North Arm Foreshore and Estuary Action Plan

For

The Friends of North Arm (FONA)

together with

Shire of East Gippsland

Department of Natural Resources and Environment

by

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Reserve Management/Eco-tourism/Government Relations

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NOVEMBER, 1996

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File No: 35/02/16

January, 1996

NORTH ARM
FORESHORE AND ESTUARY ACTION PLAN

EAST GIPPSLAND
SHIRE COUNCIL

The attached "North Arm Foreshore and Estuary Action Plan" report has been prepared for the Friends Of North Arm by consultants Landsmith Pty Ltd, Vantree Pty Ltd and Frank Hanson Pty Ltd following an allocation of Coast Action funding by the State Government. The Foreshore and Estuary Action Plan forms a comprehensive guide for the Friends Of North Arm, East Gippsland Shire Council, Department of Natural Resources and Environment and the Lakes Entrance community for the sustainable management of North Arm and its immediate hinterland.

The Action Plan document is available for public comment until 21st February, 1997 after which Council and the Department of Natural Resources and Environment will consider comments and submissions received.

Council and the Department of Natural Resources and Environment will determine their views and recommendations following consideration of public and agency submissions.

Following public consideration, submissions, modification and adoption by Council and the Department of Conservation and Natural Resources it is intended that funding opportunities for implementing the final recommendations be explored.

Eric Sjerp
Environmental Planner

Disclaimer - The attached document "North Arm Foreshore and Estuary Action Plan" is not necessarily representative of the views of the East Gippsland Shire Council or the Department of Conservation and Natural Resources.

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DISCUSSION PAPER

TO ACCOMPANY

THE NORTH ARM AND FORESHORE AND ESTUARY ACTION PLAN

PRESENTATION TO
THE EAST GIPPSLAND SHIRE COUNCIL
AND
THE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT

10TH DECEMBER 1996

F.O.N.A.
Friends Of The North Arm

From its very beginning, FONA has known that an action plan for the North Arm is of prime importance in any movement to prevent further degradation of the Arm and to attempt to restore it to its original condition. The completion of this action plan, therefore, is a very significant event, and FONA is gratified to be able to present it to the East Gippsland Shire Council and to the Department of Natural Resources and Environment in the presence of representatives from East Gippsland Water and Gippsland Ports. All of these organisations will need to work together if the plan is to serve the purpose for which it was designed.

The plan requires careful studying, and I have highlighted on the following pages some of the issues which are of particular importance to FONA. That is not to say that there are not many other equally important issues which need careful attention, and I do hope that this report does not simply gather dust on your shelves! FONA is most anxious to support the relevant authorities in implementing the plan, and is prepared to carry out its role in disseminating information and in providing 'hands on' community work as needed.

In conclusion, I acknowledge the role played by Coast Action and the East Gippsland Shire Council in providing funding for the plan: Coast Action through grants and the Shire by contributing money which had been earmarked for the Friends of the North Arm by the Foreshore Committee, when it was disbanded on council amalgamation.

We thank them all, and we believe that Landsmith Pty. Ltd., Vantree Pty. Ltd. and Frank Hanson Pty. Ltd. have provided us with a good working document which, if used wisely, is a *'good framework for effective integrated management by the relevant agencies and the community'* (page 4).

Margot Kerby
President, Friends of the North Arm
10th December 1996

1. On page six, you will find a summary of the main issues with the necessary actions listed, prioritised and apportioned to the responsible authority.

   We see for instance, that a major issue is water quality; aspects of water quality involve management of seagrass, management of nutrient and storm water, and management of recreational boating. There follows a summary of the actions required to manage each of these issues, a priority rating given and the responsible authority is noted. Details of the issues and of the recommended actions are to be found in the body of the text, but this one page gives a broad brush picture of the issues and processed needed to handle each one.

2. On page seven, we see that two public forums were held and that the information gained at these forums was used in the formation of the plan. Other sources include the Gippsland Lakes Management Plan and the Gippsland Regional Environmental Study.

3. I draw Council's attention to the last paragraph on page nine ... *'In general, both State and Local Government adopt an extension and advisory role rather than an enforcement approach when dealing with catchment based issues.* **However, our public consultation indicated dissatisfaction with the low level of enforcement applied by State and Local Government on many catchment issues**, *such as subdivision development, roads and gravel pit management on private land'.*

   FONA endorses these comments and believe that Council should be much more active in ensuring that conditions applying to planning permits are adhered to, especially in subdivisions where conditions meant to ensure the preservation of the environment are ignored with impunity.

4. FONA endorses the comment on page five which reads... *'The most significant single recommendation in the plan is the need to reduce nutrient in stormwater from the urban areas of Lakes Entrance and Kalimna entering the Arm. Excessive seagrass growth and algal problems reflect high nutrient inputs. Increased urban expansion without proper attention to this issue is the greatest threat to the North Arm estuary'.*

   The plan emphases the need for effective silt traps in all stormwater drains and for their regular maintenance. FONA believes that this process is a relatively simple start to controlling the entry of silt into the Arm and that such a system should already be in place. Stormwater drains which do not have silt traps should have them fitted as a matter of urgency, and a regular maintenance regime should be arranged to clean and repair silt traps where they already exist. Similarly, the removal of nutrients from storm water should be occurring before the water reaches the lake.

As the plan states on page 19 ... *'The management of stormwater nutrient is of the utmost importance'*. FONA draws your attention to paragraph 6.2 Stormwater Management on page 31; it believes that the health of the waters in the North Arm largely depends on the commitment of the relevant authorities to carrying out these measures.

The suggested Eastern Creek Wetland development is a possible method of filtering out nutrients. The plan suggests, and FONA concurs, that detailed studies need to be undertaken before this part of the plan proceeds. Appendix 6 is a paper on constructed wetlands, and the information it contains is a useful starting point for designing such a development.

FONA points out that Eastern Creek is not the only stormwater discharge point into the Arm - the drain which enters the Arm between View Street and Ferndale Parade drains all the urban area north of Dargo Street up past O'Neill's Road, an area which has seen enormous development over the last few years. There are also many other discharge points further up the Arm.

Monitoring of **all** stormwater from **all** the catchment area should be treated as a priority.

5. While the action plan does not recommend extensive dredging, it does recommend that dredging be carried out around the jetties and boating area along Marine Parade (see the summary of actions on page six). FONA believes that such dredging should be carried out as soon as possible because it would improve the amenity of that part of the Arm which is used extensively. FONA would also like to see the recommendations regarding the cutting of the seagrass in this area and near the Ian Street jetty implemented as soon as possible for the same reason.

6. FONA wishes to elaborate on the last paragraph of 6.5 on page 32 regarding the land to the east of the Bowls Club car park. We believe that this area should be revegetated with appropriate native species as a priority. It would then become a buffer between the formal recreation area of the Bowls Club and the proposed wetlands development and could be incorporated into the East Gippsland Shire Recreation Plan.

7. We note that the plan recommends that monitoring of tides and water movements should continue. FONA believes that it is important to collect this data, but understands that the anemometer at the public jetty has been vandalised and is currently inoperative, and that there will therefore be gaps in the data collected.

NORTH ARM FORESHORE AND ESTUARY ACTION PLAN

Acknowledgements

The consultant team wishes to acknowledge the tremendous input and assistance from the Friends of North Arm, especially in the public consultation process for this plan.

Thanks are also due to the Steering Committee for the project which, together with the Friends, included Eric Sjerp (East Gippsland Shire) and Rob Willersdorf (Department of Natural Resources and Environment).

Finally, thanks to the people of Lakes Entrance for their ideas, concerns and interest in what is, to them, one of the town's most important natural assets.

Ian Smith
Landsmith Pty Ltd

Gerry Byrne
Vantree Pty Ltd

Frank Hanson
Frank Hanson Pty Ltd

CONTENTS

A. PREFACE

The management objectives of this plan are:

- To conserve the native flora and fauna of the Arm and its immediate environs.
- To identify measures to ensure water quality appropriate for habitat protection and public amenity.
- To promote sustainable catchment management practices.
- To provide opportunities for a range of appropriate recreational and tourist activities on and surrounding North Arm.
- To protect and enhance landscape and cultural values of the Arm and its surrounds.
- To improve community understanding of the nature of the North Arm ecosystem and its management.
- To provide a framework for effective integrated management by the relevant agencies and the community.

B. SUMMARY AND VISION

This plan forms a comprehensive guide for sustainable management of the waters and environs of North Arm, a body of water overlooked by the township of Lakes Entrance in Gippsland, Victoria. North Arm is part of the much larger Gippsland Lakes estuary and the management issues here are a microcosm of the larger issues affecting the Gippsland Lakes. The catchment of North Arm contains forest, farmland and the urban areas of Lakes Entrance. The plan emphasis is on providing for amenities and recreational opportunities that are in balance with the environmental values of the North Arm and its catchment.

Significant management recommendations include:

- Improved management of seagrass, jetties, shoreline and landscape in the section of North Arm in urban area of Lakes Entrance.
- Constructed wetlands to reduce nutrient entering the waters of North Arm from the Lakes Entrance urban areas.
- A walking track system on the foreshore below Seaview Parade and from the Lakes Entrance recreation reserve north towards the Colquhoun Forest.
- Opportunities for commercial uses associated with the Recreation Reserve section.
- Revegetation of public land foreshore areas on the west side of North Arm and weed control programs for the foreshore generally upstream to the Capes Road area.
- Planning guidelines for subdivision and development in the catchment areas north of Lakes Entrance.

The most significant single recommendation in the plan is the need to reduce nutrient in stormwater from the urban areas of Lakes Entrance and Kalimna entering the Arm. Excessive seagrass growth and algal problems reflect high nutrient inputs. Increased urban expansion without proper attention to this issue is the greatest threat to the North Arm estuary.

SUMMARY OF ISSUES AND RECOMMENDED ACTIONS

The recommended actions in response to the broad issues identified during this study are summarised below. Photomontages 1-3 visually show possible proposals. Detailed actions and guidelines are listed in the area based plans for the study area and in 9.0 which follows.

ISSUES - SUMMARY		ACTIONS - SUMMARY (Responsibility in brackets)	Priority
1. Water based	- management of seagrass	Cut and remove live seagrass in Marine Parade section, dredge near jetties to deepen, connect future subdivisions to sewerage scheme (EGSC/NRE/Gippsland Ports/E.G.Water).	High
	- management of nutrient and stormwater	Construct wetland Eastern Creek, manage stormwater higher up in the urban catchments to absorb nutrients from urban Lakes Entrance (EGSC).	Top
	- management of recreational boating	Improve Marine Parade jetties (NRE), use new beach at Rec Reserve, provide landing point Mississippi Creek (NRE), continue speed limit restrictions (Gippsland Ports). Focus on passive boating in upper reaches. Retain water ski area until wetland developed, then review (Gippsland Ports).	Medium
2. Land based	- better access along foreshore frontage, need for walking tracks.	Implement walking track network on frontage, act on foreshore privatisation (EGSC/NRE).	High
	- revegetation/weed control on frontage and private land.	Commence western shoreline revegetation (NRE). Revegetate and control weeds in conjunction with track construction eastern side (EGSC).	Medium
	- controls on adjacent developments to prevent sediment transport.	East Gippsland Shire Council to adopt codes of practice, land capability analysis and "whole farm" approach to subdivisions.	High
	- landscape preservation.	Include landscape provisions in EGSC Strategy Plan (EGSC).	High
3. Flora and fauna	- co-operative management of rainforest on private land and other native vegetation.	Provide encouragement by rate incentives, grants and volunteer assistance to owners of rainforest (NRE/EGSC). Seek listing under the F.F.G. Act for the Limestone Pomaderris shrubland located near the Girl Guides camp on North Arm (FONA).	High
	- environmental weeds and noxious weed encroachment.	Incremental weeding and revegetation programs, weed control via walking track access (NRE/EGSC).	Medium
	- pest animals and urban wildlife.	Provide "safe" areas for water birds in North Arm. Control pest animals, domestic pets. Disseminate information.	Medium
4. Information, community involvement	- need for information on recreation opportunities and natural attractions.	Incorporate interpretation facilities in Eastern Creek wetland once completed (EGSC/NRE).	Medium
	- need for information on catchment issues for North Arm residents.	Prepare information brochure directed at residents in North Arm catchment using this plan as a source (FONA).	High
	- need for "hands on" community works to improve North Arm.	Friends of North Arm to act as initiator, facilitating community action.	High

1 INTRODUCTION

1.1 Background to plan preparation

"Friends of North Arm" (FONA), a local community group, together with the Shire of East Gippsland (EGSC) and the Department of Natural Resources and Environment (NRE) gained funding assistance from "Coast Action" (a Victorian Government program) for preparation of this plan. Funds were also provided from the former Lakes Entrance Foreshore Committee towards the project. FONA has been responsible for the community input process. The Shire and NRE are the managers of the public land foreshore and North Arm water body. The task of the consultant team has involved evaluation of a water quality and hydrodynamics, foreshore management, habitat conservation, recreation opportunities and planning guidelines to produce recommendations for management actions in the future. The plan draws on the extensive planning work already completed for the Gippsland lakes in general, especially the Gippsland Lakes Management Plan (DCE 1991) which was, in turn, based on comprehensive scientific studies of the lake system done during the Gippsland Regional Environmental Study (GRES) in the late 1970s and other studies in the 1980s. Unfortunately there are no specific data available on estuarine conditions in North Arm and further study is recommended. The public were invited to two forums: the first, a "Search Conference" to gain information and issues; and the second to discuss draft recommendations for action. This final plan (as accepted by "Friends of North Arm", the client) contains elements and actions which may require further community consultation if they are to be implemented. The Eastern Creek wetland proposal is one example.

1.2 Structure of the plan

- The plan recommendations are largely contained on the area based plans enclosed, and rely on a visual rather than a written approach.
- The written report contains background information on resource assessment, management responsibilities and current strategies.
- The section on management issues draws on the verbal and written submissions received from the public and managing agencies during the preparation of the plan.
- Management guidelines for specific generic issues like landscape, water quality and monitoring are also in this report. These guidelines often reflect those listed for the larger Gippsland Lakes area in the Gippsland Lakes Management Plan (DCE 1991) which should be read in conjunction with this document if further detail on issues is required.

2 LAND TENURE AND RESPONSIBILITIES

2.1 Background

The waters, bed and foreshores to North Arm are public land reserved before 1900 for protection of coastline values. In some sections the original foreshore reserve has diminished due to erosion, but generally the reservation is intact and quite wide in places where a surveyed rather than a frontage distance reservation has been made (e.g. western shoreline north of Kalimna). Although these reservations are Crown land under the *Crown Land Reserves Act 1978*, management responsibility for the section of eastern shore from North Arm Bridge to Capes Road is undertaken by EGSC (as committee of management). The western shorelines and northern reaches are managed directly by NRE. A significant area, the Lakes Entrance Recreation Reserve, abuts the North Arm foreshore reservation below Eastern Creek. The Recreation Reserve includes a sports oval, caravan park and bowling and tennis clubs within its area. Recreational use on the waters of North Arm are controlled by Gippsland Ports, who also maintain navigational beacons and speed zones.

Jetties on North Arm are licensed by NRE. There are overhead power lines crossing the Arm to Kalimna and underwater pipes supply water and other services across the bed of North Arm.

2.2 Area tenure - public land

- The northern part of the catchment is public land reserved as State Forest (Colquhoun State Forest).
- The foreshore frontage to North Arm has been reserved as Crown land since last century. Erosion of the frontage has reduced (and in one location entirely removed) the width of frontage in Crown reservation in some places.
- Dumping of sand and dredging fill has increased the width in other sections, especially the lower parts.
- Other public land categories within the catchment include roads, drainage easements (such as Eastern Creek), water reserves, wetland areas and Recreation Reserves.
- The waters and bed of North Arm are reserved Crown land.

Map 9 Shows details of land tenure for North Arm environs.

2.3 Responsibility for management

- **Colquhoun State Forest** - NRE as direct manager.
- **Foreshore frontage**
  - Southern and eastern shoreline from North Arm mouth to Capes Road and northern shoreline upstream to eastern end Seaview Parade - EGSC.
  - Remainder of frontage - NRE as direct manager.
- **Other public land**
  - Eastern Creek - EGSC.
  - Lakes Entrance Recreation Reserve - delegated management to Lakes Entrance Recreation Reserve Committee of Management (an elected local committee).
  - Drainage easements within Lakes Entrance township - EGSC.
  - Other reserves - direct management by NRE except where the reserve has been established for municipal purposes (such as a road or a water reserve) where the managing agency may be EGSC or East Gippsland Water.

- Waters of North Arm - the bed and water body components, fisheries and seagrass are NRE responsibility.
- Responsibility for navigation and boating use is with Gippsland Ports. Jetties are licensed by NRE.

2.4 Private land in North Arm catchment

The area of the catchment in private ownership is shown below.

Table 1

Location	Total area of freehold land (ha)	Area of natural vegetation (ha)	Area of agricult'l land (ha)
Catchment to west of North Arm south of Colquhoun State Forest	1,010	231 (23%)	779 (77%)
Catchment to east of North Arm south of Colquhoun Forest	973	657 (67%)	319 (33%)
Urban land Lakes Entrance	308	4 (1%)	NA
Urban land Kalimna	38	6 (16%)	NA

Agricultural use in the rural catchment areas listed above include about 60 agricultural enterprises, mainly beef cattle or beef and sheep properties (ABS 1995). Horticulture, orchards, emu, ostrich, deer farming and horse breeding enterprises on smaller farmlets is an increasing component of agriculture in the catchment.

Activities on private land are generally controlled by the Planning Scheme for EGSC which contains provisions such as land use, subdivision, roading standards, service provision and environmental considerations.

Other regulatory controls are contained in Victorian Government legislation such as the *Catchment & Land Protection Act, Wildlife Act, Flora and Fauna Guarantee Act* and the *Environment Protection Act*.

In general, both State and Local Government adopt an extension and advisory role rather than an enforcement approach when dealing with catchment based issues. However, our public consultation indicated dissatisfaction with the low level of enforcement applied by State and Local Government on many catchment issues, such as subdivision development, roads and gravel pit management on private land.

3 PRESENT STRATEGIES IN SUMMARY

3.1 East Gippsland Shire (EGSC)

The EGSC is forming a Planning and Development Strategy at present. The strategies listed below are interim.

- Maintain urban interface up to Recreation Reserve for walking, cycling, hire boat operation, public boat launching (2 ramps) and foreshore parking.
- Give responsibility for foreshore reserve fronting the Recreation Reserve to the Recreation Reserve Committee of Management.
- Manage Eastern Creek drain as major stormwater outlet for urban area.
- Manage Kalimna rainforest gully as major stormwater outlet for urban Kalimna.
- Review strategy for subdivision within catchment as part of general Shire-wide planning strategy review.
- Manage seagrass accumulations near urban areas as necessary.

3.2 Department of Natural Resources and Environment (NRE)

- Manage public land in accordance with the Land Conservation Council recommendations (see 5.3).
- Manage foreshore, estuarine and flora and fauna issues generally in accordance with Gippsland Lakes Management Plan.
- Manage jetty issues in accordance with the draft "Jetties zoning plan - Gippsland Lakes" (DCNR 1994).

Aerial view of North Arm showing original vegetation on the left and the extending urban areas of Lakes Entrance on the right.

3.2.1 Gippsland Lakes Management Plan

Excerpts from the Gippsland Lakes Management Plan (DCE 1991) which are relevant to North Arm are below. Management agencies have been updated as appropriate.

C21. The NRE and EGSC will jointly prepare a plan to co-ordinate recreation and tourism developments in North Arm and protect the natural resources of the Arm from impact due to the developments.

C2. NRE will undertake a landscape assessment study of the Gippsland Lakes environs.

C5. The Gippsland Ports in consultation with EGSC and NRE will increase capacity of the public jetty system with extensions at Lakes Entrance.

C16. NRE will assess the suitability of public land adjoining present and potential tourist destinations for development or leasing subject to proper protection of environmental values.

C17. The Committees of Management with NRE assistance will prepare management plans for Crown land reserves at Lakes Entrance.

C18. The NRE and EGSC will require marking of private land boundaries where appropriate to ensure that development of private land does not block access to public land foreshores.

C19. Municipalities around the Lakes will investigate the performance of various beach cleaning systems and the practicability of joint purchase of a suitable system.

