MARINE RESERVE IMPLEMENTATION:
CENTRAL FOREST

MARINE BIOLOGICAL SURVEY FOR A MARINE PROTECTED AREA IN THE GEOGRAPHE BAY-CAPES-HARDY INLET REGION

Final Report: MRI/CF/GBC-31/2000

A collaborative project between CALM Marine Conservation Branch
and the Central Forest Regional office

A project partially funded through the Natural Heritage Trust's
Coast and Clean Seas Marine Protected Area Programme
Project No: WA9703

Prepared by K P Bancroft
Marine Conservation Branch

March 2000

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Research and collation of information presented in this report was undertaken with funding provided by Environment Australia and the Western Australian Department of Conservation and Land Management. The project was undertaken for the Natural Heritage Trust's Coast and Clean Seas, Marine Protected Areas Program.

This report may be cited as "*Marine biological survey for a Marine Protected Area in the Geographe Bay-Capes-Hardy Inlet region*". Copies of the report may be borrowed from the library:

Environment Australia
Biodiversity Group
GPO Box 787
CANBERRA ACT 2601
AUSTRALIA

Or

The Librarian
Science and Information Division
Department of Conservation and Land Management
PO Box 51
WANNEROO WA 6065
AUSTRALIA

This report may be cited as:

Bancroft K.P (2000). Marine biological survey for a marine protected area in the Geographe Bay-Capes-Hardy Inlet region. Final Report: MRI/CF/GBC-31/2000. March 2000. Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia.

Copies of this report may be obtained from

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EXECUTIVE SUMMARY

This report summarises the major activities and outcomes of a one-year project entitled "*Marine biological survey for a Marine Protected Area in the Geographe Bay-Capes-Hardy Inlet region.*" This project was partially funded by a grant of $72,000 obtained through Environment Australia's Natural Heritage Trust, via the Coast and Clean Seas Marine Protected Area Programme. CALM contributed further resources to the project, valued at approximately $97,000.

The project involved:

(a) a review of existing biological and physical data;

(b) mapping of the marine benthic habitats;

(c) a description of the major benthic communities within representative habitats, and;

(d) obtaining an understanding of the broadscale physical oceanography of the proposed marine conservation reserve in the Geographe Bay-Capes-Hardy Inlet region.

The outcomes of specific action items detailed in the project specifications have been reported on.

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1. INTRODUCTION

This report summarises the major activities and outcomes of a one-year project entitled "*Marine biological survey for a Marine Protected Area in the Geographe Bay-Capes-Hardy Inlet region*". The outcomes of specific action items detailed in the project specifications are reported on.

1.1. BACKGROUND

In recognition of the importance of conserving the State's marine biodiversity, the Minister for the Environment established the Marine Parks and Reserves Selection Working Group (MPRSWG) in 1986. The main aim of the MPRSWG was to identify representative and unique areas of Western Australia's marine waters for consideration as part of a statewide system of marine conservation reserves under the *Conservation and Land Management (CALM) Act* 1984. The MPRSWG's report was released in June 1994 and identified over seventy such candidate areas throughout the coastal waters of Western Australia (CALM, 1994).

The State's vesting body for marine conservation reserves is the Marine Parks and Reserves Authority (MPRA) which was established in 1997. The MPRA has prioritised the candidate areas for implementation as marine conservation reserves. The Geographe Bay-Capes-Hardy Inlet region encompasses the Geographe bay-Cape Leeuwin and the Hardy Inlet, which are two of the MPRSWG recommended areas, is one of the MPRA's high priority candidate areas.

Under the State Government's marine and conservation strategy detailed in *New Horizons - The way ahead in marine conservation and management* released by the Western Australian Government in 1998 (WA Government, undated), there is a requirement for:

> *"Extensive assessment, community consultation and management planning before a new marine conservation reserve is established."*

An essential component of this is that:

> *"A comprehensive assessment of the area's biological and economic resources, and social values is carried out."*

In view of the high standing that the Geographe Bay-Capes-Hardy Inlet region has in the MPRA's priority list for new marine conservation reserves, CALM applied to Environment Australia for funding to perform a biological survey in the area. Partial funding of $72,000 for the project has been obtained through Environment Australia's Natural Heritage Trust, via the Coast and Clean Seas Marine Protected Area Programme. CALM contributed further resources to the project, valued at approximately $97,000.

The data acquired during this project will be important in the determination of the relative conservation values of the respective major habitats of the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve. It will also contribute to the information base required for the marine reserve planning process, during which marine reserve boundaries and zones for multiple-use will be considered for the area.

This project was coordinated by CALM's Marine Conservation Branch (MCB) and conducted in collaboration with the Central Forest Region, South West Capes District Office.

1.2. STUDY AREA

The study area for this survey was the marine waters from the Busselton Jetty in Geographe Bay to White Point on the eastern edge of Flinders Bay, and extends seaward to the State Territorial Limits, described as 3 nm from the State Territorial Baseline (Figure 1).

1.3. OBJECTIVES

The objectives of the project were:

1. to provide the biological and physical information layers necessary to initiate the establishment of a multiple use marine conservation reserve in the Geographe Bay-Capes-Hardy Inlet region, and;

2. to provide information on the conservation values of the candidate area for the stakeholder advisory committee and community consultation processes during the implementation phase of this reserve.

2. PROJECT TASKS

The project details are outlined in the Work Schedule (*see* Appendix A) and include seven specific action items:

Action 1. Review and collate existing biological and physical data of the area;

Action 2. Map the major benthic habitats from aerial photographs and satellite images;

Action 3. Undertake a ground truthing survey to verify the biological and spatial accuracy of the benthic habitat maps

Action 4. Undertake a comprehensive survey of the inshore marine biota to quantitatively describe the major benthic communities within representative habitats, in terms of relative diversity, abundance and primary productivity;

Action 5. Prepare and submit a progress report;

Action 6. Undertake a numerical classification of the data collected during the biological survey to statistically determine relative conservation values based on species diversity, abundance and primary productivity, and;

Action 7. Develop a primary understanding of the broadscale water movements using, if necessary, satellite imagery, computer modelling and field validation techniques.

