities, and public education programmes can help to reduce hazards and improve public safety. The recommendations reflect this.

MANAGEMENT

Primary Objective:

"Ensure that a legislative and administrative base, and appropriately funded bodies and structures exist to achieve the primary objectives of this Management Programme."

Successful waterways management depends on co-operation between all agencies with responsibility for planning and management. The recommendations emphasise the need for continuing consultation and referral, and suggest improved emergency procedures.

Prepared for the

PEEL INLET
MANAGEMENT AUTHORITY

by the

WATERWAYS COMMISSION