D3. Members of the community should:

(a) recognise that activities such as jetty construction and dredging will damage lake bed vegetation and sand flats that form important fish or bait habitat. While the local effects may be small, the net effect of such actions on the Lakes as a whole accumulate and may become significant.

(b) recognise the need for greater care in minimising the impact of a wide range of recreational activities on fish habitat in the Lakes.

D5. Committees of Management and NRE will improve facilities and access for lakeshore fishing, especially at Lakes Entrance.

E3. NRE and relevant interest groups will:

(a) consolidate knowledge on rare and endangered species and publish as appropriate.

(b) nominate those species and communities threatened with extinction and or the processes that threaten them for listing under the Flora and Fauna Guarantee Act 1988.

E4. NRE and EGSC in conjunction with the community will:

(a) develop consistent vegetation management standards and practices for application to public and private land.

(b) apply them through regional/local provisions of Planning Schemes.

E5. Private land owners should recognise the importance of vegetation on their land as fauna habitat and clear as little as possible.

E7. Private land owners should not allow non-native plants to extend outside their property.

E8. NRE will undertake staged resource assessment of all wetlands in the Gippsland Lakes and catchment to provide:

(a) information to assess relative conservation values.

(b) an information base for future management.

NRE - Department of Natural Resources and Environment EGSC - East Gippsland Shire Council

F21. NRE and EGSC will:

(a) ensure that development of private land does not block access to public land foreshores.

(b) indicate by use of signs and boundary markers where appropriate, land that is publicly owned and available for community use.

F22. NRE will:

(a) require the removal of unauthorised facilities on public land.

(b) strongly discourage damage to vegetation on public land, including legal action where appropriate.

(c) in consultation with appropriate interest groups, phase out grazing leases on public land foreshores.

3.3 Land Conservation Council recommendations

The Land Conservation Council (LCC) is the government agency responsible for recommending use of public land to provide for the balanced use of land in Victoria. The LCC published final recommendations for the Gippsland Lakes Hinterland study area in 1983 after extensive public consultation.

The recommendations have been accepted by Government, although only partially implemented during the intervening thirteen years. Public land management agencies are required to manage land categories in the spirit of the recommendations until detailed implementation is completed. Sections J and K do not recommend any radical change in land status but they do state clearly the directions public land managers must take in both areas.

The pertinent sections which apply to the North Arm are Section J (Gippsland Lakes Foreshore) and Section K (Rivers and Streams).

Section J FORESHORE RESERVE

The bulk of the Gippsland Lakes foreshore reserve is included within the Gippsland Lakes reserve (see Recommendation A5).

Not included in that area are stretches of foreshore reserve at Lakes Entrance, Metung, Paynesville, Eagle Point, and the township of Raymond Island, which are the subject of this recommendation. Being adjacent to major centres of population, these stretches receive very heavy use. One of their most important functions is to provide public access to the lakes shore, and they contain many sites where recreational facilities such as picnic areas, boat-launching ramps, toilet blocks, and car parks are provided.

Public boat marinas and port facilities have been established at Paynesville, Metung, and Lakes Entrance, using the foreshore reserve. Jetties, both private and public, and boat moorings have also been constructed.

Council recognises the increased demand for boat storage facilities around the lakes. It believes that if public land is to be used for marinas then it should be on these stretches of foreshore reserve adjacent to existing urban infrastructures.

Recommendation

J2 That the area defined below and shown on the map (includes foreshore of North Arm)

(a) be used to:

(i) provide opportunities for informal recreation for large numbers of people

(ii) provide facilities for fishing and boating (including harbour facilities) together with the necessary navigation aids

(iii) protect and conserve natural landscapes and ecosystems to the extent that this is consistent with (i) and (ii) above

and that the management authority

(b) manage the area according to the policies developed by the Coastal Management and Co-ordination Committee

(c) in its policies for the foreshore reserve, recognise the following principles:

(i) any major foreshore development projects should be subject to a detailed environmental study prior to commencement by the body proposing such developments (examples of such projects would include proposals for jetties, marinas, retaining walls, etc.)

(ii) existing legal occupation of the foreshore reserve by private individuals or organisations could be continued until and unless they conflict with public use of the area; the only new such occupations that should be considered are for water-orientated uses such as yacht clubs.

(iii) any structure obstructing legitimate public use should be removed

and that the area be permanently reserved under section 4 of the Crown Land (Reserves) Act 1978 as foreshore reserve, the lakeside boundary being low-water mark, and be managed by NRE.

Public land water frontage reserves (includes Mississippi Creek)

Water frontage reserves are defined for the purpose of these recommendations as being all existing water frontages and other reserves or unreserved public land adjoining streams except for those areas, not currently reserved as a water frontage, that have been set aside elsewhere in these recommendations whether as part of a large reserve (such as a State park or reserved forest) or for some special purpose (such as a flora, recreation or streamside reserve).

Recommendation

K1 That the public land water frontages:

(a) be used to

(i) protect adjoining land from erosion by the maintenance of adequate vegetation cover

(ii) maintain the character and quality of the local landscape

(iii) conserve native flora and fauna

(iv) provide opportunities for low-intensity recreation

(v) allow access to water and for grazing of stock by adjoining landholders under licence where appropriate

that

(b) (i) where a licence has been issued for a public land water frontage as in (a) (v) above, restricted recreation use by the public be permitted (non-damaging activities such as walking, nature observation, fishing, or just relaxing should be allowed, while potentially damaging activities such as camping, lighting fires, or using motor or motorised recreation vehicles should be prohibited)

(ii) licensees be required to provide stiles in any fences erected across their licence area if requested to do so by the management authority

(iii) cultivation not be permitted, except with the approval of NRE.

(iv) in particular cases, licensees be required to fence off and exclude stock temporarily from some parts of the licence area where, in the opinion of the management authority, special measures are necessary to protect water supplies, to

rehabilitate eroding areas, or to permit regeneration of native plants that have particular values for nature conservation

that

(c) the NRE be consulted prior to the proclamation of roads, the consultation of roadways, or the creation of buildings on public land water frontages

and that

(d) (i) public land water frontages be permanently reserved under section 4 of the Crown Land (Reserves) Act 1978

(ii) where it is not within or adjacent to a reserve or park, it be managed by the NRE or by a committee of management where one is appointed.

3.4 Waters of North Arm

The bed of North Arm is Crown land managed by NRE.

There is no formal strategy in place by any managing agency specifically for the waters of North Arm. The Gippsland Ports is responsible for the maintenance of navigation within the Arm. In practice this means the maintenance of the navigation piles that show the deep channels and of the public jetty facilities. At various times the Gippsland Ports has assisted with advice on dredging and boating issues. At present under an agreement with the shire, the Gippsland Ports is placing approximately six thousand cubic metres of sand along the beach in front of the public caravan park. The Recreation Reserve Committee of Management has a long standing agreement with NRE/EGSC to extend the shoreline of the reserve into North Arm to provide additional recreation area. The limit of extension is defined on NRE files, and is shown on Map 10 as a dotted line offshore from the Reserve.

The Lakes Entrance Recreation Reserve - looking south across Eastern Creek, showing area of shoreline extended by filling to provide additional recreation area.

4 RESOURCE ASSESSMENT

4.1 Water quality and hydrodynamics assessment

All of the waters from the North Arm catchment flow into the North Arm estuary. The catchment has a variety of land uses and each can be expected to contribute different amounts of nutrients into the estuary. The sizes of the various components and the approximate nutrient loading generated in each part of the catchment is shown in Table 2 below. They reflect the variability that can exist within various catchments. An unknown amount of these exports appear in waterways, depending on the absorptive capacity of the areas across which the flow to waterway occurs. Natural vegetation, pasture and wetlands will absorb more than urban paved areas, for instance.

NUTRIENT FACTORS NORTH ARM

Table 2 - Estimates of phosphorus and nitrogen export rates by land use.

The table below draws on DCNR data sources (1993) which give a range of export rates for each land use type. The percentages contributed by each land use type in the North Arm catchment are shown for a range of rates : low, medium and high.

Area description	Area hectares	Estimate of amount of nutrients generated by land use (kg/year) Phosphorus (Total P)			Nitrogen (Total N)		
		Low	Mod.	High	Low	Mod.	High
1 Colquhoun State Forest (north of Scriveners Rd) (Natural vegetation)	5,300	53 (41%)	106 (15%)	212 (8.7%)	316 (21%)	1,060 (20.5%)	2,120 (17.6%)
2 Catchment to west of North Arm (south of Scriveners Road)							
(a) Natural vegetation	231	2.3 (1%)	4.6 (0.6%)	9.2 (0.4%)	13 (0.8%)	46 (0.9%)	92 (0.7%)
(b) Pasture	779	23 (18%)	167 (23%)	311 (13%)	77 (5%)	1,558 (30%)	3,583 (30%)
3 Catchment east of North Arm (south of Scriveners Road)							
(a) Natural vegetation	653	6.5 (5%)	13 (2%)	26 (1%)	39 (2.5%)	131 (2.5%)	262 (2.2%)
(b) Pasture	319	9.5 (8%)	68 (9.6%)	127 (5.2%)	32 (2%)	638 (12.4%)	1,467 (12.2%)
4 Urban land							
(a) Kalimna	38	4 (3%)	38 (5.4%)	190 (8%)	114 7.5%	190 3.7%	494 4.1%
(b) Lakes Entrance	307	30 (23%)	307 (43%)	1,535 (63%)	921 (61%)	1,535 (30%)	3,991 (33%)
	7,627 ha	128 kg	703 kg	2,410 kg	1,512 kg	3,600 kg	12,009 kg

Even allowing for a range of absorptions, the contributions from the urban areas of Lakes Entrance are probably the most important inputs to North Arm nutrient loads. Any management plans to reduce nutrient inputs will have most effect if they are concentrated on the urban inputs. Tests for nutrients in Eastern Creek are shown in Appendix 5.

The estuary probably has a high nutrient load within the water column because of the abundant epiphytic algae on the seagrass, and because of the abundant growth of the seagrass and free algae. Blue green algae, occurring as blooms in the wider Lakes area, appear to enter North Arm on tidal flows, rather than originating in North Arm. However it is also clear that in biological terms, the estuary is healthy. There is an extensive bird population feeding on the fauna within the estuary waters and just a handful of the living seagrass taken from the estuary is sufficient to demonstrate the abundance and diversity of the fauna living within the seagrass mass.

Concerns that have been expressed about the health of the estuary seem to stem from the unsightliness of the free floating algae that collects in downwind pockets and from the smell of the decomposing seagrass on the shore, especially in summer.

Hydrodynamics

Preliminary measurements of the flows within the estuary due to tides were carried out over two days using floating drogues. These were dropped in a number of places and their movements were plotted over two tidal cycles. The conclusions that were drawn from these measurements were:

- Currents are low and the tidal excursion into the arm per tidal cycle is of the order of 100 m/hour or 300-500 m per cycle;
- When wind is blowing from the east or west, it has a large effect on the tidal exchange - more than the astronomical tides. This is based on site observations and discussions with fishermen;
- From observations during the recent algal bloom (April 1996), the tidal excursion up into the upper reaches of the arm does not affect the water much above buoys 17 - 19 (located just north of Eastern Creek entry). The tidal inflow into the east-west portion of the estuary acts somewhat like a piston and just pushes the water in the upper reaches up and down.

A later attempt was made using sophisticated portable current meters supplied by Gippsland Ports, to measure the currents and in particular to see whether the flows at the top of the water column were similar to those at lower depths. However the velocity of flow, under astronomical tides was below the measuring threshold of the instruments. No meaningful records were obtained.

Gippsland Ports has kindly agreed to install two very precise S4 current meters and a tide gauge on a pile near the bridge (opposite pile number 7).

Another tide gauge will be set up on the public jetty near the caravan park where NRE has just installed an anemometer. It is intended that these will operate for a period of two months. An analysis will then be carried out of the results of these tide, wind and current measurements as part of this consultancy. They will be correlated with the measurements of the existing tide gauge on the Gippsland Ports jetty on Bullock Island. It is expected that the analysis will show:

- The relative importance of tides and wind in moving water within the estuary;
- The volume of water that comes into the estuary each tide;
- The relationship between the tide in the estuary and the tide immediately outside;
- The relationship (if any) between the tides in the estuary and the predicted tide for Lakes Entrance.

The main issues raised by the public consultation process were:

- The smell of the dead seagrass;
- The shallowness and the look of the southern bank of the Arm within the township area;

- tangling of propellers in the seagrass.

There was some conflict about the use of the Arm and therefore how it should be managed (i.e. cleaned or deepened). Some people - apparently a minority, wanted the basin area north of the caravan park to be set up for water skiing. Most seemed to want it left in a natural state to encourage the bird life to stay.

NRE and EGSC agreed that, subject to Coast Action funding, a trial would be done late in the year of mowing of the seagrass near the southern edge of the Arm from the boat ramp up to the caravan park.

Dredging

The suggestion has been made that the water quality within the North Arm would be improved if a deep channel or a pair of channels was dredged along the north and south sides of the estuary. However it is not clear from the present study that there would be any substantial benefit from this dredging.

The evidence to date is that the incoming tide just pushes the existing water that is in the arm further up into the arm and there is only a real exchange of water when there is a strong wind to mix the old and new water, (as was observed when the recent Algal bloom spread throughout the Lakes but only gradually penetrated into North Arm).

The tide at present seems to penetrate only about 300-400 metres in the arm in a tidal cycle. Where it is moving, and for some distance further to the east, the arm is several metres deep. Deepening the arm even further to the east by itself, will not change the distance that the tide (or fresh salt water) penetrates.

It would be possible to increase mixing of new and old water by dredging two channels one on the north side and one on the south side of the southern part of the arm. The channels would have to be shaped so that they caused the water to favour one of the channels on the incoming tide and the other on the outgoing tide. This could be achieved by making one wider at the eastern end and the other wider at the western end - in the form of funnels. The mixing would be slow and it is not clear that it would in any way reduce the existing eutrification.

The construction of two dredged channels is not recommended for the following reasons:

- It is not clear that there would be any decrease in the nutrient level or the algal level in North Arm, so the effectiveness of the construction is not certain;
- If there were an increase in the flushing, the consequence would be that the arm would suffer more when algal blooms, such as the Nodularia outbreak, affected other parts of the Lakes;
- The sediments on the bed of the arm are mostly fine muds and there would be a significant problem in finding a suitable disposal site for the dredge spoil. There would also be a significant short term disturbance to the existing water quality of the arm;
- The dredging would be expensive and any available funds would be better spent on the activities such as biological nutrient traps, harvesting the existing algae, creating new beaches and walking tracks etc.

4.2 Foreshores and estuary assessment

4.2.1 Foreshores

The condition of the North Arm frontage areas by section are shown in Appendix 1 and 2.

In summary the natural condition of the frontages of North Arm is quite pristine within the upper half of North Arm but deteriorates in the southern half of the Arm.

The factors causing deterioration are:

- Replacement of native vegetation with weed species such as blackberries, cotoneaster, bridal creeper and pasture grasses.
- Slumping and frontage erosion due to removal of stabilising vegetation, especially on the western side.
- Urban encroachment onto frontage - mowed lawns, garden escapes, litter and rubbish,

street drainage. Frontage below Seaview Parade (Kalimna) contains good rainforest elements which are succumbing to these influences. Frontage between Capes Road and Eastern Creek is in poor condition generally due to a long term loss of native vegetation and replacement by weeds.

The urban frontage along Marine Parade up to Eastern Creek is stabilised by rock walls for the most part and has increased in some sections due to dredging operations and sand dumping. This frontage is open space parkland with lawns and tree plantings. A cycle/walking path parallels the foreshore through this section.

Offshore conditions are also shown in Appendix 1 and 2. Generally the lower parts of North Arm have extensive seagrass beds and non navigable margins. The northern sections are usually navigable by small boats and may have steeply sloping banks with little flat shoreline area.

The mouths of creeks usually have extensive, non navigable rush dominated wetland areas.

4.2.2 Estuary

No specific comprehensive survey of the aquatic flora and fauna was carried out as part of this report. It is considered that the aquatic flora and fauna of North Arm reflects that recorded for the estuarine portions of the wider Gippsland Lakes and as such the species lists for this report are based on previous published reports. A detailed aquatic study of the estuary would be desirable, especially to monitor changes in the future.

(a) Seagrasses

Two species of seagrass occur within North Arm. *Zostera muelleri* and *Ruppia spiralis* are mainly found in areas extending from the waters edge to a depth of three to four metres. *Zostera* becomes denser with depth and grades into *Ruppia* which tends to dominate at about two metres. (DCNR 1995). *Zostera* is the dominant seagrass species in North Arm.

It is considered that the seagrass community in North Arm is more extensive now than 30 years ago, particularly in the southern end of the Arm. This is probably due to the relatively large increase in nutrient and increased sediment on the floor of the estuary.
As a result, not only is the seagrass in relative localised abundance, the density of epiphytes associated with the seagrass; diatoms, algae and sessile invertebrates, is also considered high.

(b) Fish

The fish assemblage is considered to be similar to that found in the greater Gippsland Lakes. Forty one species of fish have been recorded (see appendix 4).

The seagrass communities of the Gippsland Lakes are important nursery areas for most species of fish recorded in the Lakes (Rigby 1982, Ramm 1986).

This point is especially important for North Arm due to its relatively abundant seagrass communities, shallow water depth, limited movement of the water body and apparent high aquatic biodiversity, in particular aquatic invertebrates.

Commercial fishing is prohibited in North Arm. Hauling nets and spear fishing are also prohibited. Amateur bait collection is permitted. (M. Fletcher, F&WO Lakes Entrance, pers. comm.)

(c) Invertebrates

The aquatic invertebrates found in the Gippsland Lakes are documented in Poore 1982, Ramm 1986 and Rigby 1982 and are believed to be similar to those found in North Arm. Amateur pumping for sandworm in the lower reaches of the Arm is carried out.

(d) Bird life

The aquatic avifauna of North Arm is limited to only a few species. It is evident that the Arm supports large numbers of individual species at particular times e.g. Black Swan, several species of Cormorant, several species of duck and other waterbirds which utilise areas of open water for shelter and feeding.

The White-bellied Sea Eagle nests and feeds in the vicinity of North Arm. This large bird of prey, feeds principally on fish and is listed

under the *Flora and Fauna Guarantee Act* 1988.

(e) Ecological aspects

The estuary is primarily saline with a number of freshwater inflows. The principal inflow is Mississippi Creek. Its catchment is mainly forested and is dissected by many unsurfaced roads and tracks. Other point discharges are from Eastern Creek and numerous stormwater drains which drain urban areas. Non-point discharges originate generally from cleared agricultural land.

Water quality is described in Section 6.1. The catchment of the urban area probably contributes the majority of the Phosphorus and a significant portion of the Nitrogen. The management of stormwater nutrient is of utmost importance.

The relative abundance of seagrasses and the high density of epiphytes is indicative of a system with high nutrient levels. Although not immediately of major consequence, the continued discharge of highly nutritious water to the North Arm system will impact on the density and diversity of aquatic biota. If these highly nutritious discharges continue, it could be expected that the frequency and duration of algal blooms will increase. The increased frequency and duration of algal blooms will further reduce the amenity value of the Arm due to the reduction in angling species of fish, the reduced density of birdlife and the increased odour as a result of decomposition of the dying algae following blooms.

Seagrass, especially *Zostera*, naturally sheds two-thirds to three-quarters of its leaves during the year. Often these leaves drift to the shoreline and decompose, emitting an unpleasant odour. Ultimately the leaves will decay into the estuarine sediments or on the shoreline. The resultant increase in the organic matter of the relatively nutrient-poor sands of the foreshore is considered important for colonisation by sand-binding plants.

The growth rates of seagrasses is very light dependent. They will only occur if the substrate is suitable and if adequate light penetrates through the water column to the leaves of the plant. Turbid water as a result of high loads of suspended sediments and or dense algal blooms will cause a reduction in the density of the seagrass and its ultimate demise. Once destroyed the seagrass communities take considerable time to regenerate.

Control of seagrass will depend on removing the substrate on which it grows and/or decreasing the light available to the plants. The long term impact of cutting a portion of the seagrass beds is not known. The removal of the substrate preferred by the seagrass, combined with a reduction of the aqueous nutrient is considered essential if the seagrass is to be effectively controlled.

4.2.3 Shoreline environment

The shoreline environment is that area of land associated with North Arm which is directly influenced by the estuarine water.