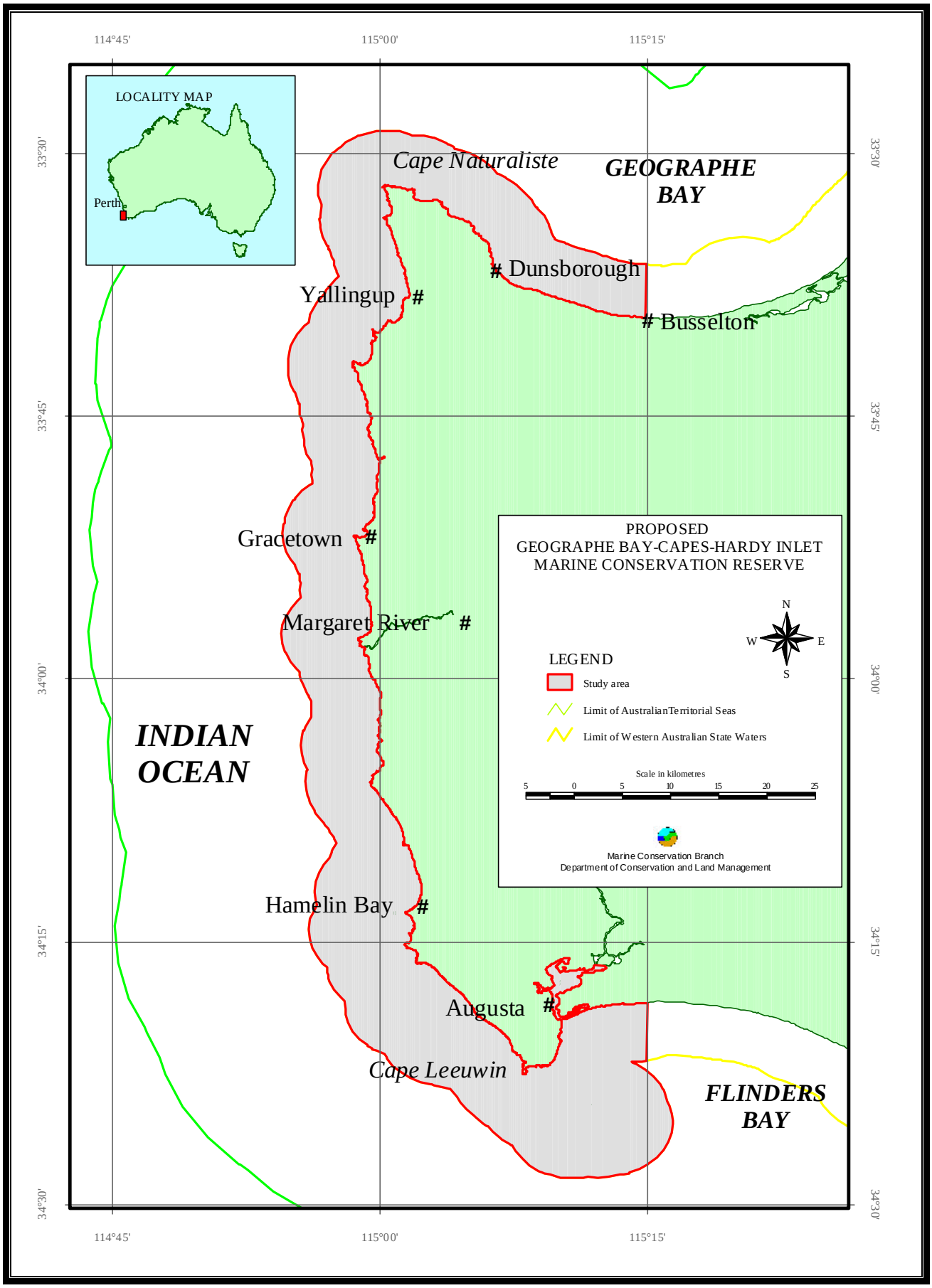

Figure 1. The proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve

ACTION 1: Review and collate existing biological and physical data of the area

This action item was achieved through a review of existing ecological information for the Geographe Bay-Capes-Hardy Inlet region, which was completed in February 1999 (*see* Appendix B. CALM Literature Review: MRI/CF/GBC-19/1999; Elscot & Bancroft, 1999).

This review presents a general description of the physical characteristics and summarises the biological resources of the region. The information that has been compiled in the review was collected mainly through literature searches, review of published information, examination of CALM data for marine mammals and stranding events, and from anecdotal information.

The review collates information available for benthic habitats, marine flora and fauna, marine wildlife, estuarine and coastal wetlands, and coastal terrestrial biota. It highlights the gaps in ecological information for the region, particularly:

1. The poor coverage of existing benthic habitat mapping;
2. The lack of information on the marine flora and fauna in general, and particularly between Cape Leeuwin and Cape Naturaliste;
3. The little information available on mobile marine invertebrates and macroalgal diversity, and;
4. The absence of information on sessile marine invertebrate diversity and distribution.

This review will be utilised as a resource document for the planning process in the implementation of the marine conservation reserve proposed in the Geographe Bay-Capes-Hardy Inlet region.

ACTION 2. Map the major benthic habitats from aerial photographs and satellite images

A preliminary habitat map was produced using aerial photographs and Landsat imagery. This information was overlaid on CAMRIS Coastal Atlas data. Figure 2 presents the preliminary habitat map with 350 (categorised) sites preselected for the habitat verification field survey (*see* ACTION 3).

These predetermined habitat verification sites highlighted areas (particularly the deep, >25 m offshore regions) that required more investigation due to poor water penetration of the aerial photographs and satellite imagery. The preliminary habitat map also highlighted that the west coast of Cape Naturaliste had no existing habitat information.

The preliminary habitat data was utilised as a start point for understanding the spatial distribution of marine benthic habitats in the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve and was improved upon by data collected during the habtat verification survey (*see* Action 3).

ACTION 3: Undertake a ground truthing survey to verify the biological and spatial accuracy of the benthic habitat maps

A ground truthing survey was conducted in November/December 1998 (*see* CALM Field Programme Report: MRI/CF/GBC-16/1998; Bancroft & Colman, 1998 which is incorporated in CALM Progress Report: MRI/CF/GBC-26/1999; Bancroft, 1999b).

The data report presents the results of a shore-based field survey that was undertaken from the 13th to 20th December 1998, along the coast of southwestern Western Australia from Geographe Bay to Flinders Bay. This survey was coordinated by the MCB and conducted in collaboration with CALM's Central Forest Region, South West Capes District Office.

The objectives of the field survey were:

(a) to ground-truth the existing digital benthic habitat map for the coastal waters of the Leeuwin-Naturaliste coast between Geographe Bay and Flinders Bay, and;

(b) to provide additional biological data on major benthic community types.

The results of the survey provided additional data on major benthic community types, which improved the accuracy of habitat classification and spatial rectification of the existing habitat maps (see Appendix C; CALM Data Report MRI/CF/GBC-32/2000; Bancroft, 2000a). Revised habitat maps have been developed as shown in Figures 3, 4, 5 & 6). The field survey grid of 350 pre-selected and seven opportunistic locations provided relatively high-density coverage of sites in the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve.

The benthic community data collected on this survey assisted in the planning of the sampling methodology and in the selection of sampling sites for a systematic marine biological survey. The biological survey of the Leeuwin-Naturaliste coast between Geographe Bay and Flinders Bay was performed in January/February 1999 (*see* Action 4; *see* CALM Field Programme Report: MRI/CF/GBC-18/1999; Bancroft, 1999a which is incorporated in CALM Progress Report: MRI/CF/GBC-26/1999; Bancroft, 1999b).

This data, in association with the revised habitat map, will be important in the determination of the relative conservation values of the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve. They will also contribute to the information base for the boundary and zoning planning process for the proposed marine conservation reserve.

ACTION 4: Undertake a comprehensive survey of the inshore marine biota to quantitatively describe the major benthic communities within representative habitats, in terms of relative diversity, abundance and primary productivity

A biological survey of marine benthic habitats was performed in January/February 1999 (*see* CALM Field Programme Report: MRI/CF/GBC-18/1999; Bancroft, 1999a which is incorporated in CALM Progress Report: MRI/CF/GBC-26/1999; Bancroft, 1999b).

The survey team comprised leading Western Australian and New Zealand marine ecologists, taxonomists and phycologists.