(a) Bird life

The most significant species of seabird to utilise North Arm is the Little Tern. This species is considered endangered nationally and regularly nests on the constructed nest site of Rigby Island. This species has nested at various locations around Lakes Entrance including Club Hotel Spit, Bullock Island and the Ocean Beach. Little Tern prefer to nest on clear sandy or shingle substrates including recently deposited dredge spoil. Little Tern feed by diving on small bait sized fish and favour the southern shallow waters of North Arm where this prey is abundant during the breeding period. The Fairy Tern nests in similar habitats to Little Tern and is considered vulnerable. Both species are listed under the *Flora and Fauna Guarantee Act* 1988.

(b) Ecological aspects

The shoreline of the Gippsland Lakes is still undergoing change as a result of the permanent opening to the sea 100 years ago. The shoreline vegetation is changing from one which was influenced by principally a freshwater regime to one which is now influenced by a more saline environment. As such the

shoreline vegetation has not stabilised and the consequences of this are that the shoreline, in the absence of the stabilising influence of well established vegetation, is subject to erosion or movement. In many situations this erosion is not acceptable to the community or individual landowners and shoreline stabilisation works, such as rock walling, are carried out. These works are ecologically of much reduced value when compared to the natural but changing shoreline.

The importance of the wind-washed shed seagrass to the ecology of the shoreline and its role in encouraging stable vegetation communities is unknown but believed to be important as a considerable source of organic matter, nutrient and shelter for germinating colonising plants.

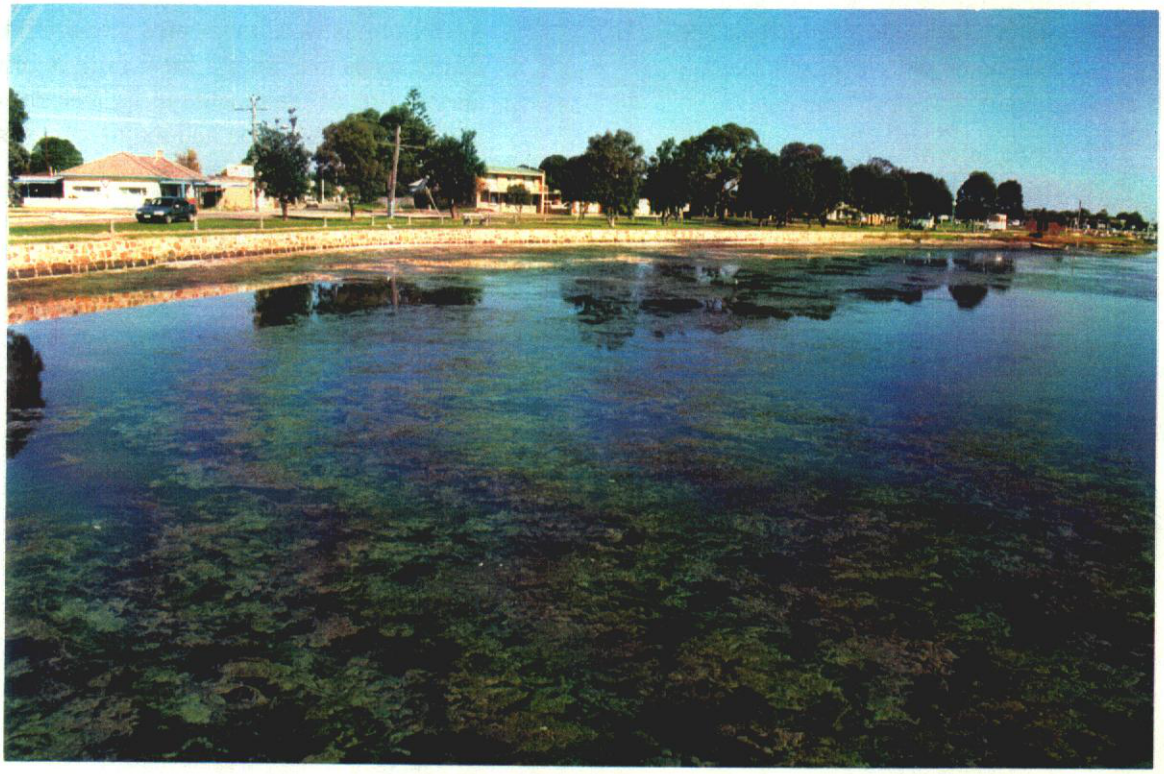
The original, pre-1895, shoreline vegetation of North Arm was probably dominated by Swamp Paperbark *(Melaleuca ericifolia)* and Common Reed *(Phragmites australis)*. Under the influence of the saline water, this community is now much reduced and only occurs at sites influenced by relatively fresh ground or river water. Swamp Paperbark has considerable benefits in stabilising the shoreline because of its extensive root system and its suckering method of regeneration. Common Reed has significant impact on reducing the wind-generated wave energy.

In some bays of North Arm, extensive areas of salt tolerant aquatic plants have established. One of those bays is the mouth of Eastern Creek.

(c) Eastern Creek

The vegetation of Eastern Creek is dominated by Sea Rush *(Juncus kraussii)* with associated salt tolerant plants including Glasswort *(Sarcocornia* spp.*)*.

This area, although degraded, is important as a trap for sediments contained in the urban stormwater. The site lends itself to further development to enhance its ability to trap and manage suspended sediments, develop habitat to encourage waterfowl, rails and wading birds, and provide wildlife viewing areas.



Shed seagrass and algae - North Arm - Marine parade area.

4.3 LAND BASED RESOURCE ASSESSMENT

4.3.1 Vegetation assessment

Map1 shows areas of vegetation either officially classified as significant or advanced by us as worthy of recognition. Listed below are significant features of the vegetation in the major land systems.

(a) The shore-line terrestrial/littoral vegetation of North Arm

- Shoreline vegetation is depauperate towards the Entrance, apparently reflecting the process of increased salinity and die-back of vegetation reported by other authors (Ladd *et al.* 1976) throughout the Gippsland Lakes system
- Effects of salinity are obvious through the absence of live Swamp Paperbark and Common Reed around the margins of North Arm below Otterburn. Substantial stumps of former foreshore vegetation, probably Swamp Paperbark, were found on muddy flats near the marshes of Eastern Creek and amongst the marshes near Otterburn. Existing stands of Swamp Paperbark and Common Reed below Otterburn appear to be associated with localised seepage of freshwater.
- Existing littoral vegetation seems now to be related to the level of salinity in the soil. Salinity of the littoral soil appears to be determined by the salinity of lake water, the exposure to lake water and the extent of any freshwater flushing from the land. The salinity effects might loosely be classified as high, medium and low.
- The 'high' salinity profile is of sparse Glasswort herbfield which provides little protection to the shoreline
- The 'medium' salinity vegetation profile now consists of a 'Tussock Rushland' dominated by Sea Rush.
- The 'low' salinity profile, of Common Reed on the lake side of a closed shrubland of Swamp Paperbark, is now restricted to the Mississippi Creek, Eastern Creek and to pockets of freshwater infusion around the lake shore but, as has been mentioned above, was probably the characteristic vegetation type around the North Arm shoreline before the permanent entrance was opened.

(b) Terrestrial vegetation within 50m of North Arm

Descriptions were segmented into arbitrary study zones (see Map 7 for detail). A brief description of the remaining or reestablishing indigenous vegetation and major weeds is shown in Table 3.

Table 3 - Terrestrial vegetation within 50 m of North Arm

Section	Dominant Indigenous species	Exotic species	Comments
W1*	Sweet Pittosporum, Lilly Pilly, Blackwood, Gippsland Grey Box, Mountain Grey Gum, Blanket-leaf, Coast Banksia, Viscid Daisy-bush	Mirror Bush, Bridal Creeper, Agapanthus, Albizzia, Cotoneaster, Boxthorn, Passionfruit, Blackberry, Christmas Lily, Pampas Grass, Kikuyu, *Livistona* Palm	Warm Temperate Rainforest Coastal East Gippsland form, EVC 32. Sites 18, 22 of Peel (1981) Site No EG 12: 'Lover's Walk' rated as 'Regionally significant' for flora conservation (NRE in prep.).
W2	Sweet Pittosporum, Boobialla as isolated plants, Poa tussock on slopes, Common Reed and Glasswort on shore	Phalaris, Buffalo Grass, Fleabane, Bridal Creeper, Kikuyu, Cotoneaster, Cocksfoot, Variable Plantain	Grazing land from which stock have been lately excluded and eroding slope stabilised with exotic species. Indigenous spp. incidental.
W3	Swamp Melaleuca as isolated plants, isolated Common Reed on shore. Sea Rush and Glasswort on swamp valley floors and margins of open water	Predominantly pasture species dominated by Kikuyu, Boxthorn as occasional plants	Grazing farmland. Stock access to shore and swamp areas.
W4a	Sweet Pittosporum, Lilly Pilly, Blackwood, Muttonwood, Common Boobialla, (RNE records)	Bridal Creeper	South and southeast facing slopes including 'Golden Point' Warm Temperate Rainforest Coastal East Gippsland form, EVC 32. Rainforest remnant or early stage of regeneration. Predominance of Bridal Creeper in the ground cover.
W4b	Red Ironbark, Early Black Wattle, Sticky Hop-bush, Common Boobialla	Bridal Creeper	North and northeast facing slopes, few trees and extensive Sticky Hoop-bush shrubland in north facing places.
W5a	Isolated Gippsland Grey Box	Pasture species, patches of Blackberry and isolated shrubs of Boxthorn (mostly treated) on farmland	'Winfield's' farmland.
W5b	Sea Rush in extensive flats, some Swamp Paperbark along shore margins and evidence of formerly extensive stands of Swamp paperbark amongst the Sea Rush, Gippsland Grey Box, Fuzzy Box and Red Ironbark on valley sides. Understorey variable from grassy to moderately well developed understorey of Limestone Pomaderris, Bracken, Early Black Wattle	Pasture spp in open, probably grazed forest. Boxthorn, Blackberry patches	Open forest with a variety of current use.

* Refer to Map 7 for section locations.

Table 3 continued

Section	Dominant Indigenous species	Exotic species	Comments
W5c	Gippsland Grey Box, Fuzzy Box, Mountain Grey Gum,		Westerly slope.
W5d	Mountain Grey Gum, Blackwood, Hazel Pomaderris	Pasture species, Ragwort and Blackberry patches on flat	Opposite rock barge landing.
W5e	Red Ironbark, Fuzzy Box, Gippsland Grey Box, Manna Gum, Limestone Pomaderris, Blue-leafed Wattle, Cherry Ballart	Blackberry	Limestone Pomaderris shrubland (possibly of State significance and worthy of nomination for listing under the *Flora and Fauna Guarantee Act*, 1988), Mistletoe causing significant stress and death to trees.
W5f	White Stringybark, Mountain Grey Gum damp forest		
W5g	Scattered White Stringybark	Pasture species	'Otterburn' farmland
W5h	Sweet Pittosporum, Lilly Pilly, Muttonwood and Blackwood		'North Esk' and 'Lulgra' rainforest patches on south facing steep sea cliff type environment.
E5	Sea Rush and Glasswort foreshore	Pasture species	Pasture or replanted grazing land from Winery jetty to Capes Road.
E4	Sweet Pittosporum, Lilly Pilly, Hazel Pomaderris, Early Black Wattle, Blackwood, Limestone Blue Wattle, Viscid Daisy-bush.	Pasture species predominate in less overgrown areas, Bridal Creeper, Blackberry, Cotoneaster, Privet, Briar, Apple, other garden escapes	Apparently naturally regenerated tall shrubland with predominantly rainforest elements in the indigenous flora.
E3	Virtually nil behind shoreline of Sea Rush and patches of Common Reed.	pasture species, Blackberry, Briar	
E2	Sea Rush dominant swamp in Eastern Creek, Swamp Paperbark on banks, some Common Reed upstream		
E1	Small patches of Glasswort herbfield	Buffalo Grass and Kikuyu used to stabilise sand areas	Beach and small mudflats between the Recreation Reserve and the North Arm bridge

(c) Urban Lakes Entrance

- Mainly cleared and re-established with variety of species in and urban or semi-rural setting.
- Remnant native terrestrial vegetation restricted to 'Ostlers Road Gully' rainforest which is small, weed infested and unprotected from grazing.

(d) Urban Kalimna

- Mainly cleared and re-established with variety of species in and urban or semi-rural setting
- 'Arran Dene' ('Bona Vista', Musk Gully, Hunter Gully) rainforest gully off Hunter's Lane has been classified as of 'State Significance' for conservation. Contains rare species, is relatively large and contains examples of two rainforest types, Coastal East Gippsland rainforest and East Gippsland Alluvial Terraces rainforest (Peel pers. comm.).
- 'Creighton Creek' (Stans Gully) rainforest gully is usually bundled with 'Lovers Walk' rainforest (see North Arm land unit) in discussions of significance and as such rates as 'Regionally Significant'.

(e) Mississippi Creek

- The northern and central sections near Mississippi Creek retain an indigenous forest type contiguous and similar to the Colquhoun Forest types listed below.
- The southern and eastern portions are mainly cleared and maintained for agriculture but with significant remnants of original vegetation or regrowth.
- 'East Airfield, Kalimna West 1.' rainforest gully, formerly cleared now regrowth but with a substantial buffer of dry forest vegetation surrounding it.
- 'East Airfield, Kalimna West 2.' rainforest gully.
- 'Otterburn' rainforest gully. Listed, with 'Upper Otterburn', as a rainforest site of regional significance.
- 'Upper Otterburn' rainforest gully. Listed, with 'Otterburn', as a rainforest site of regional significance.
- 'Secombes Gully' rainforest remnants. Listed as a rainforest site of regional significance.

(f) Colquhoun State Forest

Open forest mainly dominated by White Stringybark but with changes of dominance depending on aspect, soil type and moisture profile. LCC recognised three main forest types generally confirmed by our brief appraisal. The gradation from 3a to 3c generally reflects an increasing average soil moisture profile often associated with a change from northerly to southerly aspect. A description for each forest type is shown in Table 4.

Table 4 - Forest types - Colquhoun State Forest

LCC Map Unit	Major species of tallest stratum	Associated tree species	Common species of lower stratum
3a	White Stringybark, Silvertop	Mountain Grey Gum, Red Stringybark, Red Ironbark, Fuzzy Box, Brittle Gum, But But	Bracken, Shiny Cassinia, Sunshine Wattle, Saw Banksia, Black She-oak, Broad Saw Sedge, Cluster Flower Geebung, Silky Tea Tree, Common Heath, Thatch Saw Sedge
3b	White Stringybark	Silvertop, Red Stringybark, Mountain Grey Gum, Red Box, Yertchuk, Red Ironbark	Bracken, Shiny Cassinia, Broad Saw Sedge, Silky Tea Tree, Nodding Blue Lily, Guinea Flower, Pomaderris, Pink Bells, Common Apple-berry
3c	Mountain Grey Gum, White stringybark or Yellow Stringybark	Silvertop, Narrow-leaf Peppermint, Blue Gum, But But, River Peppermint, Manna Gum	Bracken, Hazel Pomaderris, Silver Wattle, Hop Goodenia, Snowy Daisy Bush, Australian Clematis, Spiny-headed Mat-rush

Designated sites or species of significance and other features of floristic note are listed in Appendix 3.

4.3.2 Fauna assessment

- More than two hundred species of vertebrate that have a predominantly terrestrial habit have been recorded in the area of Lakes Entrance and Metung (Victorian Wildlife database, appendix).
- Medium sized ground dwelling mammals, like Tuan, Long-nosed Bandicoot, Southern Brown Bandicoot, Long-nosed Potoroo, Eastern Quoll and Red-bellied Pademelon, are either extinct or much reduced in numbers in the North Arm area.
- There are no 'significant' populations of species identified within the North Arm area. The Colquhoun Forest in the adjacent Toorloo Arm catchment was listed as a site of 'National' significance because of the maternity colony of two species of bat (Norris and Mansergh 1981). The general area of 'Kalimna' was listed as a site of 'regional' significance because of the diversity of fauna and the presence of rarely observed species (Norris and Mansergh 1981).
- Remnant vegetation provides important areas of refuge and habitat for more mobile species including species characteristic of a rainforest environment.
- Colquhoun Forest is a large and important area of foothill forest for forest dwelling species of fauna. Box/Ironbark Forests are renowned for their attractiveness to nectivorous species of bird and mammal. Red Ironbark usually flowers during the winter, during the period of high energy requirements and low general food availability for fauna.

- There is no opportunity for long distance walks, for instance north to destinations in Colquhoun Forest, except along roads.

Restraints to land based recreation

- Lack of access to public frontage due to terrain or vegetation.
- Poorly defined boundaries between public and freehold land sections.
- Lack of facilities such as picnic sites, seating, viewing points and toilets.
- Lack of sandy shoreline.
- Lack of information on recreation opportunities.

Opportunities for land based recreation

- Improved shoreline access.
- Information on opportunities for recreation in the catchment with emphasis on ecotourism aspects such as nature observation.
- Improved use of road reserves and public land to provide track linkages throughout the catchment.

Natural vegetation - head of North Arm (navigable limit). Tramway bench north to rock quarry in foreground. Rock was loaded at this site on to barges for transport to the Entrance as rock wall protection.

4.4 Recreation assessment

4.4.1 Water based recreation

- The lower sections of North Arm are used for pleasure boating (hire boats for example) boat based fishing and water skiing (in one location near the Recreation Reserve).
- Boating is generally confined to marked channel areas due to the shallowness of seagrass beds.
- The Arm is less popular with large fly bridge cruisers or sailing boats due to the low clearance of North Arm Bridge which prevents passage. Speed limits and narrow channels also reduce use by powerful large boats.
- Water recreation generally is highly peaked towards summer periods generally between November and April.
- The upper reaches of the Arm are suitable for canoeing and row boats and present a tranquil environment for nature observation.
- The sheltered waters of North Arm are attractive to water ski users, but shallowness and restricted areas are disincentives. Jet ski use is less affected.
- North Arm is closed to commercial fishing and the lower reaches are a popular site for hire boat fishermen. The water areas towards Mississippi Creek are popular for fishermen seeking bass and bream.
- Commercial boat tours to Wyanga Winery are an important component of tourist use.
- Swimming is not a major use due to seagrass, mud and the general lack of sandy shoreline.
- Fishing from the bank and jetties is carried out successfully at accessible locations. Lack of access is an issue here.
- Sailing/sailboarding is a minor use due to narrow channels, lack of good beach launching areas and the likely conflict with other users especially in the lower parts of the Arm.

Restraints to water recreation

- Shallow water near shore.
- Seagrass fouling propellers and rudders.
- Boating is restricted by defined channels and speed zonings.
- Lack of sandy beaches or landing points especially in the northern parts.
- Lack of public jetty and beach mooring spaces.
- Lack of frontage access for shore based fishing.

Opportunities for water recreation

- Improve sandy shoreline and landing points.
- Improve shoreline access.
- Provide more public mooring spaces.

4.4.2 Land based recreation

- Present use is largely walking and sightseeing along the urbanised frontages to the Arm. A formal walking path is constructed on the southern shoreline in the town area. A bush track along the northern shoreline below Seaview Parade, Kalimna is also used, mainly by local residents.
- Birdwatching and nature observation near the inlets at Eastern Creek, below Kalimna and near Capes Road is also popular.
- Access to public frontage is difficult along all shoreline adjacent to the Lakes Entrance urban area because of poor frontage definition, "defacto" privatisation of sections, steepness and weed infestation.
- The western shoreline is generally not used past Kalimna because of lack of access via farmland and steep slopes in some sections, although the upper reaches provide excellent scenery and natural vegetation.
- The North Arm catchment is popular for walking, cycling, horseriding and trail bike riding along the many minor access roads and tracks in the Harrisons Road/Baades Road/Scriveners Track areas.

4.5 Landscape character assessment

The North Arm Catchment is an area with outstanding visual and environmental qualities.

However there has been pressure brought to bear on the area by the increasing urbanisation of Lakes Entrance and Kalimna and clearing and development in rural areas.

For the purposes of Landscape Character and Environmental Assessment, the catchment area has been divided into 5 land units as follows (refer Maps 2 to 6):

- North Arm
- Urban Lakes Entrance
- Urban Kalimna
- Mississippi Creek
- Colquhoun Forest

North Arm

This land unit includes both the immediate foreshore areas and the water areas of the Arm which form the focus of this study. The water acts as a unifying element which ties together the other disparate landscape types that adjoin it.

Urban Lakes Entrance

This area is the most highly developed landscape unit of the study area. It is characterised by large built-up areas of dwellings and hard surface areas such as roads and car parks. The foreshore of the main town area has extensive stone retaining areas and jetties.

Although this area is urban in character it has strong visual connections with the more remote 'wild' areas. This closeness of natural areas is reinforced by the presence of feeding birds in close proximity to the urban shoreline.

Unfortunately, the shoreline interface of Lakes Entrance detracts considerably from the visual qualities of the Arm. Unsympathetic development of sporting facilities, car parks and the caravan park is exposed due to a lack of tree cover in the area. Dumped piles of rubbish and litter washed in from Eastern Creek are further visual and environmental detractions.

Urban Kalimna

This land unit forms a visual backdrop to the north-west side of the arm and is highly visible from Lakes Entrance. Areas of rainforest near Harris Road and along the foreshore and the varied topography of the area provide visual interest, however often overly-rigid subdivision patterns, unsympathetic to the natural topography, detract from this.

Mississippi Creek

The Mississippi Creek land unit is made of a mixture of rural residential and agricultural land, together with indigenous forest. The natural vegetation is concentrated along the creek itself and the gullies which have significant rainforest vegetation. Grazing and other agricultural activities has resulted in the creation of large open paddocks which have been carved out of the dense vegetation. In the area, ridgelines have often been chosen for residential development which has visually detracted from the natural look of the area.

The creek area itself is surrounded by forest and is quite visually contained.

Colquhoun Forest

This area is the largest landscape unit of the study area. It is the uppermost area of the catchment and the least affected by urban development. The majority of the area is either within the boundaries the Colquhoun State Forest or the Colquhoun State Park and as such is well covered by indigenous forest. Scriveners Road, the main access road through this area is visually contained within the forest area.

5 MANAGEMENT ISSUES

The study team held a "Search Forum" in Lakes Entrance where local people could provide information and ideas on what they saw as the main issues, and what they thought needed to be done.

A summary of these issues and options is below:

5.1 Water based issues

- Water quality - reflected mainly in accumulated seagrass smell and algae problems in the lower Arm. Stormwater pollution was also seen as a problem.
- The shallowness of the southern bank of the Arm within the problem township area.
- Tangling of propellers and rudders in the seagrass.
- Improved water skiing opportunities, balanced by some who did not wish to encourage water skiing due to a perceived effect on fauna and bank erosion.
- Silt from urban subdivisions entering the Arm.
- Constrictions to tidal flow at the mouth of North Arm due to rock groynes, resulting in a reduced tidal flushing and a lowering of water quality.
- Difficult navigation in the northern sections of the Arm.
- The lack of sewerage connections north of Lakes Entrance.
- Dredging to remove seagrass and improve flushing - Marine Parade area.
- A proposal to dredge the bay north of Eastern Creek to improve flushing and reduce weed accumulation.
- Mud in estuary.
- Oily water in creek areas.
- Crab plague ate seagrass many years ago.
- Need to test water quality of Eastern Creek.
- Stormwater drains along Marine Parade.
- Fishermans Wharf and restaurant, Marine Parade proposed.
- Open up Mississippi Creek to allow boating further upstream.
- Better town drainage control.
- Subdivision and septic tank installation (Shamrock Park subdivision mentioned).
- Eastern Creek used as a wash down area.
- Entrance to Eastern Creek should be developed as a freshwater wetland.
- Need for green strip along Eastern Creek.
- Recognition that the nutrients in North Arm ultimately will be seen to be a passing issue compared to other issues.

5.2 Land based issues

- Slumping of unstable cliff sections, Kalimna area and to the north.
- Weed invasion on public land frontage areas - especially near Lakes Entrance urban area.
- Lack of easy access along foreshore in some sections.
- Conservation of natural vegetation areas on private land in the catchment generally and restoration of native vegetation on denuded sections of foreshore.
- Poor presentation of hire boat caravans on urban foreshore section.
- Enforcement of planning controls during development.
- Need for walking tracks and views for local residents and tourists.
- Bird viewing areas and wetlands.
- Poor presentation of caravan park in Recreation Reserve.
- Privatization of some foreshore areas.
- Litter and rubbish (land and water

generated) on foreshores.

- Need for fish cleaning facilities near boat ramps.
- Birdlife/botanic garden concept.
- Neglected beach areas/rubbish collection.
- Reclaim land near Recreation Reserve.
- Provide viewing points.
- Consider relocation of football oval to Eastern Beach or Aquadome.
- Walking track - Kalimna foreshore.
- Need for education and interpretation of North Arm values.
- Enforce tree clearing controls.
- Stop clearing of trees/foreshore for views.
- Can't see the water because of trees.
- Demonstration projects for good land management.
- Garden rubbish on foreshores.
- Need for enforcement of planning and land regulations.
- Need for new toilet blocks Marine Parade.
- Bird hide at Eastern Creek.
- Relocate caravan park at Recreation Reserve.
- 52 lot subdivision Ostlers Road.
- Erosion on farm grazing land.
- Need a range of trees around North Arm to attract birds.
- Need to re-establish vegetation natural to sites by using existing pockets of vegetation as a nucleus.
- Foreshore planting after the existing areas are cleaned up.
- Co-operative development of a wildlife sanctuary.
- Agreement that forest health (weeds, mistletoe) is a serious and generally unrecognised problem.
- Development of an Environment Centre or natural history museum.
- Suggestion to re-name Eastern Creek Merrangbaur Creek.

The study group also met with the managing agencies. The issues raised at these meetings reflected most of those listed above, but also included:

- Management responsibility and funding for seagrass control is unclear.
- The Shire lacks funds for foreshore management initiatives.
- Works approvals on foreshore areas are still the responsibility of the Coastal management Co-ordination Committee (CMCC) pending the outcome of operations of the new Regional Coastal Board (RCB) and the state-wide Coast and Bay Management Council (CBMC).
- Port activities in North Arm such as navigation beacons, channel dredging etc. are now the responsibility of Gippsland Ports Committee of Management, with operational works carried out by former Port of Melbourne Authority infrasture.

5.3 Flora and fauna issues

- Absence of suitable species of plant to stabilise the present saline shoreline.
- Significant areas of vegetation around North Arm, including rainforest remnants, are not managed for their conservation value.
- Lack of continuity of forest types around North Arm and linking rainforest sites of significance.
- Dry forest types containing Red Ironbark and Fuzzy Box near North Arm have been infested with Mistletoe, suggesting an unbalanced environment possibly due to a lack of suitable fire frequency.
- Environmental weeds are changing the indigenous ecosystems and eliminating indigenous species.
- Environmental weeds hinder attempts to re-establish indigenous ecosystems.
- Pest animals including foxes, cats, rabbits and deer impact on indigenous ecosystems.

6 MANAGEMENT GUIDELINES

6.1 Water body

At this stage it appears likely that wind is more important than the astronomical tide as a mixing agent within the estuary. If, as a result of the ongoing measurement program, this turns out to be the case, deepening the channels by dredging will have only a marginal effect on the exchange of water. (It could even be argued that increasing the exchange between the estuary and the rest of the Lakes is not desirable in any case because it would increase the penetration of algal blooms into the estuary whenever there is a bloom elsewhere in the Gippsland Lakes, as occurred this year.)

The best way to improve the perceived amenity of the lower parts of North Arm would be to remove the seagrass and epiphytic algae from the areas of water where boats moor and to provide sandy beaches along the shore. There are several ways in which the seagrass could be removed and there is a surplus of sand available as a result of the need to dredge inside of the entrance. Refer to Map 8 Action Plan - Marine Parade. No action is recommended for the water body of upper reaches of North Arm, which are considered to be in a good natural condition.

6.2 Stormwater management

Trap sediment nutrient and litter as close as possible to its source by:

- Adequate street cleaning in the urban areas;
- Ensuring silt traps in the existing urban drains are cleared of silt build up and that litter is removed at estuary discharge points;
- Designing new subdivision drainage systems to incorporate adequate silt and litter traps.

Utilise biological methods where practicable to strip out nutrients and place sediments by:

- Use of vegetated buffer strips, especially along drainage lines;
- Use of ponds and swales in drainage lines to slow runoff and absorb nutrient;
- Use of wetlands to control nutrients (see Eastern Creek wetland);
- Adopting EPA guidelines (in prep.) for water quality management of urban stormwater runoff.

Enforce planning permit requirements for minimising sediment and pollution from development sites.

Several local agencies in Victorian non metropolitan cities (Benalla, Wangaratta, Swan Hill) and metropolitan agencies such as Melbourne Water and the Urban Land Authority are implementing pilot projects on better stormwater management practices. There is now adequate data available to allow a similar approach to be taken with Lakes Entrance stormwater management. The Waste Management Council may be a funding source in this instance.

6.3 Eastern Creek wetland development

Incorporate tourism development/facility in artificial wetland to facilitate nutrient and sediment stripping of stormwater.

Design criteria

- High edge to surface area ratio.
- Safe islands for wildlife.
- Diversity of habitats and vegetation communities (perhaps to represent all the major Gippsland Lakes vegetation communities).
- Varying water depths, incorporating a sediment trap, designed to facilitate mechanical sediment removal.
- Engineering considerations include a requirement to maximise flow during periods of high lake level and storm events.
- Encourage incorporation of facilities with appropriate interpretation.

EXISTING

PROPOSED

PHOTOMONTAGE 1: EASTERN CREEK WETLAND DEVELOPMENT

More detail on design principles for constructed wetlands is in Appendix 6.

Recommendation:

That a full engineering and design study be carried out prior to commencement of any work on this development. Such study should ensure that:

- *An artificial island concept is considered (see Lake Guthridge at Sale);*
- *The area is suitable for a variety of bird species;*
- *The island is not accessible to predators (including rats, cats and dogs);*
- *The siltation/pollution problems are suitably addressed;*
- *Stormwater controls are adequate (a system of small channels was suggested);*
- *An interpretive area is developed;*
- *Ownership of the land buffer zone is established;*
- *An agreed boundary with the Recreation Reserve Committee of management is established.*

6.4 Water quality monitoring

Encourage community participation in monitoring, especially of stormwater drainage lines and at major creek entry points to the estuary using the "Waterwatch" program.

6.5 Foreshore management

Generally :

- Encourage indigenous revegetation.
- Permit natural/successional processes to occur, including foreshore stabilisation.
- Create and intensively manage, high public use beaches free of shed seagrass.
- Serially fence foreshore reserve from grazing.
  Western foreshore - currently grazed
- Fence to exclude livestock.
  - *Grazing is discouraging regeneration*
  - *Loss of soil binding vegetation is permitting foreshore erosion as well as a source of sediment and slumping.*
  - *Encourage the regeneration of Swamp Paperbark in suitable moist freshwater sites. Swamp Paperbark has an extensive binding root system but will not tolerate periods of extended exposure to saline water.*
- Implement trial to monitor the vegetation response after fencing.
  - *Monitor the regeneration of all plants in the enclosures, especially weeds, Swamp Paperbark, Common Boobialla and other natives.*
  - *Develop and trial weed control methods suitable for the site.*
  - *Develop methods suitable for encouraging the regeneration of native plants especially Swamp Paperbark.*
- Develop foreshore fencing strategy based on the outcomes of the above trial.

Eastern Foreshore

- Strategic construction of elevated boardwalk or benched surfaced walking track where suitable.
- Walking track to be incorporated into the artificial wetland development.
- That part of the unused Crown land east of the Bowls Club car park be used as an interface area between the formal facilities of the Recreation Reserve and the wetland proposal.

6.6 Weed control - Seagrass

- Design and implement in-water harvesting program. Ensure monitoring of relative amounts of shed seagrass which reaches foreshore. Note the growth response to harvesting of the cropped in-situ seagrass.

- Rationalise jetties along southern shoreline.
- Develop and implement a dredging program for the vicinity of rationalised jetties and at Toyes jetty to increase water depth and discourage seagrass for a longer period.
- Beach renourishment - judicious placement of sand, free of organic matter/sediment (ex entrance).
- Investigate permanent removal of substrate in the vicinity of the rationalised jetties, deepen where possible for more permanent solution to the seagrass issue.
- Consider zoning southern foreshore into:
  - *No shed seagrass removal - conservation area;*
  - *Active and regular removal of shed seagrass;*
  - *Substrate removal and considerable deepening;*
  - *Beach renourishment.*

6.7 Landscape management guidelines

There are a number of principles that should be adhered to to maintain and enhance the visual character of North Arm.

- Special attention should be paid to enhancing the vegetation cover of the higher shoreline areas of Kalimna and similar areas which form a visual backdrop to the Arm and Lakes Entrance.
- Valleys, drainage lines and foreshore areas should be revegetated where necessary for erosion control, promotion of wildlife corridors and general visual enhancement.
- Pockets of indigenous vegetation should be linked by plantings to provide visual continuity.
- Landholders should be actively encouraged to reestablish indigenous vegetation in large cleared paddocks and visually exposed areas.
- The Eastern Beach caravan park should be visually contained by buffer planting.
- Indigenous vegetation should be reintroduced into the Eastern Creek outflow area partially to screen housing and other developments in the area and to enhance visual, environmental and amenity values in the area.

The following guidelines should be used for new residential development:

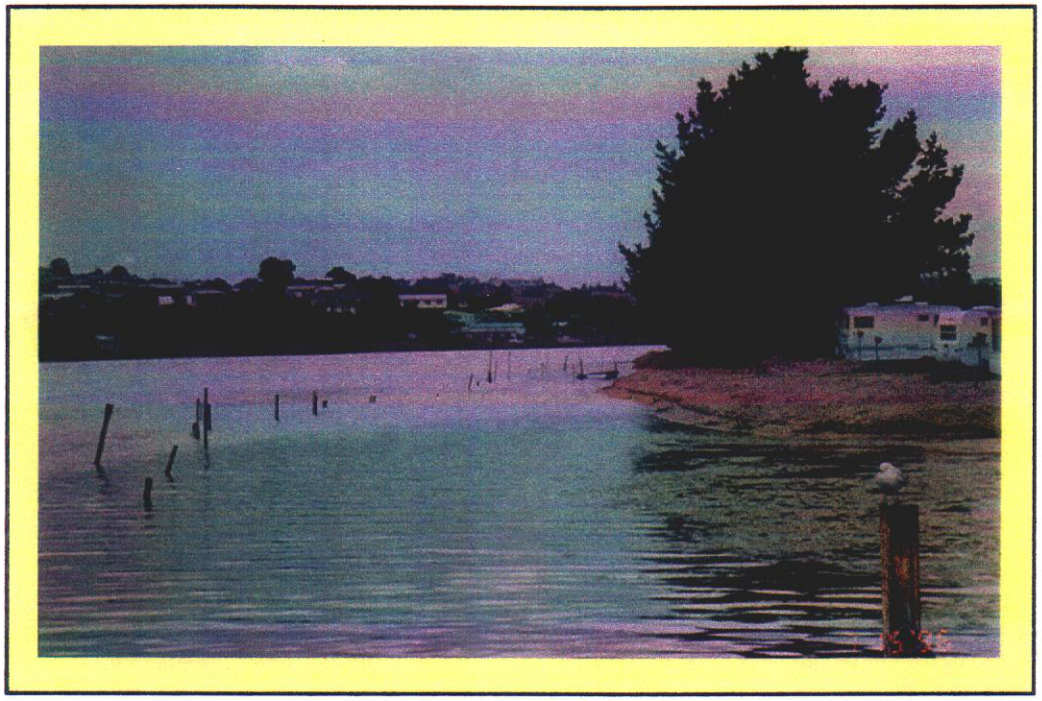
- The design of new houses should have regard to the existing character and vegetation of the area in terms of their bulk, height and scale.
- Non-reflective colours and materials which have muted tones should be used, especially in highly visible locations. Colours should be selected which blend well with the dominant character of the area.
- Narrow roads and driveways following the natural topography should be promoted rather than wider roads following a rigid geometry to reduce their visual impact.
- Development on ridgelines should be discouraged where possible.

6.8 Re-establishment and management of native ecosystems

Two approaches are outlined and are suggested, depending on finance, time available and the weight given to issues like good neighbour relations with weeds. The quality approach is designed to concentrate on ensuring that only indigenous species are included in the regenerating area. The quantity approach, as the name suggests, seeks to cover as much area as possible without being concerned, in the early stages, with what non-indigenous species might cohabit.

Scenario 1. Quality approach

- Incremental establishment of native vegetation by fencing, elimination of exotic species and planting of selected species.
- Bradley* method of incremental weeding for existing sites of natural revegetation.



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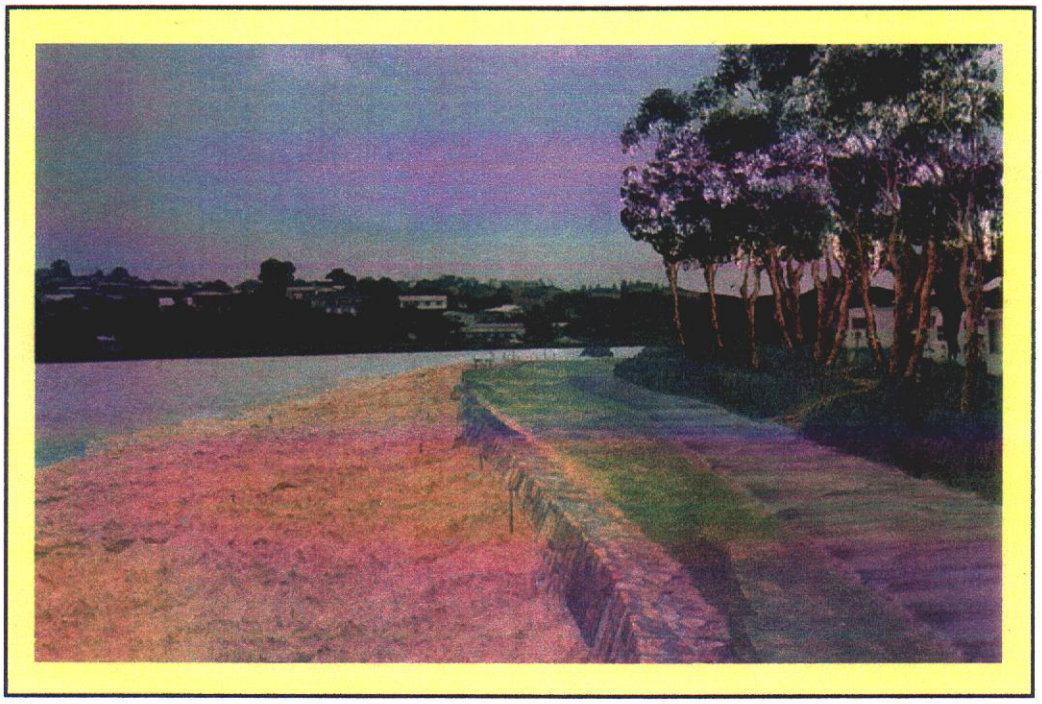

PROPOSED

PHOTOMONTAGE 2: REDEVELOPMENT OF FORESHORE NEAR CARAVAN PARK

EXISTING

PROPOSED

PHOTOMONTAGE 3: REVEGETATION ALONG CREEK, AND FORESHORE - KALIMNA WEST

Pros

- Only indigenous species which leads to more of an Australian character.
- Contributes more to Australian biodiversity conservation.
- Possibly 'better' environment for native fauna.
- Probably easier to access in the long term.

Cons

- Labour intensive.
- Slow.

Scenario 2. Quantity approach

- Fence out stock and let natural successional processes occur.
- Some initial broadcasting of seed or planting of indigenous trees.

Pros

- Speed.
- Relatively cheap.

Cons

- Legal requirements for noxious weeds.
- Impassibility of Blackberry etc. dominated vegetation.
- Non-Australian feel to the environment.
- Possible poor neighbour relations with weeds.