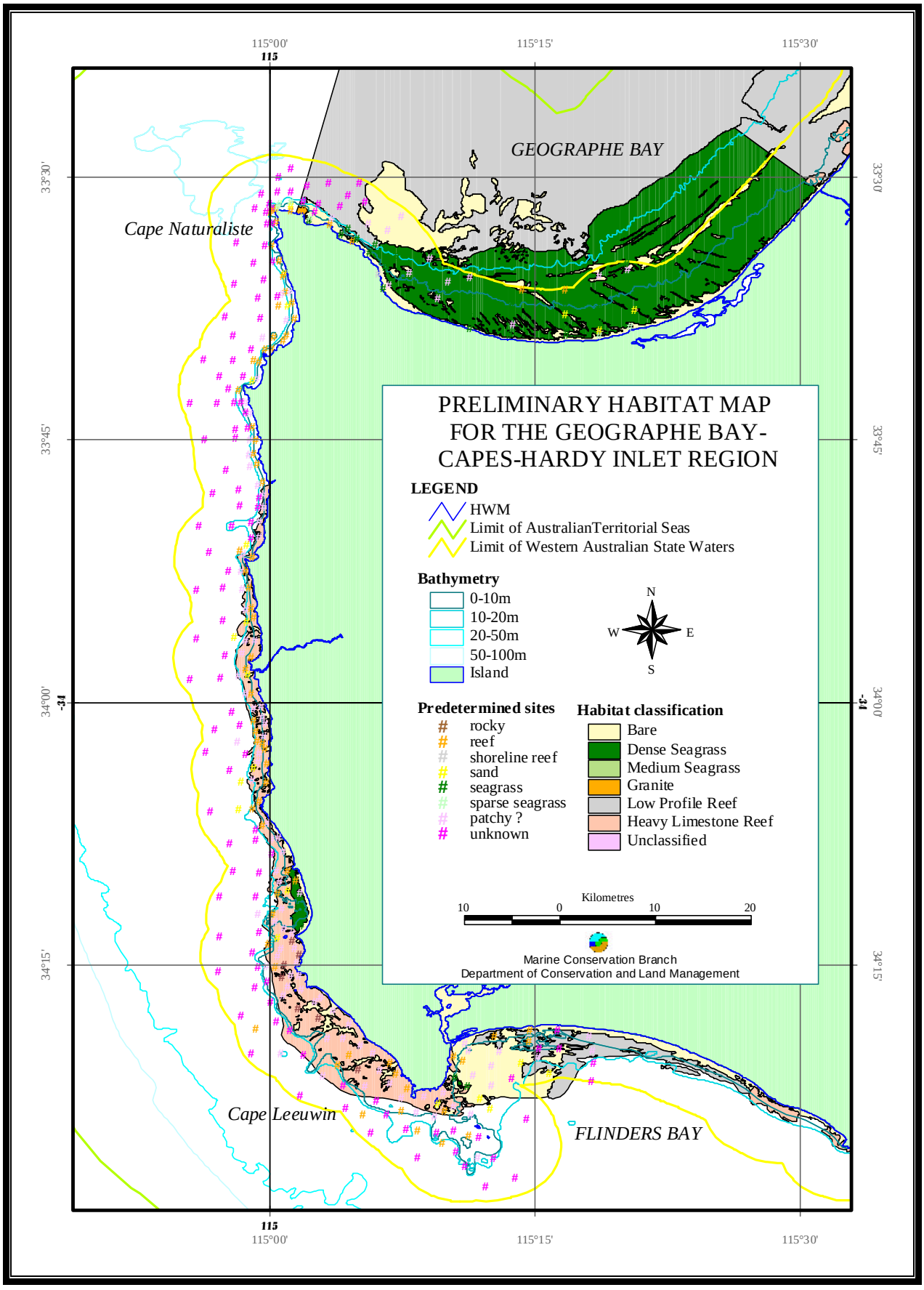

Figure 2. Preliminary habitat map for the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve

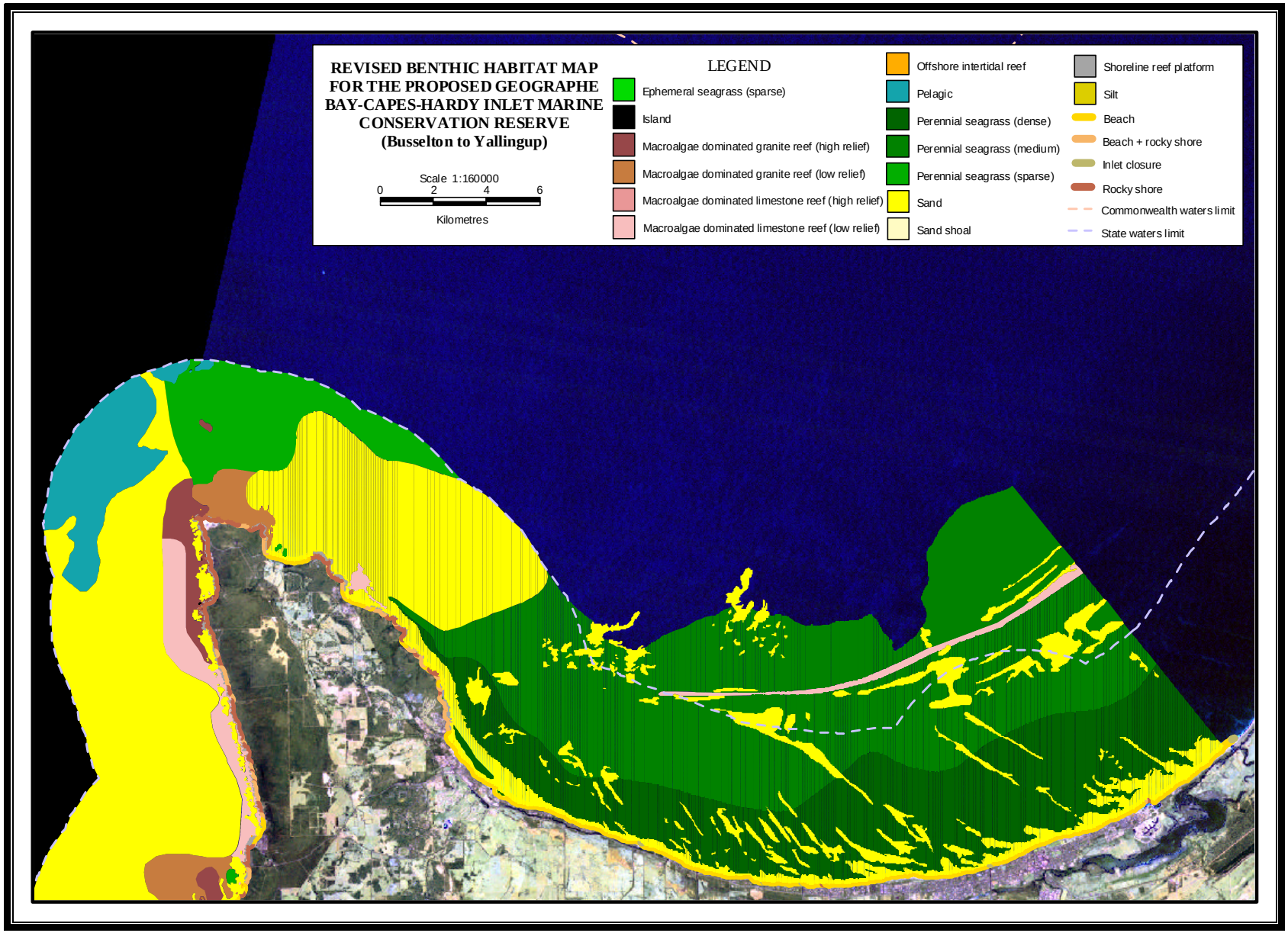

Figure 3. Revised habitat map for the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve (Busselton to Yallingup)