6.9 Actions - flora and fauna conservation

- Investigate the introduction of robust Australian, saline tolerant species of plant suitable for consolidating the shoreline downstream of Otterburn e.g. White Mangrove.
- Fence out the foreshore of North Arm to a depth of 10m. and introduce canopy species appropriate to the site viz. Lilly Pilly and Sweet Pittosporum on slopes of southern aspect, Gippsland Grey Box, Red Ironbark and Blue Box on sites of northern aspect. Control proclaimed noxious weeds and remove grass competition from around tree seedlings during early growth stages.
- Begin a 'Bradley method' weeding of the natural revegetation south of Capes Road in association with the establishment of a walking trail/bicycle track.
- Establish a forest buffer around the margins of rainforest remnants.
- Revegetate the lower part of Arran Dene gully with appropriate indigenous species to form a continuum with the North Arm foreshore vegetation.
- Seek to have the Limestone Pomaderris shrubland listed as a site of significance under the *Flora and Fauna Guarantee Act*.

Planning control guidelines

- Require all future subdivisions in the catchment to be connected to the Lakes Entrance sewerage scheme.
- Implement vegetation controls to ensure rainforest areas within subdivisions are adequately buffered from exterior influences.
- Retain land parcel north of Kalimna for large integrated development.
- Allow infill development on Hunter's Lane.
- Allow rural farmlets on Comers Lane.
- Retain Harrisons Track and Baades Road lot density at present levels.
- Require small lot subdivisions to be designed on "whole farm" plan principles.
- Ensure planning scheme provisions are based on rural land mapping and land capability information.
- Incorporate compliance with "codes of practice" applying to rural land use in planning permit approvals with special attention to stormwater/urban wastewater management.

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Appendix 1

NORTH ARM FORESHORE SURVEY (Western shoreline)

Section	Natural conditions land (metres)				Natural conditions water/shore (metres)				Legal conditions (%)			Hinterland (describe)	Recreation Options (describe)
	Intact natural vegetat'n	Depleted vegetat'n (describe)	Weed infest'n (describe)	Flora/fauna habitat value (describe)	Sandy beach	Seaweed accumul'n	Shoreline slope (offshore)	Dist. offshore to clear water	Full frontage reserve	Reduced frontage reserve	No reserve		
W1	1,000	-	See W1 plant list	Rainforest	1,000	1,000	Shallow 10 m then deep	20-25 m	80%	20%	Requires survey to determine	Steep rainforest cliff - suburban road above	Walking track Shoreline fishing Nature obs. Swimming east end at point
W2	200 including saltmarsh	600 clear grazing land	See W2 list	Saltmarsh Rainforest Grazing land Cliffed grassy section	200 Pebble beach at cliff base 400 m	500	Shallow	20-70 m (70 m in bay)	NIL	400	400	Valley bottoms (Saltmarsh) Grazing land. Grassy cliff (fenced)	Minor
W3	NIL (some saltmarsh in valley bottoms	100% 1400 m	Isolated Boxthorn	Grazing land	-	Minor	Gentle	10 m shallow edge	Requires survey to determine			Grazing land very few trees or vegetation	Minor
W5	1,900 west side 1,800 east side	400 m east side (Otterburn) 3,200 m west side (grazing land)	Boxthorn (Winfields - treated) B'berries (open patches) Generally minor	Swamp Paperbark thicket Sea Rush - Common Reed Gippsland Grey Box forest Fuzzy Box	50 m (two stopping places)	NIL	Moderate to steep behind but flat edges to water	Less than 10 m Some places nil distance (boats can land on bank)	Yes			Forested valley but grazing land within 0.5 km east side within 0.2 km west side	Fishing (boat) Swimming (2 places only) Nature obs. Historic study. Camping BBQ

Appendix 2

NORTH ARM FORESHORE SURVEY (Eastern shoreline)

Section	Natural conditions land (metres)				Natural conditions water/shore (metres)				Legal conditions (%)			Hinterland (describe)	Recreation Options (describe)
	Intact natural vegetat'n	Depleted vegetat'n (describe)	Weed infest'n (describe)	Flora/fauna habitat value (describe)	Sandy beach	Seaweed accumul'n	Shoreline slope (offshore)	Dist. offshore to clear water	Full frontage reserve	Reduced frontage reserve	No reserve		
E2	NIL	800 m No shrubs or trees Fairly natural saltmarsh and Phragmites (Swamp Paperbark remnants)	Minor (mainly saltmarsh) Garden escapes north of Eastern Creek	Saltmarsh Reed/rushes Shallow shoreline	NIL 100 m pebbly stable to north of creek	Minor	Shallow	5 m at football reserve 40-50 m at creek	Yes			Public Recreation Reserve Saline wetland Suburban houses	Wildlife viewing Boating (Rec. reserve shore only) Caravan park Walking
E3	NIL	500 m Most of area privatised foreshore Phragmites Combungi at Toys jetty	Garden escapes Kikuyu mown grass Not much "natural" veg. remains	Reed beds 5 m deep in sections. Remnant native veg. northern end	200 m but covered in seagrass	Major up to 12 m depth from shore	Shallow for 15 m then steep to houses	15 to 25 m across seagrass beds	Yes	-	-	Suburban houses	• Boating • Walking (difficult due to "creeping yard" problem)
E4	300 m Near Capes Road on point and in gullies (Sweet Pittosporum thickets)	900 m Grazing land reverted to scrub Few big trees	Major - B'berries cotoneaster thistles apples privet Some tracks Cut down trees Boneseed higher up	Remnants of rainforest Sweet Pittosporum thickets	NIL	Up to 5 m offshore	Moderate	4-5 m	Yes	-	-	Suburban houses at top of steep slope	• Walking • Viewing

Appendix 3 - Features of the environs identified as regionally significant or better

Significant Feature	Land Unit	Comments
Arran Dene Rainforest	Urban Kalimna	State significance as a rainforest remnant. Includes several rare species
Otterburn Gully Rainforest	Mississippi Creek	Regional significance as a rainforest remnant
Secombes Gully Rainforest	Misissippi Creek	Regional significance as a rainforest remnant
Limestone Pomaderris Shrubland	Mississippi Creek	Probable State significance as a rare Ecological Vegetation Class
Limestone Pomaderris, *Pomaderris oraria calcicola*	Mississippi Creek, Colquhoun Forest	]
Blue Wattle, *Acacia caerulescens*	Mississippi Creek, Colquhoun Forest	] Rare and/or listed species] under the Flora and Fauna
Yellow Milk-vine, *Marsdenia flavescens*	Urban Kalimna, Mississippi Creek	] Guarantee Act]
Viscid Daisy-bush, *Olearia viscosa*	North Arm	]
Pinkwood, *Beyeria viscosa*	Mississippi Creek	]
Masked Owl, *Tyto novaehollandiae*	Urban Kalimna	]

Appendix 4 - Estuarine Fish of the Gippsland Lakes (LCC 1982)

COMMON NAME	SCIENTIFIC NAME
Southern anchovy	*Engraulis australis*
Black bream	*Acanthopagrus butcheri*
Cobbler	*Gymnapistes marmoratus*
Long-finned eel	*Leptocephalus wilsoni*
Short-finned eel	*Anguila australis*
Serpent eel	*Ophisurus serpens*
Short-headed worm eel	*Muraenichthys breviceps*
Estuary perch	*Macquaria colonorum*
Dusty flathead	*Neoplatycephalus fuscus*
Greenback flounder	*Rhombosolea tapirina*
Long-snouted flounder	*Ammotretis rostratus*
Garfish	*Hemiramphus melanochir*
Bridled goby	*Arenigobius bifrenatus*
Big-headed gudgeon	*Philypnodon grandiceps*
Globe fish	*Atopomycterus nichtemerus*
Small-mouthed hardy head	*Atherinasoma microstoma*
Silver hardy head	*Atherinasoma presberytoides*
Six-spined leatherjacket	*Meuschenia multiradiatus*
Ling	*Genyptems blacodes*
Luderick	*Girella tricuspidata*
Flat-tail mullet	*Liza argentea*
Sand mullet	*Myxus elongatus*
Sea mullet	*Mugil cephalus*
Yellow-eye mullet	*Aldrichetta forsteri*
Oldwife	*Enoplosus armatus*
Pipefish	*Several species*
Snapper	*Chrysophris unicolor*
Blue sprat	*Spratelloides robustus*
Sprat	*Clupea bassensis*
Snook	*Australuzza novaehollandiae*
Black sole	*Synaptura nigra*
Native trout	*Galaxius maculatus*
Smooth toadfish	*Torquigener glaber*
Prickly toadfish	*Contusus richei*
Australian smelt	*Retropinna semoni*
Tommy rough	*Arripis georgiana*
Tupong	*Pseudaphritis urvilli*
Tailor	*Pomatus saltator*
Trevalley	*Vsacaranx georgianus*
Yellowtail scad	*Trachurus mecullochi*
King George whiting	*Sillaginodes punctatus*

Appendix 5 - Nutrient levels - Eastern Creek

There are no official EPA tests for nutrient levels in Eastern Creek drain.

The following are results of phosphate analysis taken by FONA members in 1995 from two sites in Eastern Creek. The measuring kit used was a Merk Aquaquant Phosphate Kit.

Measurements were taken at the drain under Palmers Road (near Aquadome) and at the junction of Whiters Street and Coates Road (ie above and below the industrial estate).

Date	Whiters Street	Palmers Road	
17/5/95	>8	3	
7/6/95	>8	3	(7 after digestion)
3/8/95 (after heavy rain)	>8	0	

The kit gives a colour reading which relates to the concentration of phosphates in the sample. The No. 8 is the maximum that can be determined (dark blue) and apparently represents phosphates in excess of 0.43 ppm. If the sample shows >8 after addition of reagents P_1A and P_2A then there is no point in doing a full digestion.

A sample taken at Carpenter Street on 20/4/95 analysed at East Gippsland College of TAFE (with full digestion under supervision of Andrea Brumley) showed:

Phosphate >0.43 ppm (ie >8)

Salinity 7,800 ppm (Sea H_2O 35,000 ppm)

and significant turbidity.

The tests infer a high nutrient level in Eastern Creek.

Appendix 6

Extract from Dept of Housing N.S.W. (1994)
"Soil and Water Management for Urban Development"
N.S.W. Government.
by kind permission of the publishers

6.4 Constructed Wetlands

6.4.1 Preamble

The design criteria and construction details for constructed wetlands are still in an evolutionary phase with a number of organisations currently involved in data collection and investigations into various alternatives for water quality control. However, Australian data remains both scarce and variable in nature.

Nevertheless, constructed wetlands should be considered, especially when undertaking the structure planning of new release areas. Their incorporation into "infill" developments should also be considered, although construction opportunities might be considerably limited.

General principles to be adopted include:

(i) the wetland should maintain the pre-development water quality of the downstream receiving water body;

(ii) proportion the costs of construction and land take between contributing catchments and development areas (e.g., by Section 94 contributions);

(iii) land designated as constructed wetland should be in such a way that it can be considered as unstructured open space;

(iv) the ultimate owner should participate in the development and adoption of a management plan for the ongoing maintenance of the wetland;

Consider both regional and local wetland schemes at the design stage. Generally, the former are more economical and represent better use of community dollars in meeting construction costs, while the latter are more efficient at removing pollutants, especially where a "first flush" can be demonstrated (see footnote 1, page 63 for an explanation of "first flush").

6.4.2 Introduction

(a) Constructed wetlands are designed to retain nutrients, heavy metals, bacteria and other pollutants. They should aim to ensure that discharge water quality post-development is, at least equal to, or better than the quality pre-development in average annual runoff.

(b) However, the technology on which design of constructed wetlands is based, is still in its infancy and the following information should be interpreted with this in mind - the design criteria suggested below might be substantially modified as new information becomes available.

(c) Consider wetlands as part of a comprehensive stormwater management system, i.e., part of a "treatment train" (Section 1.1.1) which involves the whole catchment. Consequently, assess constraints on a site-by-site basis (Section 2). Where these constraints limit opportunity for development of wetlands, the control of pollution of nutrients, etc. can be addressed further down the catchment.

(d) Constructed wetlands appear to be most appropriate in areas where receiving water quality problems are, or are likely to become caused by nutrient loadings,[12] e.g., reservoirs, lakes and estuaries.

(e) Current practice is to design large, on-line, regional scale wetlands. However, where it is desirable to control "first flush" waters, locate them with catchment areas smaller than about 40 hectares ("first flush" effects are less apparent in larger catchments) and so that waters beyond the "first flush" can bypass. Ensure the catchment area and soil type are adequate to mitigate excessive water loss in dry periods.

(f) Generally, it will not be necessary to commission wetlands during the construction phase - during this phase, control of sediment pollution is the major issue. Control of pollution of other materials usually only becomes necessary after landscaping has started and traffic levels have increased.

(g) A major criterion affecting the effectiveness of wetlands is hydraulic residence time - accordingly, it is important to ensure that flow short circuiting is avoided.[13] Another important criterion is maintenance of a balanced ecosystem.

(h) Before water enters a wetland it is desirable to

(i) reduce sediment loads (particularly, dispersible clays if significant quantities occur), organic debris and other floating materials; and

(ii) attenuate stormwater volumes so that the wetland's retention time (and, hence, its ecological viability) is not adversely affected.

12 The US EPA (1983) and NVPDC (1983) have compared average pollutant removal efficiencies for constructed wetlands and sediment retention basins. Results indicate that wetlands are about 2 to 3 times more efficient for phosphorus removal and 1.3 to 2 times more efficient for total nitrogen removal (no indication is presented on the effect of dispersible colloids on these figures). For other pollutants (total suspended solids, lead, zinc, BOD and COD), the average removal rates of the two systems are very similar. These results assume an average hydraulic residence time of 2 weeks or greater (c.f. figure 6.21) for the permanent pool of the wetlands, and 12-24 hours detention time with a storage capacity of about 10 mm of runoff per impervious hectare for sediment retention basins.

13 In this regard various computer programs are available for designing lakes for pollution control.

(i) Consider the water body in two parts (figure 6.19):

(i) the lower section - does not normally outlet and is called the "permanent pool" (capacity determined by intended pond effectiveness); and

(ii) the upper or surcharge section.

(j) Designers

(i) need to be aware that occasional maintenance of wetlands is essential, including harvesting of plants and possible removal of sediment. Nevertheless, confine sediment trapping systems to pre-treatment basins or inflow sumps;

(ii) should ensure the introduction of natural agents to wetlands to assist with biological control of likely pests and diseases; and

(iii) should consider wetland design in terms of enhancement of the amenity value of an area and returns from increased property values.

6.4.3 Construction Details

General Comments

(a) Where practicable, water entering wetlands should be relatively free of sediment, particularly dispersed colloids. Where pre-treatment for sediment control is not achieved before water enters a wetland, alternative options are provided in figures 6.19 and 6.20. These options propose a sediment sump associated with the wetland, designed so that during surcharge, the sump and wetland become a single water body and share a common surcharge pool. These sumps can be converted to wetlands following completion of the development phase and site rehabilitation (when sediment pollution rates drop substantially). Note: the sumps and wetlands might be constructed either in series or in parallel as follows:

(i) *in series* - all flows pass through both structures; and

(ii) *in parallel* - trickle flows and "first flush" waters pass readily from the sediment basin to the wetlands, with larger flows essentially bypassing the wetlands. This has the effect of directing very large flows away from the wetlands and helping to maintain their integrity.

Where the sediments contain significant quantities of dispersible materials, add a flocculating agent to the water. This can be achieved in various ways (see Appendix D).

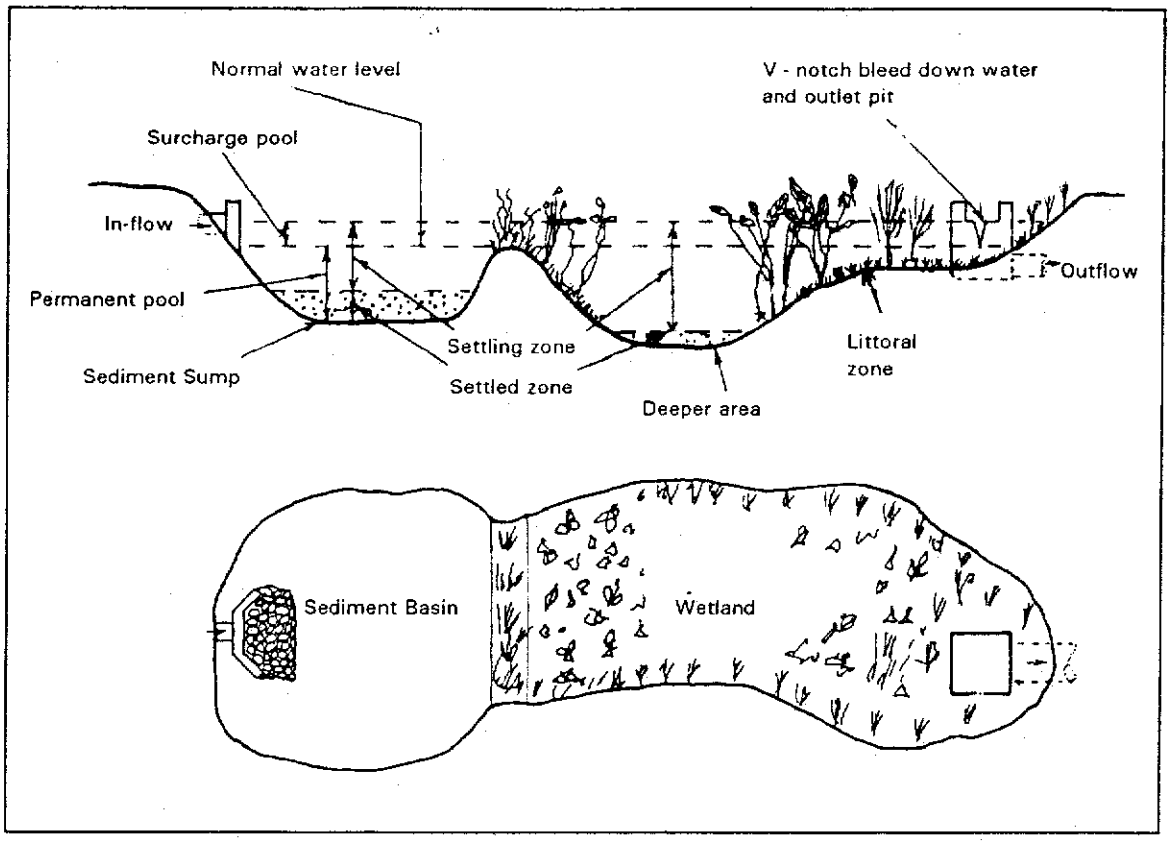


Figure 6.19 Sediment basin/constructed wetlands – typical series configuration (adapted from Livingston *et al*, 1988); plan and longitudinal sections

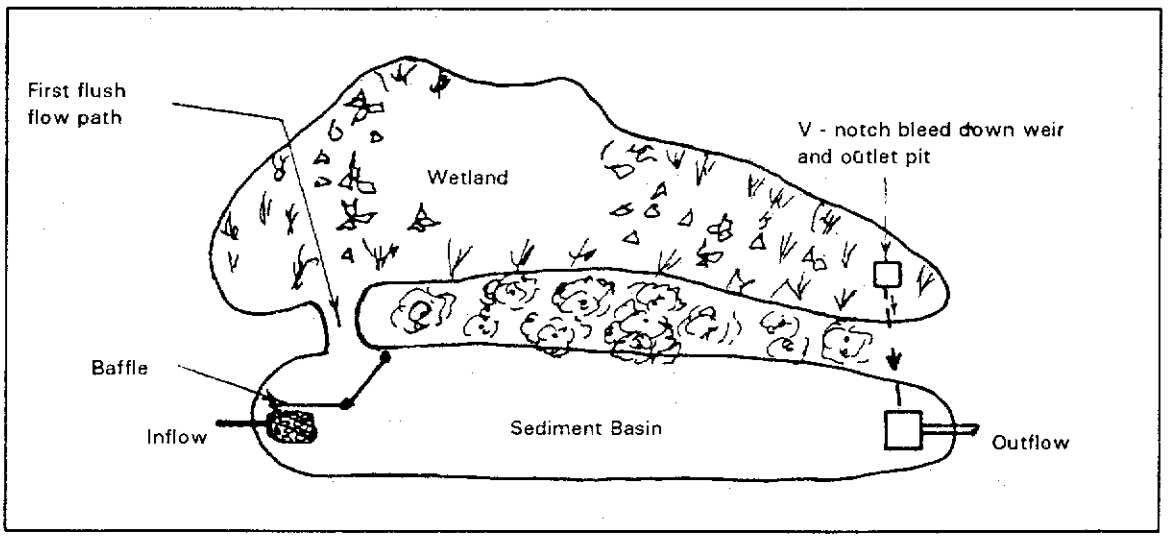


Figure 6.20 Sediment basin/constructed wetlands – typical parallel configuration

(b) To maximise the natural treatment functions of wetlands

(i) Construct the inlet zone to ensure that in-flowing water is distributed horizontally across the pond and will not bypass as a plume – might be achieved using wide flat weirs, level spreaders, baffles, islands and the like. Velocity of flow should not exceed 0.3 metres per second in the one year ARI event;

(ii) consider the use of multiple inlets to disperse the total inlet load around the upstream end of a pond;

(iii) aquatic vegetation should occupy about 30 per cent of the pond surface area, planted on a littoral shelf; and

(iv) ideally, the pond should have a length width ratio of at least 3:1. This can be achieved through strategic location of the inlet and outlet structures, and/or construction of baffles or islands.

The Permanent Pool

(c) Various techniques are available for estimating the appropriate size of the permanent pool. The better ones involve specific detailed hydrologic and biotic examination and are flexible enough to make use of emerging alternative data on nutrient uptake rates. One such technique involves the following 3 steps:

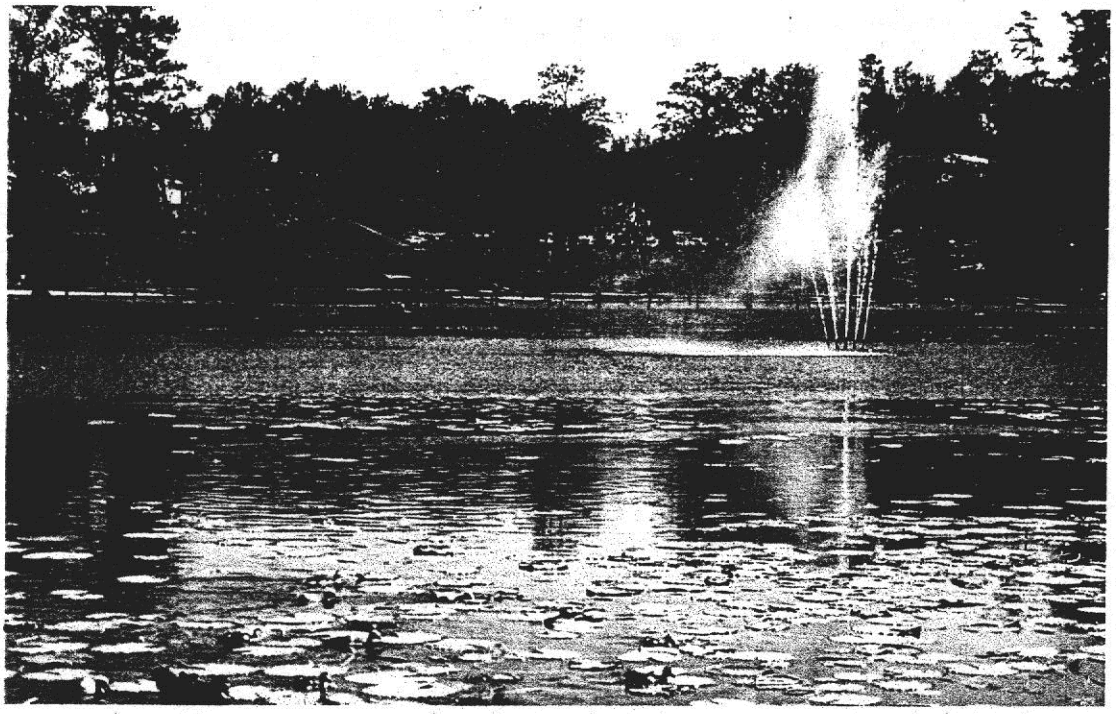
(i) estimate the mean annual runoff (m^3/yr) (unless other relevant data are available, assume it as the product of percentage impervious area[14] in the catchment and mean annual rainfall);

(ii) determine the required hydraulic residence time (yrs) to achieve a nominated pollutant retention percentage (figure 6.21);[15] and

(iii) calculate the required capacity (m^3) from the product of (i) and (ii), above. Where effective sediment removal is not achieved before inlet to the wetlands, add 20 per cent to allow for sedimentation.

14 Generally, ranges from
- 5 to 20 per cent for rural residential and large lot residential development
- 20 to 50 per cent for low to medium density residential development
- 50 to 90 per cent for commercial/industrial and high density residential development.

15 Seek a hydraulic residence time which achieves the minimum adequate nutrient uptake. This will minimise the risk of thermal stratification which can result in anaerobic bottom conditions and consequent export of nutrients from sediments – particularly important in deeper ponds.



A flocculating agent is added to in-flowing water immediately upstream of six of the seven inlet points to this 5.4 hectare wetland.

Before 1986 and the addition of the flocculation system, pollutants regularly resulted in formation of dense floating mats of algae, and periodic fish and duck kills. The pollutants mainly came from continual stormwater input from a highly urbanised catchment (64.6 ha; average annual rainfall about 1 500 mm). The lake does not appear to stratify thermally, possibly due to its relatively shallow depth (mean depth 2.1 m; maximum depth 2.7 m). Due to depleted oxygen levels at depths greater than 2 metres, recycling of phosphorus was assumed to be an important nutrient source (Harper *et al*, 1986).

According to Livingston (1988), the flocculation system has

(i) reduced the internal recycling of nutrients and metals;

(ii) resulted in a retention of about 85 per cent of pollutants;

(iii) stopped

- formation of algal mats
- fish and duck kills; and

(iv) caused a substantial increase in

- the amenity value of the lake
- values of surrounding properties.

Figure 6.22. A wetland recently enhanced in form to more effectively precipitate pollutants.

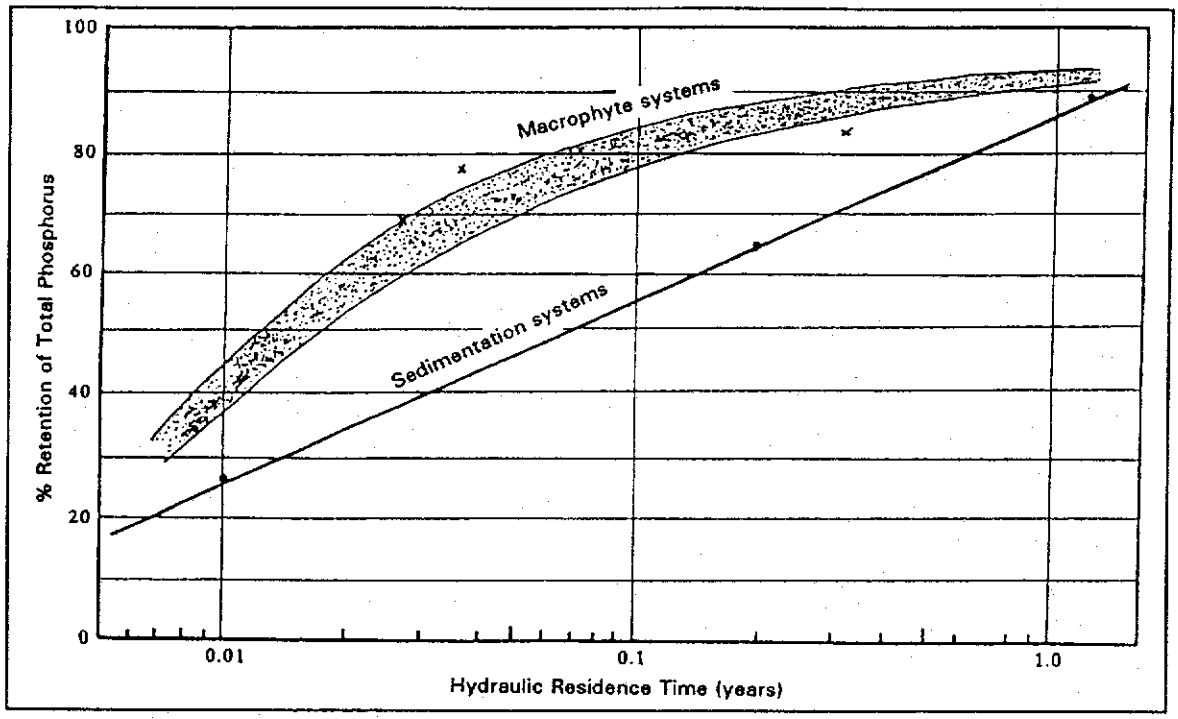


Figure 6.21 Hydraulic residence time for phosphorus retention (Lawrence, 1986)

(d) The depth of the permanent pool should be

(i) in the littoral zone (about 30% of pond surface area) 0.3 to 0.6 metres where emergent macrophytes are to grow; and down to 2.4 metres where submerged macrophytes are to grow; and

(ii) in the open water zone, 2.4 to 5-8 metres.[16]

The likelihood of stratification and, where appropriate, methods to address it must be considered with ponds deeper than about 4 metres.

(e) Internal batter gradients should meet the criteria in Section 6.3.3(d)(iii). However, to provide for a 30 per cent littoral zone, average gradients are likely to be less steep than 5(H):1(V) in the top 1.5 metres depth. If practicable, protect shorelines exposed to prevailing winds and wave erosion with

- emergent macrophytes and gradients of at least 10(H):1(V)
- other appropriate stabilisation techniques.

16 Chose an actual maximum depth which is considerate of the need to minimise the likelihood of thermal stratification at that location – generally less than about 6 metres. The open water zones (deeper than 2.4 m) are important areas for settlement of finer soil particles and allowing sunlight to kill bacteria.

(f) Verify the performance of any constructed wetlands through application of appropriate models and modify design where necessary.

The Surcharge Pool

(g) In the surcharge pool,[17] embankments should have a minimum grade of 10(H):1(V).[18] Vertical walls might be installed providing they meet the criteria in Section 6.3.3(d)(iii) and are no higher than 300 mm.

(h) Ensure the outlet from the surcharge pool draws surcharge water down over no less than 40 hours (preferably three days) and with no more than half the surcharge volume discharged within one third of that time. It should contain a secondary outlet to cater for flood flows. Very low flows should bypass the spillway area to prevent slime build-up.

Maintenance

(i) To allow for maintenance, there should be provision in the pond design for drainage of

(i) at least 60 per cent of the pond volume for removal of pollution deposits; and

(ii) 1.5 metres depth for manipulation of plant growth (e.g., harvesting). This can be critical, especially around the inlet zone. Invasive plants, e.g., *Typha, Phragmites* and *Juncus spp*, can completely clog parts of the wetland, resulting in water bypassing as a plume with a consequent reduction in the effective residence time.

Where possible, drainage by gravity is preferred, although pumping is acceptable.

(j) Maintain wetlands such that any sediment or other pollutants are removed when less than 90 per cent of the capacity necessary to meet pollution control requirements remains in the settling zone. An advantage of water that is relatively sediment free when it enters wetlands is that the maintenance requirements of the wetlands are reduced. Dispose of any pollutants removed from sediment basins or wetlands in areas where further pollution to downslope lands and waterways will not occur.

17 Where a "first flush" effect can be demonstrated, the surcharge and permanent pools should have a total capacity which contains the first 10 mm of runoff in catchments smaller than 40 hectares; or the runoff from the first 25 mm of rainfall in catchments larger than 40 hectares.

18 This grade is intended to minimise mosquito breeding problems by ensuring adequate surface drainage and preventing isolated pools forming in wet periods.

Other Considerations

(k) Generally, encourage emergent macrophytes right to the water's edge to assist in

- removal of nutrients and toxic products
- trapping any extraneous sediment or litter
- restriction of human access.

(l) Occasionally, however, it might be necessary to discourage emergent macrophytes at specific locations for landscaping or other reasons. At such locations edges constructed in stone, concrete, timber, etc., are acceptable.

(m) Choose plant species which do

- not result in undesirable impacts on downstream ecosystems or elsewhere in the pond
- enhance the visual impact of the pond.

(n) Trees and other plants near the water's edge should include water-tolerant species, such as Melaleucas, Casuarinas, etc. Deciduous exotic species are not desirable because of the high oxygen demand that leaf fall might impose on the pond. Generally, planting of trees on embankments is not recommended.

(o) To minimise mosquito problems, limit expanses of water with more than 50 per cent shading and ensure no sections of water become isolated from the main body.

(p) Islands are highly beneficial as wildlife refuges, especially for birds. Their design should consider the effects on changes in water tables.

(q) Stock ponds with selected native fish to improve the water quality (not for sport), especially species which will control mosquito larvae and select zooplankton in preference to phytoplankton. Avoid use of fish which are bottom feeders.

Appendix 7 - Funding sources

This calendar has been adapted from one prepared by the Coastal Unit, Port Phillip Region of the Department of Natural Resources and Environment (NRE) as a guide to grant applications for foreshore managers. The aim is to enable easy identification of the sources of funds most likely to support a particular foreshore project. The calendar has been divided into sections according to the type of coastal works.

This list is not exhaustive and should be updated as information becomes available. ***In many cases, grant timetables change from year to year and others are dependent on future budget allocations.*** *This calendar is only intended to provide an estimate of the grants that may be available, the time of year when applications may be sought and a contact for more information.*

Appendix 7 *(continued)*

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A. CONSERVATION AND PARK MANAGEMENT WORKS												
Department of Natural Resources and Environment												
Coast Action/Coastcare												
Beach Protection *												
Risk Mitigation Grants												
Conservation and Ethnic Grants												
National Estate Program												
B. WASTE MINIMISATION & LITTER CONTROL WORKS												
Recycle and Resource Recovery Council												
Waste Management Council												
Litter Recycling and Research Association *												
C. and D. COMMUNITY PROJECTS AND OTHERS												
Community Support Fund (CSF) *												
Tourism Victoria component of CSF												
Arts Victoria (example)												
Australia Council for the Arts (example)												
State Boating Council												

* Applications for these grants is through inquiry and there are no preset dates for acceptance of applications.
All other dates on the calendar are approximate, and should only be used as a guide for the time of year that applications may be accepted.

Appendix 7 *(continued)*

CALENDAR OF GRANTS AVAILABLE TO COMMITTEES OF MANAGEMENT AND VOLUNTEER GROUPS

A. CONSERVATION AND PARK MANAGEMENT WORKS

SOURCE	ADVERTISED	APPLICATIONS CLOSE	CONTACT	ELIGIBILITY/ COMMENTS	TYPE OF WORKS
Department of Natural Resources & Environm't					
• Coast Action/Coastcare Includes Indigenous Communities component of Coast Action/Coastcare	End of March	Mid-May (although for 1996 the closing date is 2 August)	Jennifer Lewis NRE Bairnsdale (051) 520400	Local community groups and Committees of Management. An Indigenous Communities component provides support for Aboriginal communities in coastal management.	Coastal and habitat restoration and improved recreation opportunities along the Victorian coastline. Includes planning, on-ground, monitoring and project support works.
• Beach Protection Grants	Application on inquiry	Submissions preferred before March each year	as above	Foreshore management groups	Beach renourishment, development of coastal protection structurees and strategies
• Risk Mitigation Grants	Application on inquiry	Submissions preferred before May each year	as above	Committees of Management, foreshore managers	Protective fencing, rock stabilisation, warning signage, rationalising access to dangerous areas.
• Conservation Grants (also Friends and Volunteers Grants)	August	October (announced Jan)	Anne van de Meene Grants Coordinator (03) 9412 4927	Committees of Management	Funding for a range of conservation works on public land. FVG really limited to Friends groups (not including Coast Action).
• Ethnic Grants	Details as per Conservation Grants above			Funding directed to ethnic communities and organisations	Various conservation projects
• National Estate Program (with the Aust. Heritage Commission)	February NB program currently on hold pending August budget	End of March	Anne van de Meene Grants Coordinator (03) 9412 4927	Local community groups	Conservation and interpretation projects for existing National Estate Register sites and survey of potential sites.
• Botanic Guardians Program		Ongoing	Local NRE Flora, Fauna & Fisheries Coordinator More information : Gill Earl (03) 9412 4227	Currently under review	Protection of threatened flora species by community groups on public land
• National Landcare Program			Laurie Norman NRE Bairnsdale (051) 520400	Predominantly for private landholders	Habitat corridors, remnant vegetation, Waterwatch, catchment areas.

Appendix 7 *(continued)*

B. WASTE MINIMISATION AND LITTER CONTROL WORKS

SOURCE	ADVERTISED	APPLICATIONS CLOSE	CONTACT	ELIGIBILITY/ COMMENTS	TYPE OF WORKS
Recycle & Resource Recovery Council (RRRC)	End of July	End of August Notification in October	Grants Coordinator (03) 9639 0922	Community groups, industry and local government. **NB RRRC soon to merge with Waste Management Council and details will change. Information provided only relevant for the next few months.**	Waste minimisation
Waste Management Council (WMC)	May	End of June	Grants Coordinator (03) 9853 0540	Statutory bodies and general community **NB as above, merge with RRRC may alter grant details.**	Reducing landfill, recycling projects and large-scale projects.
Litter Recycling & Research Association, Victoria	Application on inquiry	N/A	David Hitchcock (03) 9289 9596	Primarily local government	Litter control and domestic waste management. Development of works that can be implemented in other municipalities favoured.
Environment Protection Authority	No grants available at this stage. Will be notified of grants if they become available later in the year		Lorna Pitt (03) 9628 5460 Ron Scott (03) 9628 5070		Possible future litter control grants Possible cleaner production grants
Clean Up Australia 2001 (Westpac)	N/A	N/A	1800 676 001	No grants available but assistance available particularly to councils in identifying environmental projects.	Identification and repair of 2001 environmental assets by the year 2001.

Appendix 7 *(continued)*

C. COMMUNITY BASED PROJECTS

SOURCE	ADVERTISED	APPLICATIONS CLOSE	CONTACT	ELIGIBILITY/ COMMENTS	TYPE OF WORKS
Department of Premier and Cabinet Community Support Fund (CSF)	Application on inquiry	N/A	CSF Unit, 1 Treasury Place Melbourne 3002 (Anne Kiewiek (03) 9684 8802) - phone number soon to change)	Open eligibility excluding commercial organisations	Programs and projects that will benefit the Victorian community.
Tourism Victoria	November	January	Diane (03) 9653 9777/9653 9854	Tourism Victoria grants are administered through the Community Support Fund program described above and must satisfy the relevant criteria.	Projects with substantial tourism and therefore community benefit.
Aboriginal Affairs Victoria (AAV)	Information on inquiry	N/A	Manager, Heritage Services Branch (03) 9412 7498	Generally not a funding source but may be able to help on a case-by-case basis where coastal site management and protection works are endorsed and supported by a local Aboriginal community.	AAV is also available for advice on possible funding options and for assistance with applications for funding from the Australian Heritage Commission.
Arts Victoria The Victoria Commissions Arts Development Projects		1 August 1 September	Fiona Beckwith Project Officer, Arts Vic Private Bag 1 City Road P.O. 3205 Toll free 1800 134894 (regional Victoria only)	Awaiting development of updated information kit **NB** Arts Victoria has a range of other grants which may be applicable and a full information kit is available.	Commissioning of new and significant work for publication or siting in Victoria Artistic publications and exhibitions
Australia Council for the Arts (this is only a sample of the type of grants available) Community Cultural Development Fund Visual Arts/Craft Fund		May and August June and July	Toll free 1800 226 912 Handbook available on request	Individuals and organisations	eg. Projects that link the cultural life of communities and the quality of their physical environment.