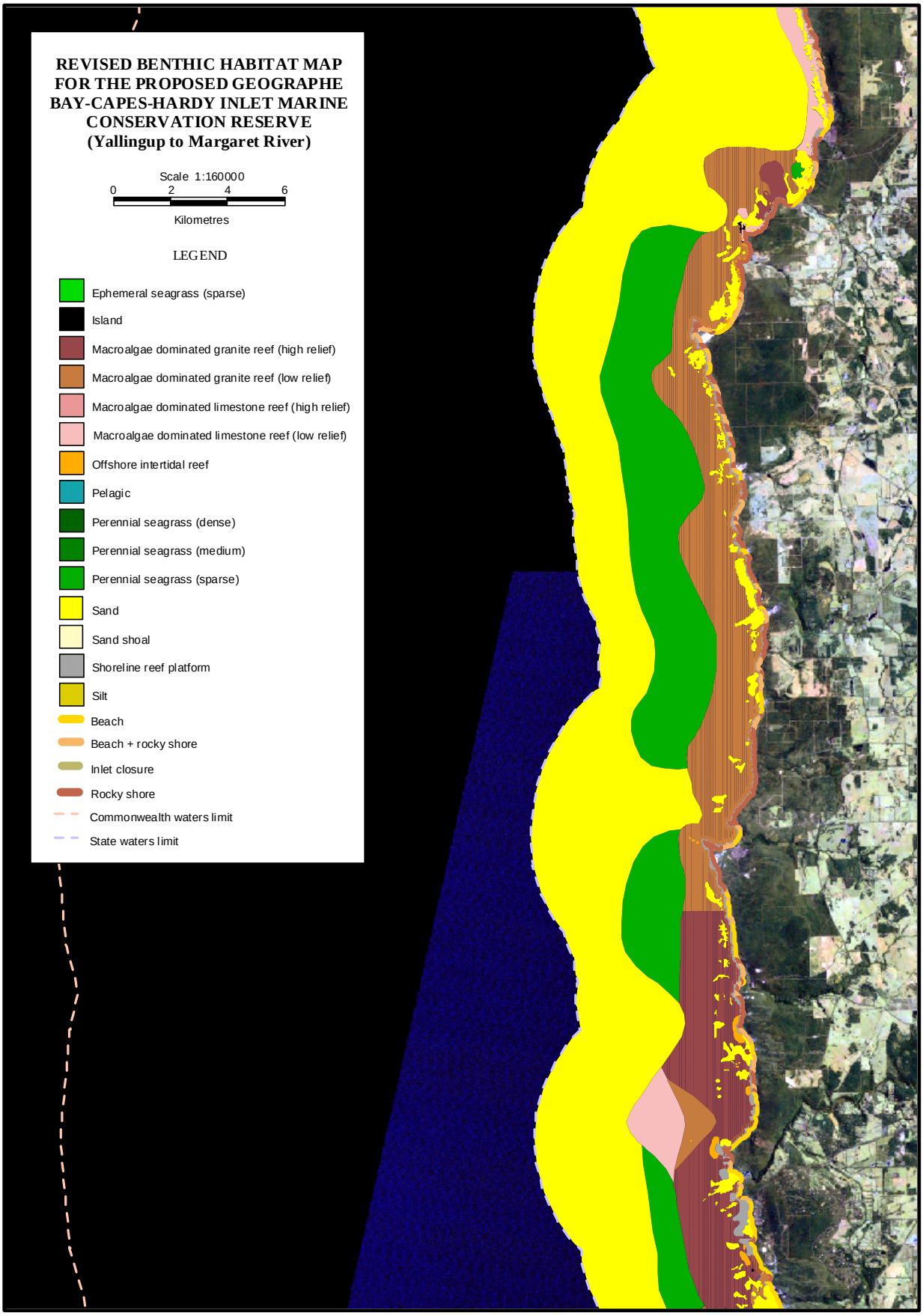

Figure 4. Revised habitat map for the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve (Yallingup to Margaret River)