Appendix 7 *(continued)*

D. OTHER COASTAL PROJECTS AND PHILANTHROPIC TRUSTS AND FOUNDATIONS

SOURCE	ADVERTISED	APPLICATIONS CLOSE	CONTACT	ELIGIBILITY/ COMMENTS	TYPE OF WORKS
State Boating Council	Early January	April-May	Mr Steve Parsons (03) 9619 6683	Statutory bodies	Development of new or improved boating facilities
National Ecotourism Project (Commonwealth Dept of Industry, Science and Tourism)			Asst Secretary, Regional & Env'mental Tourism Branch (06) 2797145 (06) 2797111	Currently not available but possibility that program will be funded.	Non profit groups.
Aust. Nature Conservation Agency (ANCA) - Commonwealth - wetlands - Contract Employment Program for Aboriginals in natural and cultural resource managemt - CEPA		March	General inquiries (06) 2500200 Kate Gowland (wetlands) (06) 2500797 Kim Orchard (CEPA) (06) 250 0324	General environmental protection funding available 1996 is the end of the initial 5 year CEPA program and this may not continue to run.	Protection of Ramsar wetland sites. May also continue a Contract Employment Program for Aboriginals in cultural and resource management.
Commonwealth Public Affairs Branch Environment, Education and Information Grants			(06) 274 1704	Currently under review	Primarily for environmental education projects with a **national** focus.
Alcoa Australia	N/A	N/A	Mr John Hannagan Corporate Affairs Mgr (03) 9270 6111	Individual assessment of requests for sponsorship	Sponsorship directed in particular towards Landcare projects
BHP Petroleum Australia			Details on internet http://www/bhp.com.au.	Seemed relucant to fund any government driven initiatives.	May assist the general community through BHP Community Trust.
# The Myer Foundation and The Sidney Myer Fund		March, July, November	Executive Officer Myer Foundation 250 Elizabeth Street Melbourne 3000 (03) 9663 3113		Promoting community services to education and the environment.
# Australian Bird Environment Foundation		May and October	The Secretary, ABEF PO Box 185 Nunawading 3131 (03) 9877 5752		Supporting projects or studies aimed at protection of habitat, needs of species or education of the public.
# Ian Potter/George Alexander Foundation		July	The Secretary, IPF/GAF Level 25, 101 Collins Street Melbourne 3000 (03) 9650 3188)		Grants for, amongst other things, public conservation works.

Notes

This calendar is divided into sections which provide information on particular categories of grants available. This is to help identify the most appropriate funding source for the proposed works. Within each section, the sources are arranged in order to reflect those that are most likely to provide funding.

This list is not exhaustive. **It is particularly important to note that grant programs often differ from year to year.** Some organisations are merging and others are awaiting details of funds to be made available in coming budgets. As such, the information may alter.

Entries marked # are examples of philanthropic Trusts and Foundations which may be relevant to community conservation projects. These usually require a very high standard of application and well detailed project proposals which meet specified objectives.

More information on these and other philanthropic sources may be found in:

The Australian Directory of Philanthropy, 7th ed. (1993)
(Australian Association of Philanthropy).

Appendix 7 *(continued)*

REFERENCE LIST

A. ENVIRONMENTAL EDUCATION

- **Gould League of Victoria** — Ph (03) 95532 0909
  Waste matters and other environmental care programs
- **Victorian Association for Environmental Education** — Ph (03) 9428 9812
  Particularly for education material for Port Phillip Bay
- **Victorian Outdoor Education Association** — Ph (03) 9428 9920
  Various resources
- **Natural Resources Conservation League** — Ph (03) 9546 9744
- **Energy Victoria** — Ph (03) 9412 6886
  Consultation and advice available regarding renewable energy planning and options. Contact Bruce McKenzie.
- **Marine and Coastal Community Network.** Contact Tim Allen. — Ph (03) 9650 4846

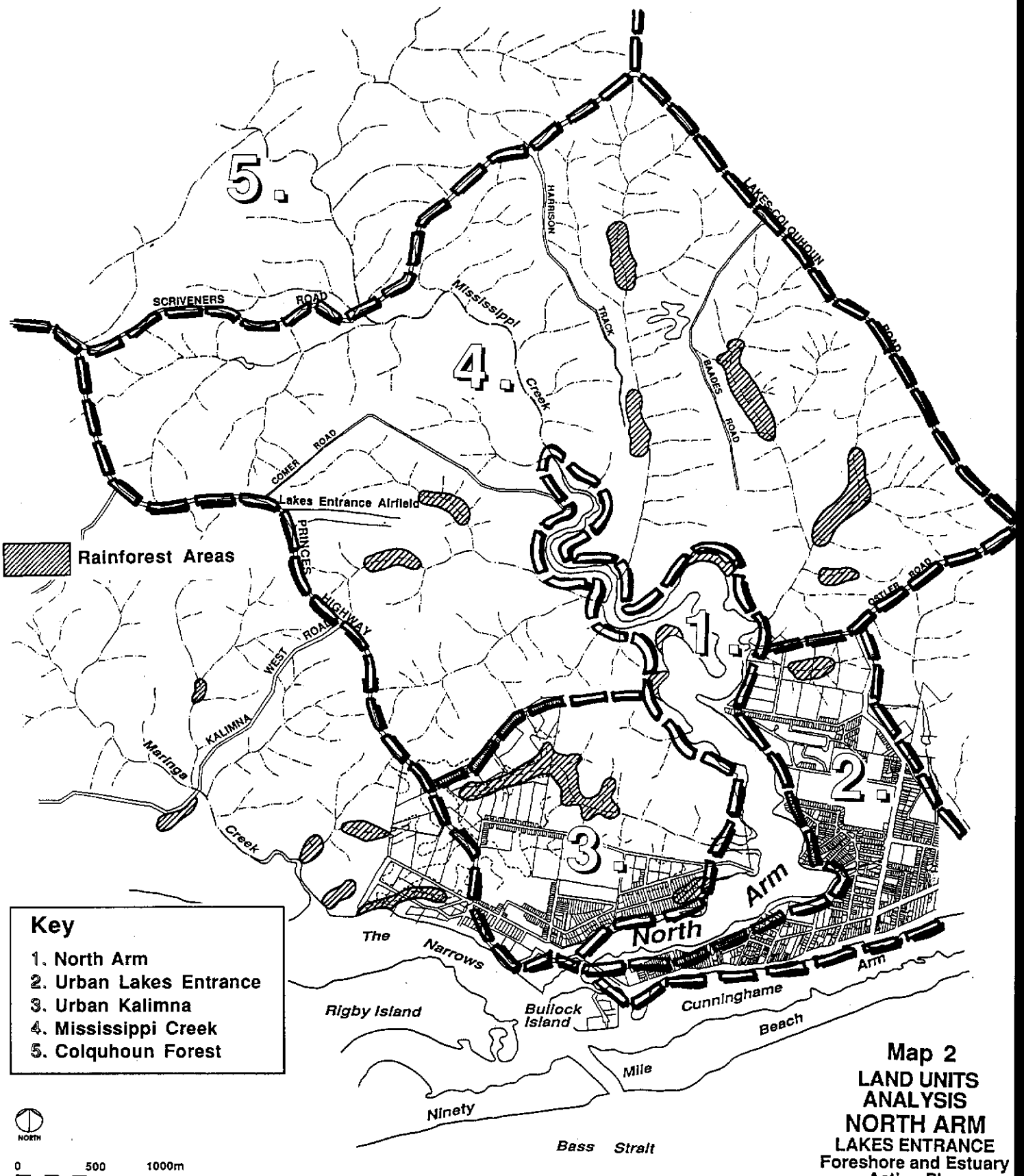
B. VOLUNTEER CONTACTS

- **Coast Action Coordinator, Bairnsdale.** Contact Jennifer Lewis, NRE Bairnsdale — Ph (051) 520400
- **Australian Trust for Conservation Volunteers** — Ph (03) 9681 9155
- **Local scouting groups, schools and clubs (eg birdwatching)**

C. SPONSORSHIP TIPS

Steps to gaining sponsorship:

1. Have a set idea or project
2. Provide an opportunity to promote the sponsor, eg signage, media
3. Local stores or suppliers can be a good first point of contact. From there you can ask for the name of the local sales representative
4. Some companies look for opportunities to have their staff involved in the project they may be sponsoring. Other sponsors may prefer just to give in kind, ie supply their own product rather than supply funds.



Map 2
LAND UNITS ANALYSIS
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan

Map 1

NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan

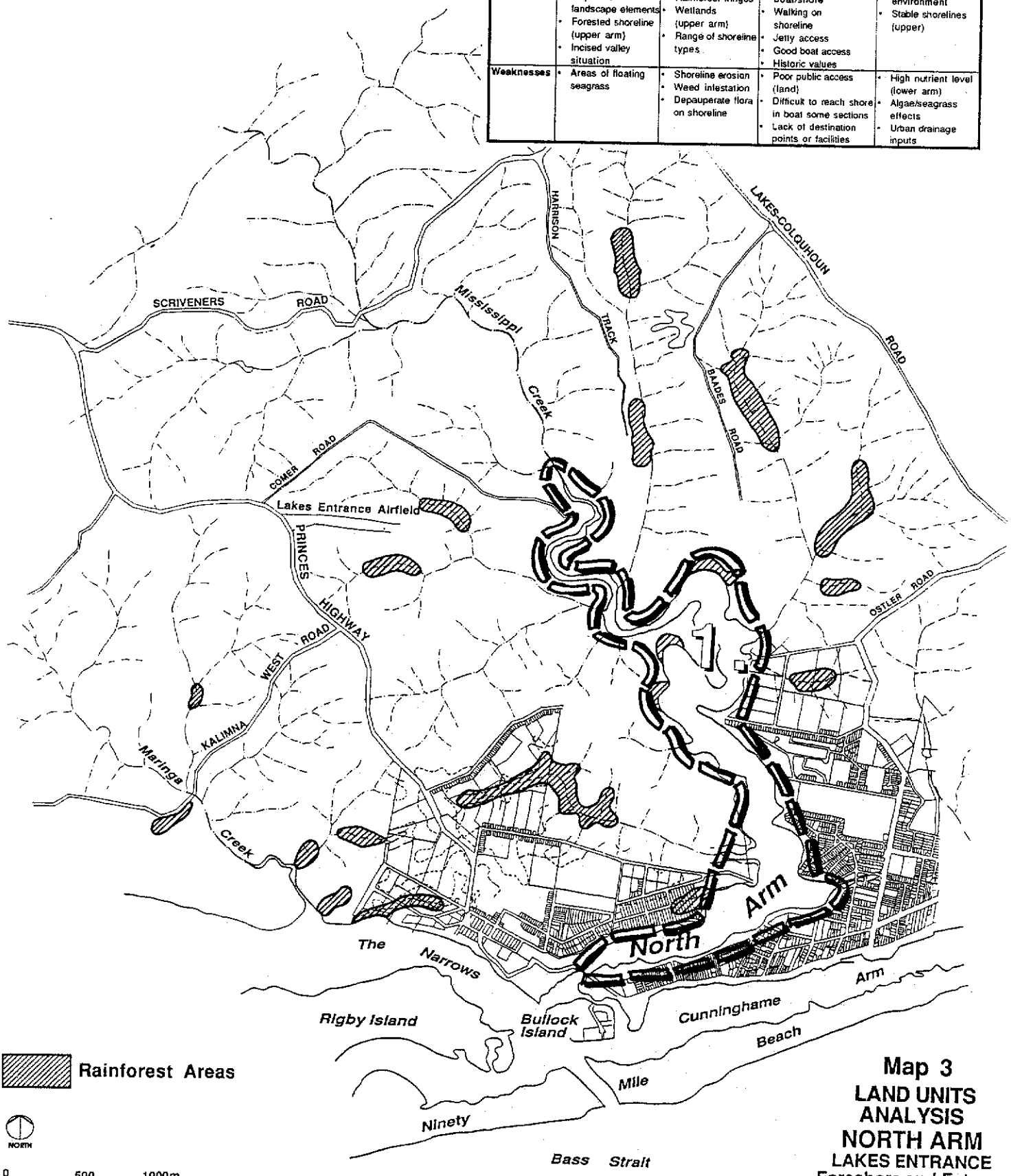
August, 1996

For
The Friends of North Arm (FONA)
Together With
Shire of East Gippsland
Department of Natural Resources and Environment
By
Landsmith Pty Ltd
Resource Management/Eco-tourism/Government Relations
Vantree Pty Ltd
Coastal Engineering And Port Planning
Frank Hanson Pty Ltd
Landscape Architecture/Landscape Planning/Urban Design

1 NORTH ARM

This landscape unit which includes both the immediate foreshore areas and the water areas of the arm forms the focus of this study.

	Landscape component	Conservation component	Recreation component	Water component
Strengths	• Water acts as visual continuity to disparate landscape elements • Forested shoreline (upper arm) • Incised valley situation	• Seagrass beds for fish breeding • Rainforest fringes • Wetlands (upper arm) • Range of shoreline types	• Navigable for 6 Km • Fishing opportunities boat/shore • Walking on shoreline • Jetty access • Good boat access • Historic values	• Tidal flushing • Good marine environment • Stable shorelines (upper)
Weaknesses	• Areas of floating seagrass	• Shoreline erosion • Weed infestation • Depauperate flora on shoreline	• Poor public access (land) • Difficult to reach shore in boat some sections • Lack of destination points or facilities	• High nutrient level (lower arm) • Algae/seagrass effects • Urban drainage inputs

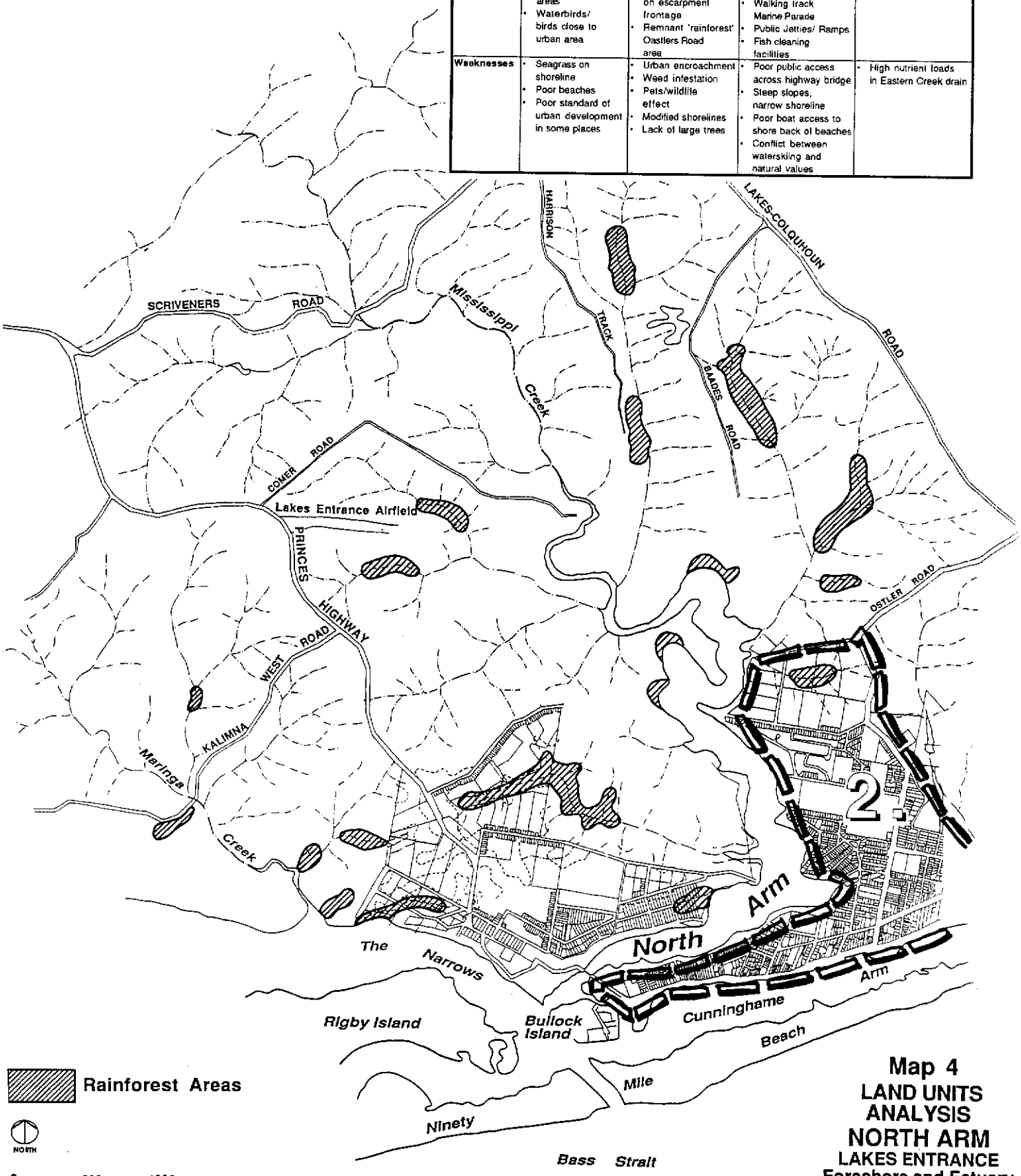


Map 3
LAND UNITS ANALYSIS
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan

2 URBAN LAKES ENTRANCE

This area is the most highly developed landscape unit of the study area. It is characterised by large built up areas of dwellings and hard surface areas areas such as roads and car parks. The foreshore of the main town area has extensive stone retaining walls and jetties.

	Landscape component	Conservation component	Recreation component	Water component
Strengths	• Visual link between urban/natural areas • Waterbirds/ birds close to urban area	• Waterbirds near urban area • Remnant Vegetation on escarpment frontage • Remnant 'rainforest' Ostlers Road area	• Water ski beach • Good facilities (Recreation Reserve) • Walking track Marine Parade • Public Jetties/ Ramps • Fish cleaning facilities	• Fresh water areas in town drainage system
Weaknesses	• Seagrass on shoreline • Poor beaches • Poor standard of urban development in some places	• Urban encroachment • Weed infestation • Pets/wildlife effect • Modified shorelines • Lack of large trees	• Poor public access across highway bridge • Steep slopes, narrow shoreline • Poor boat access to shore back of beaches • Conflict between waterskiing and natural values	• High nutrient loads in Eastern Creek drain

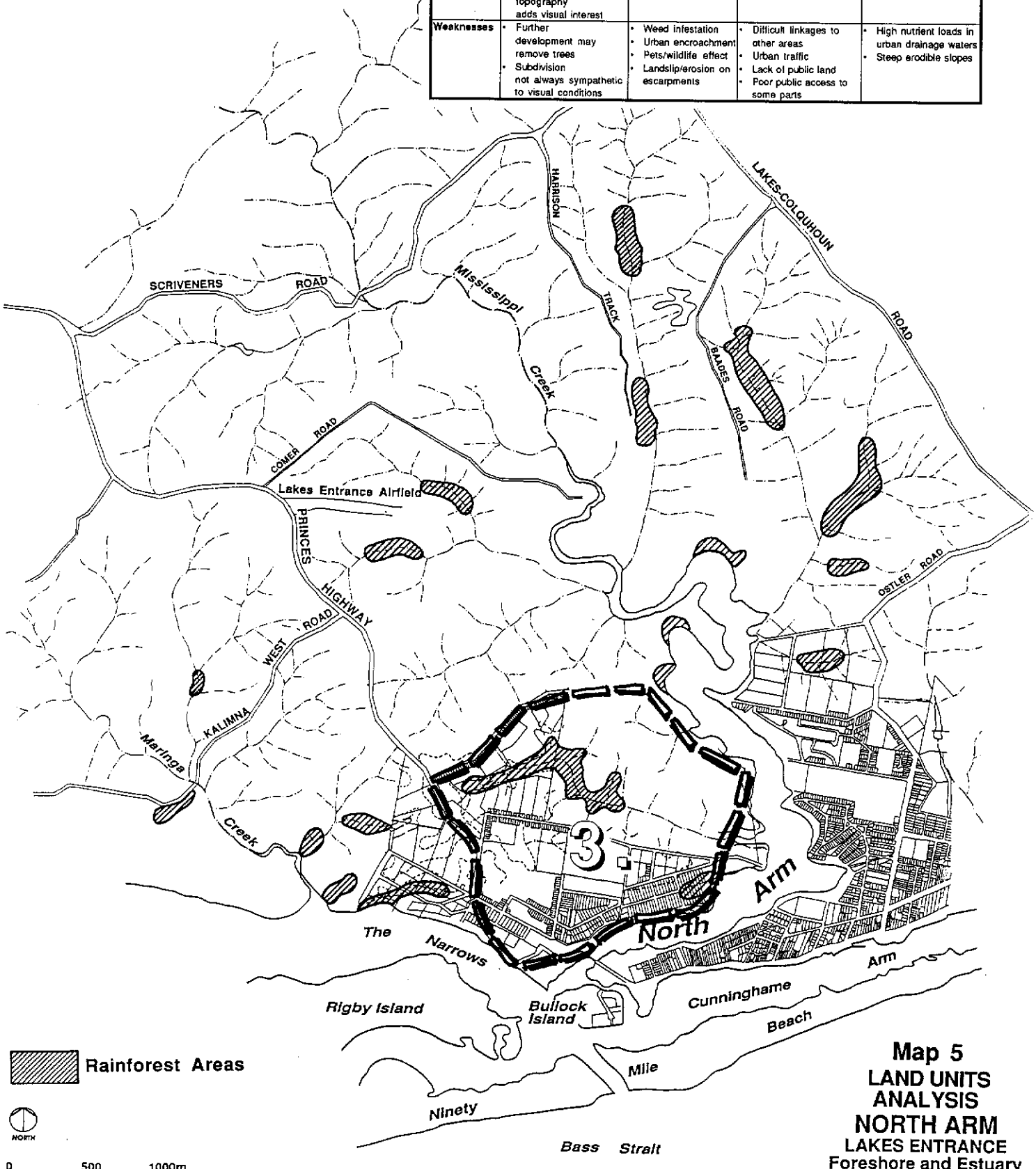


Map 4
LAND UNITS ANALYSIS
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan