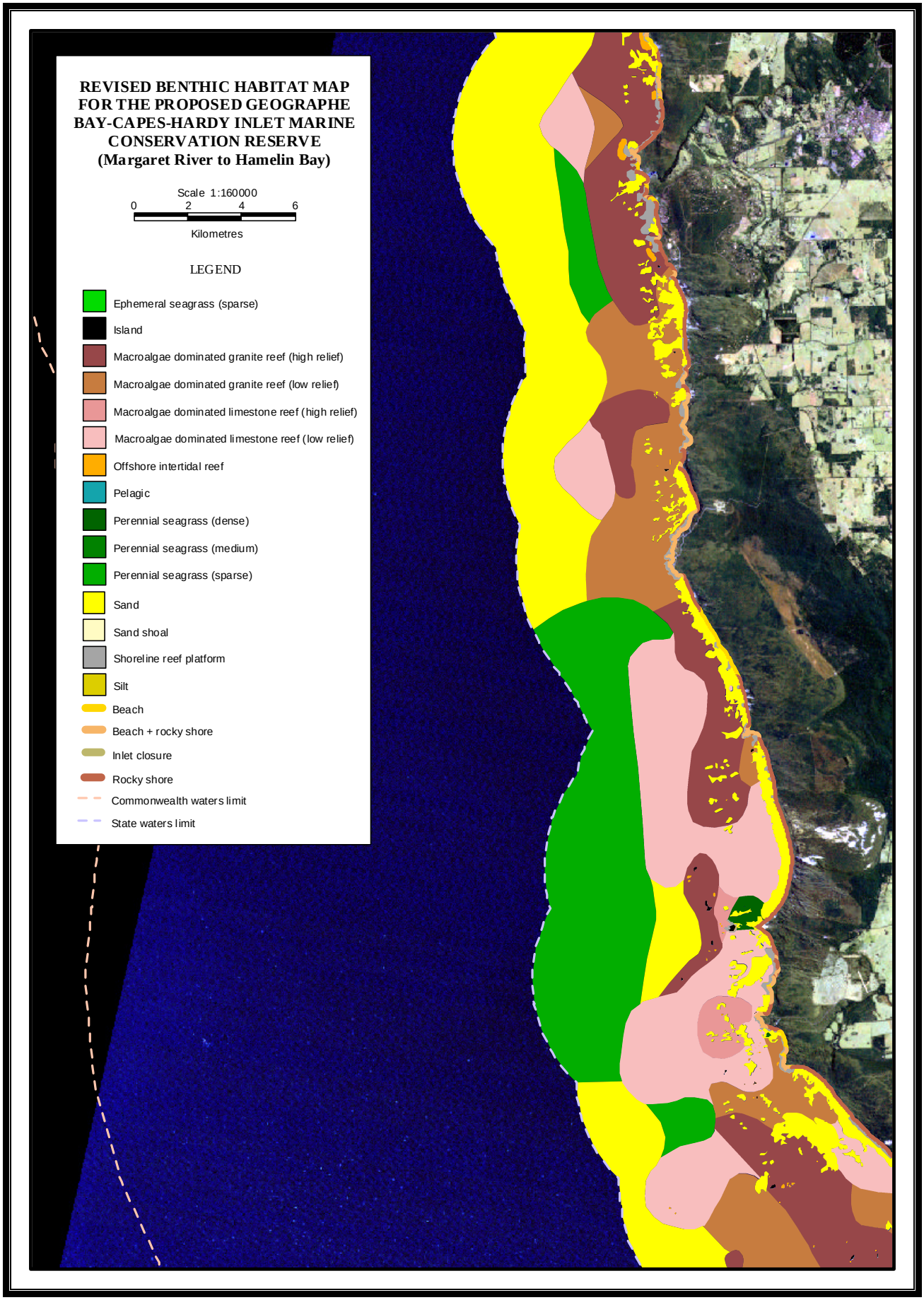

Figure 5. Revised habitat map for the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve (Margaret River to Hamelin Bay)

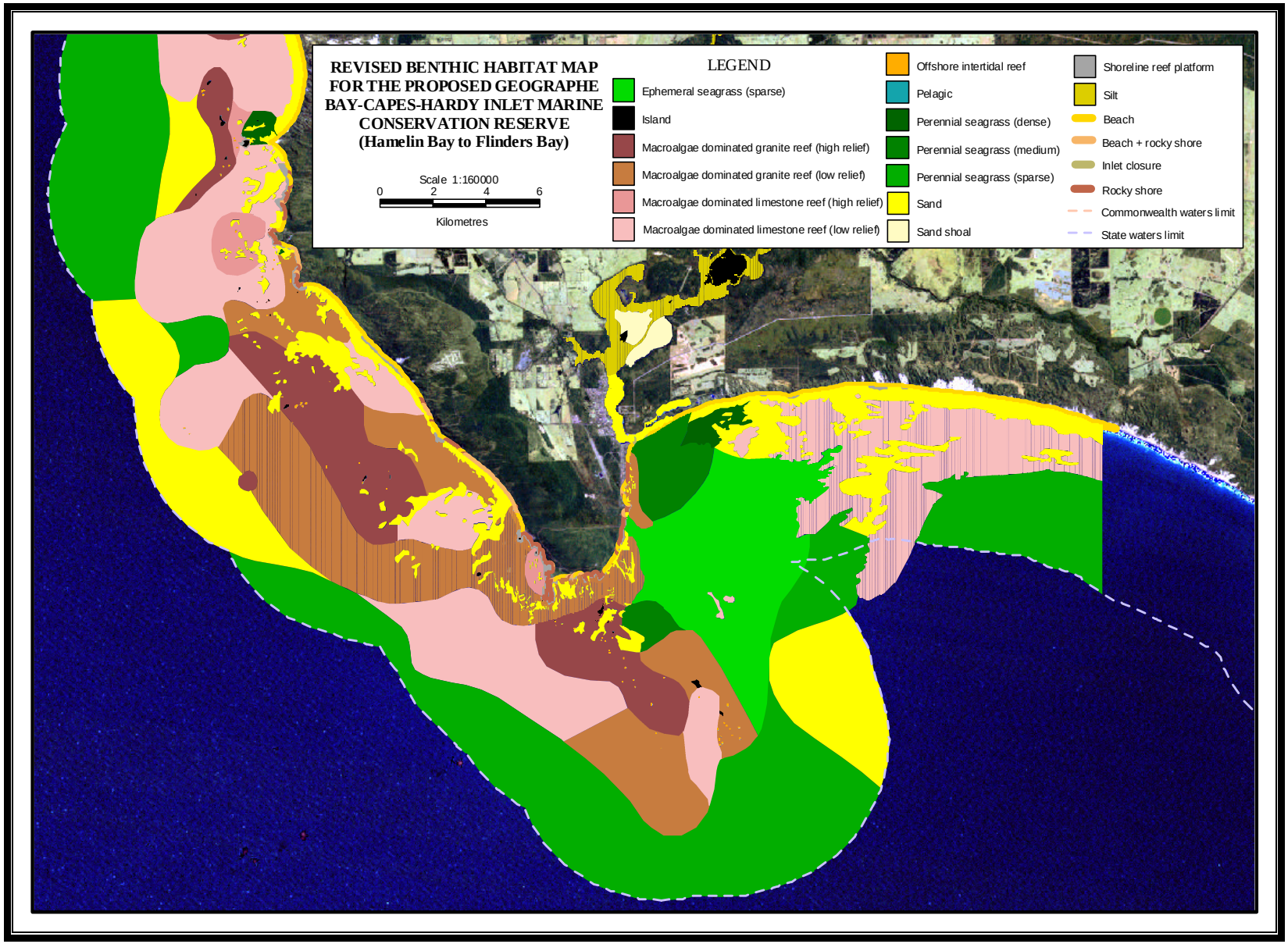

Figure 6. Revised habitat map for the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve (Hamelin Bay to Flinders Bay)

The primary objectives of this survey were to collect data:

1. to enable quantitative description of marine biota at representative sites of the major benthic habitats;

2. to establish understanding of the diversity within the major benthic community types, and;

3. for baseline information for long term monitoring.

This biological survey was divided into two components:

(a) a subtidal survey, and;

(b) an intertidal survey.

A total of 20 sites of varying substrate (granite, limestone), varying depth (shallow, deep) and varying exposure (sheltered, exposed) were intensively sampled in the subtidal survey. Algae, fish, ascidian and sponge communities were sampled, and data on diversity and abundance was collected. A total of 527 species of flora and fauna was collected during the subtidal survey, which is comprised of 150 algae, two seagrass, 110 sponge, 44 ascidian, eleven coral and 110 fish species.

Twenty-six intertidal reefs of varying substrate were sampled for the intertidal survey. Diversity and abundance data for the faunal and floral communities was collected (Bancroft, 2000b). Eighty-one species of marine flora and fauna, comprising of 26 algae, one seagrass, two sponge, five anemone, one zooanthid, one coral, 34 molluscs, two polychaete worms, five crustaceans, one seastar, one brittlestar, one seaurchin and one seacucumber species were collected during the intertidal survey.

This biomass and community data was utilised to statistically determine relative conservation values (*see* Action 6) and will be utilised in the planning processes for the implementation of a marine conservation reserve in the Geographe Bay-Capes-Hardy Inlet region.

ACTION 5: Prepare and submit a progress report

A progress report was submitted to Environment Australia in November 1999 (*see* CALM Progress Report: MRI/CF/GBC-26/1999; Bancroft, 1999b). The report addressed all scope items and referred to progress against the Work Schedule (Appendix A).

The progress report incorporates:

(i) the habitat verification survey Field Programme Report: MRI/CF/GBC-16/1998 (Bancroft & Colman, 1998), and;

(ii) the biological survey Field Programme Report: MRI/CF/GBC-18/1999 (Bancroft, 1999a).

ACTION 6: Undertake a numerical classification of the data collected during the biological survey to statistically determine relative conservation values based on species diversity, abundance and primary productivity

The University of Western Australia was contracted to perform the numerical classification of the data collected for the marine biological survey (*see* Appendix D. CALM Summary Report: MRI/CF/GBC-27/1999; Kendrick *et al*., 1999).

This Summary Report provides:

- quantitative description of marine biota at representative sites within the major benthic habitats;
- quantitative analysis of species richness within the major benthic community types;
- results of investigations into the influence of physical parameters, such as substrate type and wave exposure, on community diversity, and;
- fauna and flora density and biomass data for use as baseline information for long-term monitoring of communities before and after marine reserve implementation.

The Summary Report also makes recommendations on zoning issues in both subtidal and intertidal habitats, and on survey design and methods.

These recommendations and other information summarised in this report will be utilised in the planning process for the implementation of a marine conservation reserve in the Geographe Bay-Capes-Hardy Inlet region.

ACTION 7: Develop a primary understanding of the broadscale water movements using, if necessary, satellite imagery, computer modelling and field validation techniques

A comprehensive review of existing information on the physical oceanography of the Geographe Bay-Capes-Hardy Inlet region was undertaken (*see* Appendix E; CALM Literature Review: MRI/CF/GBC-28/1999; D'Adamo, 1999). This report provides an understanding of the broadscale oceanography of the region highlighting the influences of the Leeuwin Current and the Capes Current. The information that has been compiled in the review was collected mainly through literature searches, review of published information, and from anecdotal information.

This review has highlighted areas where more information is required. It has initiated a proposed collaborative study with CSIRO and commercial interests to investigate aspects of the physical oceanography of the region.

The review suggests that from an oceanographic context, the region can be viewed as a series of four contiguous areas, namely: (i) the southern area of Geographe Bay; (ii) the coastal area from Cape Naturaliste to Cape Leeuwin; (iii) Flinders Bay, and; (iv) Hardy Inlet.

Hardy Inlet has its hydrodynamics governed by classical estuarine processes, influenced by tide, wind, heat flux, freshwater inputs and density gradients. Typically, during winter and into spring strong freshwater discharge from the Blackwood and Scott rivers leads to the complete expulsion of marine water from the estuary. As discharge rates weaken, marine water enters the system as a salt wedge and the dynamical behaviour of the Blackwood Estuary reflects that typical of salt wedge estuaries.

Pooling and trapping of dense saline water at the bottom of the depressions and upstream of bars or sills, is a feature of the progressive build-up of salinity within the system.

The overall hydrodynamic behaviours of the other three areas are influenced principally by wind stress and regional currents (the Leeuwin and Capes currents), with tides and stratification playing minor roles within specific nearshore areas. The area south of Cape Naturaliste is relatively exposed, with the nearshore zone subjected to relatively strong swells from the Indian and Southern oceans. In summer/spring the predominance of westward winds along the south coast (Flinders Bay) and northward winds along the west coast (between the capes) leads to the formation and northward advection of the Capes Current. The Capes Current carries relatively low temperature water, derived from upwelling over the shelf and below the thermocline. The upwelled water is relatively rich in nutrients, which feed increases in biomass, measured as chlorophyll "a". The Capes Current travels reasonably close to the coast, however the extent to which it encroaches into the nearshore zone or into Geographe Bay is not fully understood at present. As the winds which generate the Capes Current subside (during autumn and winter) the Leeuwin Current intensifies as a southward flowing boundary current of relatively warm, low salinity water, bringing a mixture of tropical and sub-tropical water nearer to the coast in the region between Cape Naturaliste and Flinders Bay. It appears that the Leeuwin Current is effectively restricted from entering Geographe Bay due to the shallowing nature of the bay, hence bypassing the bay as it rounds the capes. The extent to which the Leeuwin Current or water derived from it, penetrates into the nearshore zone is presently unclear. The presence of tropical and temperate flora and fauna in the area reflects the respective roles of the Leeuwin and Capes currents in introducing seasonal flows of warm tropical and cold temperate waters. Anecdotal evidence from local users of the marine region indicate that the beaches are relatively warm during winter and relatively cold during summer, which points to the need for further investigation to clarify the role of these broad-scale currents on the ecology of the nearshore zone.