3 URBAN KALIMNA

This unit forms an important visual backdrop for the Urban areas of Lakes Entrance
Significant areas of coastal rainforest

	Landscape component	Conservation component	Recreation component	Water component
Strengths	• Rainforest and wooded backdrop to Lakes Entrance • Varied topography adds visual interest	• Significant rainforest remnants • Saline wetland at creek mouth	• Good street walks • Foreshore access • Interesting topography and views • Boats can reach shore	• Urban drainage absorbed by gully vegetation in some places
Weaknesses	• Further development may remove trees • Subdivision not always sympathetic to visual conditions	• Weed infestation • Urban encroachment • Pets/wildlife effect • Landslip/erosion on escarpments	• Difficult linkages to other areas • Urban traffic • Lack of public land • Poor public access to some parts	• High nutrient loads in urban drainage waters • Steep erodible slopes

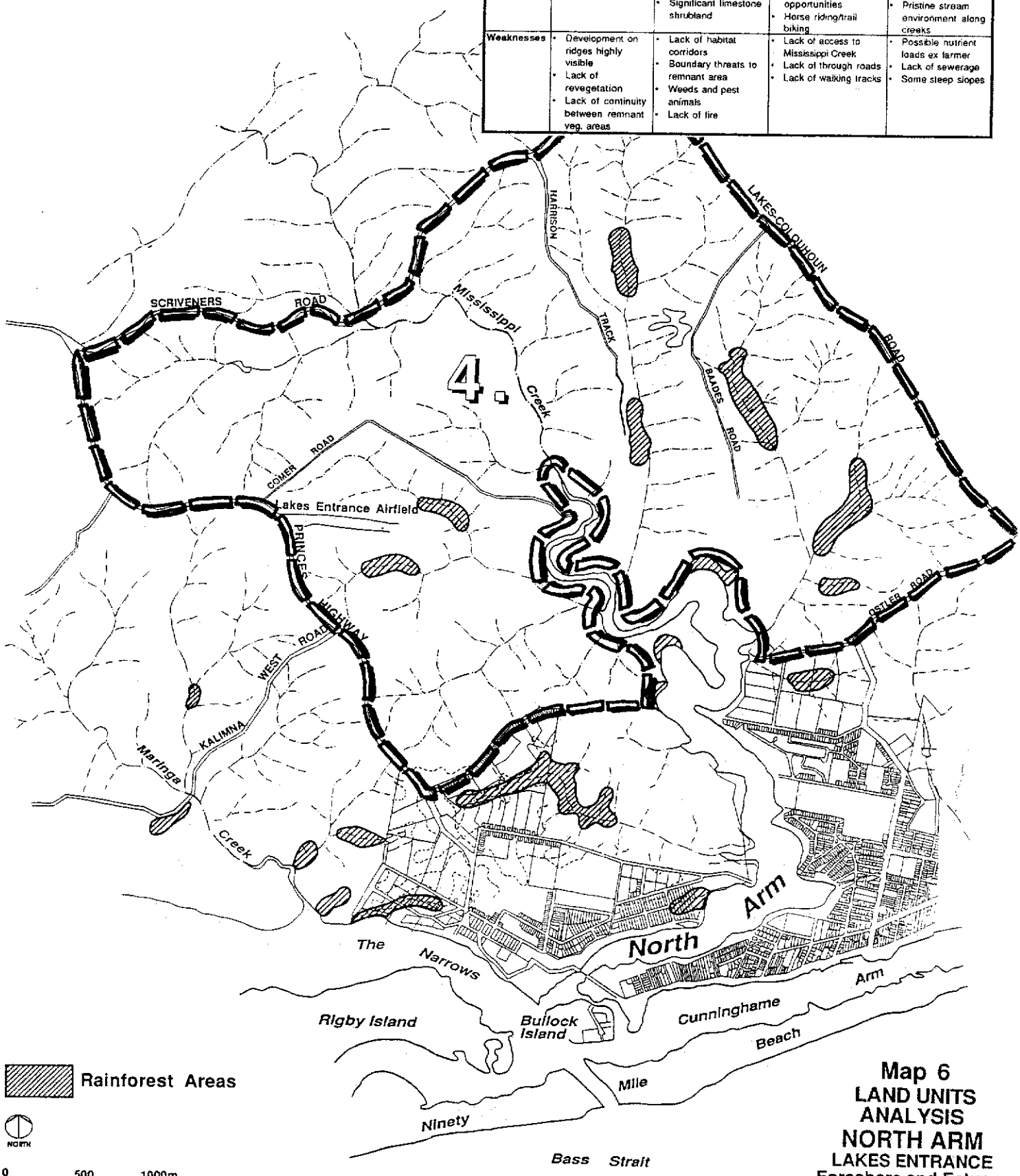


Map 5
LAND UNITS ANALYSIS
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan

4 MISSISSIPPI CREEK

This landscape unit is characterised by a predominantly rural appearance. Grazing and other farm uses result in large open paddock areas and scattered buildings. Remnant vegetation is found in roadside areas and in large wood lots.

	Landscape component	Conservation component	Recreation component	Water component
Strengths	• Significant remnant native vegetation	• Significant rainforest and other rare plant communities • Significant limestone shrubland	• Tourist destinations, winery, galleries etc • Walking, driving opportunities • Horse riding/trail biking	• Flood flows restrained by farm dams • Pristine stream environment along creeks
Weaknesses	• Development on ridges highly visible • Lack of revegetation • Lack of continuity between remnant veg. areas	• Lack of habitat corridors • Boundary threats to remnant area • Weeds and pest animals • Lack of fire	• Lack of access to Mississippi Creek • Lack of through roads • Lack of walking tracks	• Possible nutrient loads ex farmer • Lack of sewerage • Some steep slopes

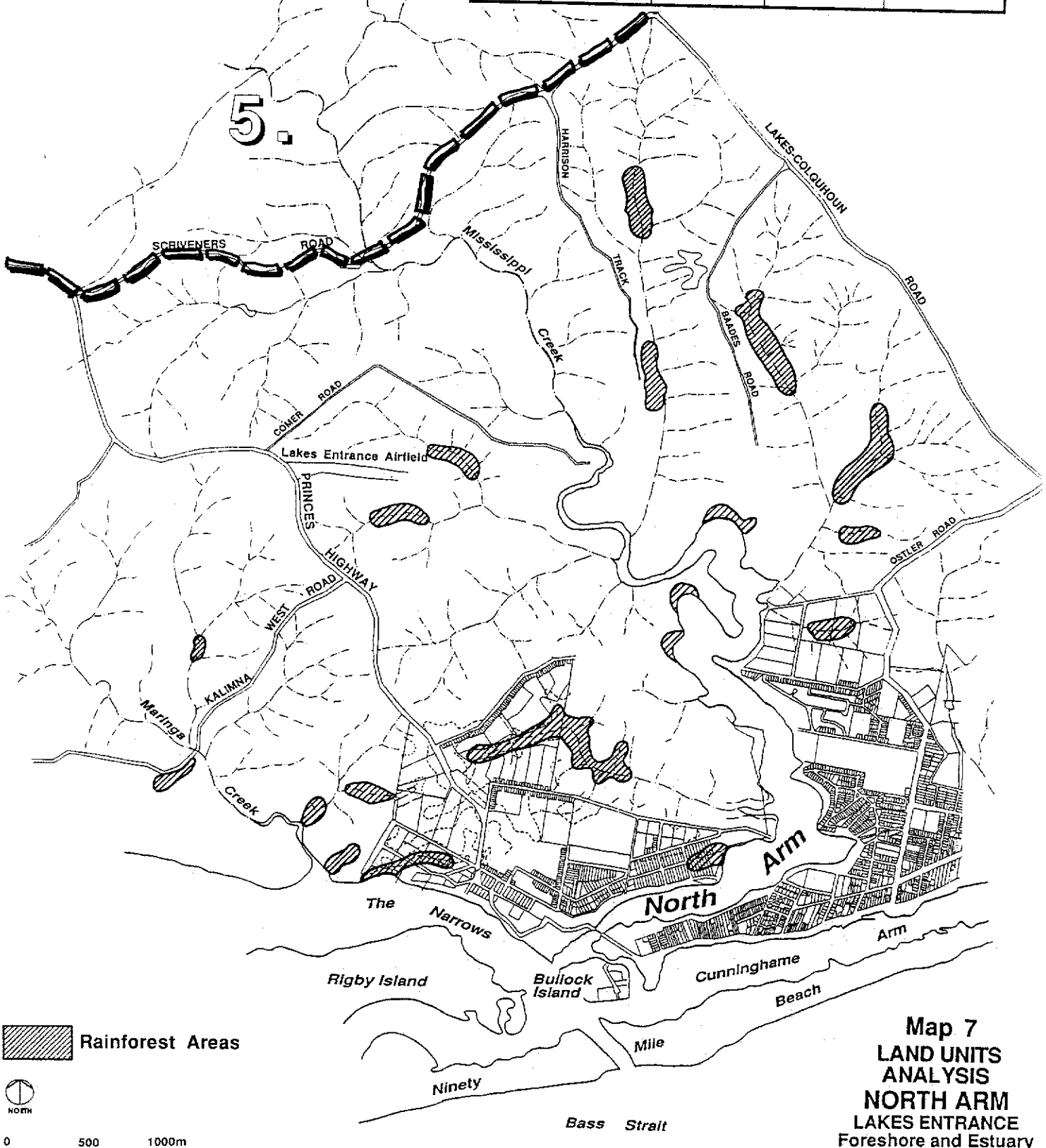


Map 6
LAND UNITS ANALYSIS
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan

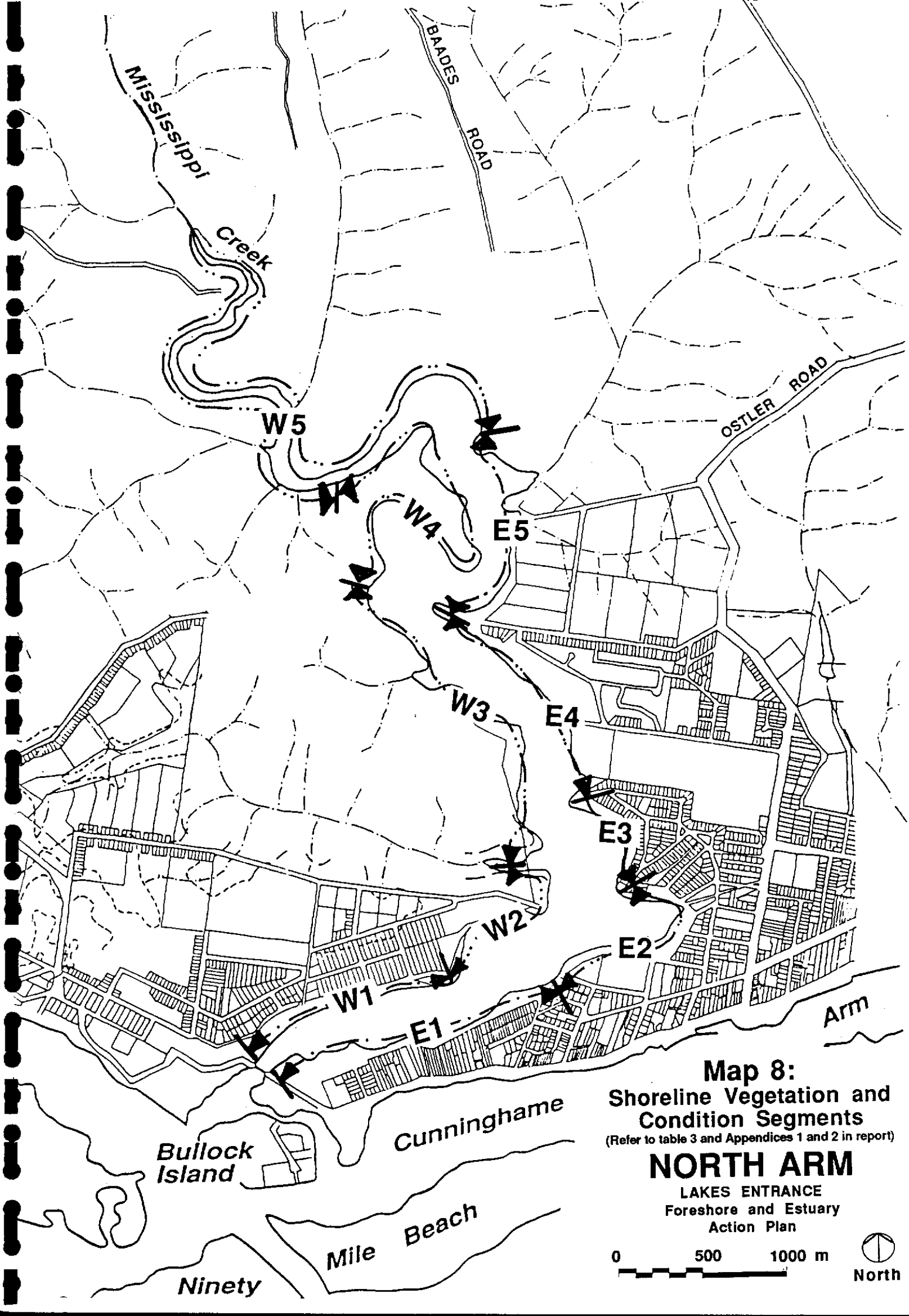
5 COLQUHOUN FOREST

This area is the largest landscape unit of the study area. It is the upper-most area of the catchment and the least affected by urban development.

	Landscape component	Conservation component	Recreation component	Water component
Strengths	• Large area of natural vegetation	• Intact, large area capable of sustaining viable flora and fauna conservation	• Spacious area for forest walks, drives, nature study, picknicking	• Forested natural catchment providing quality water & reducing sediment transport
Weaknesses	• Lack of viewpoints	• Gravel extraction, road network, utilisation	• None	• None



Map 7
LAND UNITS ANALYSIS
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan



Map 8:

Shoreline Vegetation and Condition Segments

(Refer to table 3 and Appendices 1 and 2 in report)

NORTH ARM

LAKES ENTRANCE
Foreshore and Estuary
Action Plan

0 500 1000 m

North

Kalimna

SEAVIEW PDE

CLARA ST

North

Arm

Shallow Area

Develop artificial wetland/ filtration system on Eastern Creek estuary.

Provide Foreshore Walking Access

NORTH ARM BRIDGE

Deep Water Line

Boat Ramp

Existing Jetties

Shallow Area

Consider closure of this ramp (Use area for more parking)

Deep Water

Screen Caravan Park

MARINE

PARADE

Improve and widen shoreline at Recreation Reserve

RECREATION RESERVE

Dredge to Create Deep Water

Proposed Replacement Jetty Pen Structures

Dredge Spoil Areas (New Shoreline)

Lakes Entrance

(PRINCES HWY)

LAURA ST

CARSTAIRS AVE

BARKES AVE

ROWE ST

MECHANICS ST

ESPLANADE

LEGEND:

- Proposed Sand Fill Areas
- Proposed Deep Water Line
- Proposed Jetty Pen Structures
- Proposed Dredging Near Jetty Pen Structures
- Proposed Shallow Areas (Habitat or Wetland Areas)

Cunninghame Arm

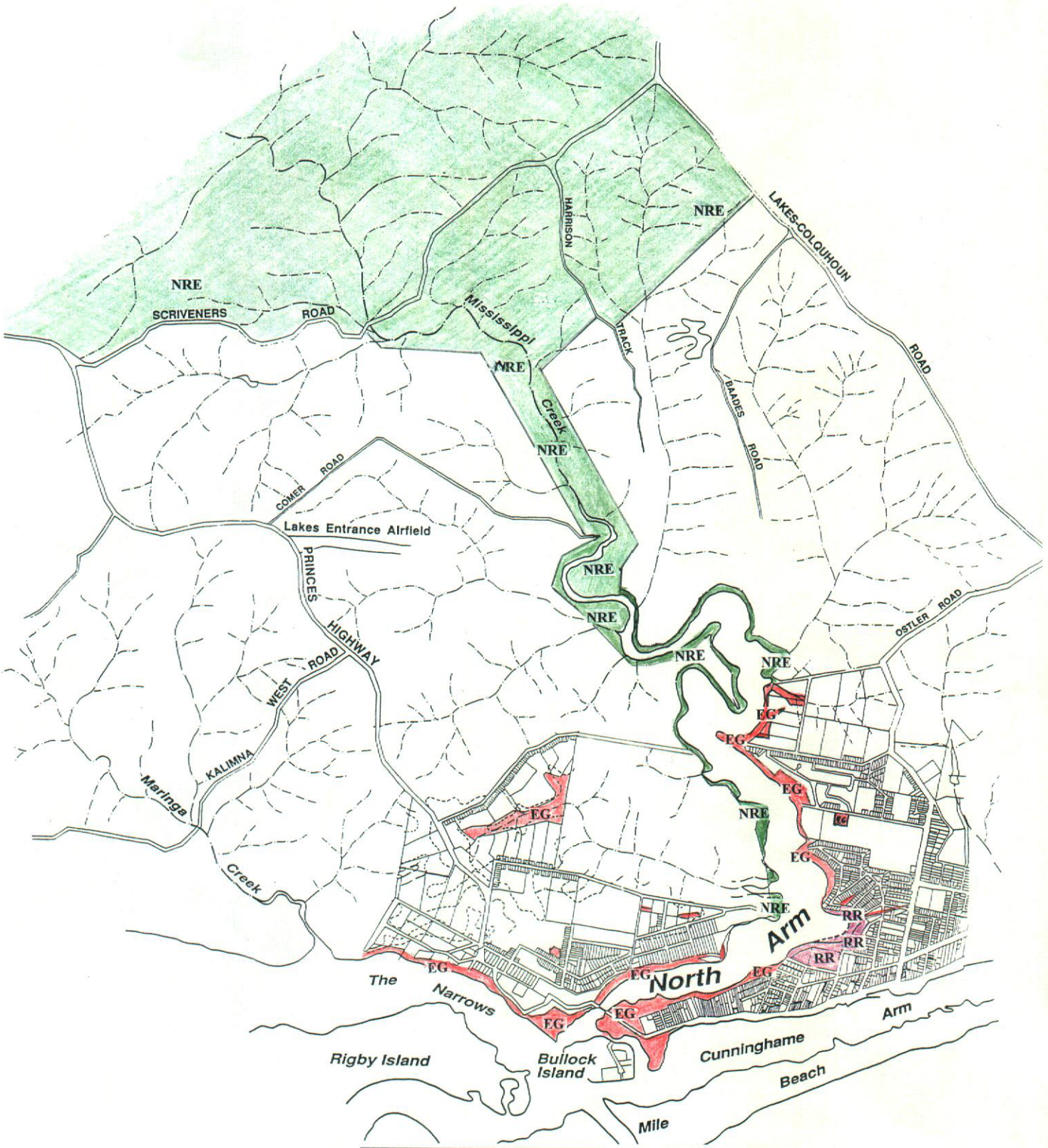
Map 9

Marine Parade Precinct Actions

NORTH ARM

LAKES ENTRANCE Foreshore and Estuary Action Plan

August, 1996



NORTH

0 500 1000m

Public land areas managed by East Gippsland Shire either directly or as Committee of Management	EG
Public land managed directly by Dept of N.R.E.	NRE
Public land managed by Lakes Entrance Recreation Reserve Committee of Management	R.R.

Map 10:
Land Tenure
NORTH ARM
LAKES ENTRANCE
Foreshore and Estuary Action Plan