The hydrodynamic characteristics of the nearshore embayments and lagoonal areas between Cape Naturaliste and Flinders Bay are yet to be studied in any great detail and this provides another area of research that would be of benefit to the management of the proposed marine conservation reserve area.

This report will be utilised as a resource document for the planning process in the implementation of the marine conservation reserve proposed in the Geographe Bay-Capes-Hardy Inlet region.

3. STATEMENT OF EXPENDITURE

Item	MPAP funding	MPAP Expenditure ($)	CALM Expenditure ($)	Total Expenditure ($)
NHT funds received 1998	$54,000			**$0**
Expenditure to June 1999		$72,000	$68,994	**$140,994**
Funds on progress report (Nov 1999)	$0			**$140,994**
Expenditure 1999/2000 (to Jan 1999)		$0	$28,401	**$159,395**
Funds on final report 1999/2000	$18,000			**$159,395**
Totals	**$72,000**	**$72,000**	**$97,395**	**$159,395**

4. REFERENCES

Bancroft, K.P. (1999a). Biological survey of the major benthic habitats of the Geographe Bay-Capes-Hardy Inlet region (Geographe Bay to Flinders Bay). 28 January-8 February. Field Programme Report MRI/CF/GBC-18/1999. January 1999. Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia. (Unpublished report)

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Kendrick, G.A.; Brearley, A.; Prince, J.; Harvey, E.; Sim, C.; Bancroft, K.P.; Huisman, J. & Stocker, L. (1999). Biological survey of the major benthic habitats in the Geographe Bay-Capes-Hardy Inlet region (Geographe Bay to Flinders Bay) 28 January-8 February 1999. Summary Report: MRI/CF/GBC-27/1999. November 1999. Prepared by the Botany Department, University of Western Australia for the Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia. (Unpublished report).

5. APPENDICES

APPENDIX A. PROJECT DETAILS AND WORK SCHEDULE

Schedule 3
PROJECT DETAILS

Project No. and Title: WA9703 Marine biological survey for a MPA in the Geographe Bay-Capes region

Project Supervisor:	**Dr Chris Simpson**
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Aims:

- To provide the biological and physical information layers necessary to initiate the establishment of a multiple-use marine reserve in the Geographe Bay-Capes region of Western Australia.
- To provide information on the conservation values of the candidate area for the stakeholder advisory committee and community consultation processes during the implementation phase of this reserve.

Scope

Specific Tasks

1. Review and collate existing biological and physical data of the area.
2. Map and auto-classify the major benthic habitats from aerial photographs and satellite images.
3. Undertake a ground truthing survey to verify the biological and spatial accuracy of the benthic habitat maps.
4. Undertake a comprehensive survey of the inshore marine biota to quantitatively describe the major benthic communities within representative habitats, in terms of relative diversity and primary productivity.
5. Prepare and submit a Progress Report.
6. Undertake a numerical classification of the data collected during the biological survey to statistically determine relative conservation values based on species diversity, abundance and primary productivity.
7. Develop a preliminary understanding of the broadscale water movements using satellite imagery, computer simulation and field validation techniques.
8. Produce a draft final report summarising the information resulting from the above actions and submit the Final report.

Financial Payments and Reporting Schedule

The total financial payment for the project is $72,000 payable by the instalments specified in Table 1:

Table 1 (*variation Nov 1999*)

Payment	Report	Date	Amount
Initial	Work Schedule	October 1998	$54,000
	Progress	April 1999	$0
	Draft Final	December 1999	$0
Final	Final	January 2000	$18,000
		Total	$72,000

Reporting Requirements

The Proponent must prepare and provide to Environment Australia reports as follows, by the dates specified in Table 1 above.

Work Schedule

Provide a Work Schedule in Microsoft Project, Microsoft Excel or any similar software package. Information should include:

- Tasks as per Scope (providing detailed breakdown of tasks).
- Timelines for each specified task.
- Milestones.

See Attachment 1 for an example of work schedule.

Initial payment will be dependant upon provision of the Work Schedule.

Progress Report

One (1) unbound copy of the report. The report shall address all Scope items and refer to progress against the Work Schedule.

In addition to the Progress Report, the Proponent shall provide:

- Mapping coordinates that define the project's extent. These coordinates should be given in latitude and longitude, to the nearest degree, minute and second. A coordinate for the northern, northeastern, northwestern, eastern, western, southern, southwestern and southeastern extent of the project shall be given. To ensure accuracy, please use the finest scale map possible when calculating coordinate readings (ie use a 1:10,000 map sheet when calculating coordinates for a 1 hectare project region).
- Name of 1:100,000 or 1:250,000 map sheets covering the study area, unless the project is state-wide
- IMCRA region name/s.

Draft Final Report

The Draft Final Report should be formatted and presented as in the Final Report. It is to be provided at least **2 months prior** to submission of the Final Report to allow adequate time for assessment of the report.

Final Report

Four (4) copies of the report (one unbound).

The Final Report should be a stand alone document which can be used for information and dissemination purposes on the operation, mechanisms and processes employed in the Project.

The Final Report of the Project must include summaries of the major activities undertaken by the Proponent, in particular:

- an assessment and evaluation of the Project against the criteria set out in "Evaluation" below;
- an examination of the degree to which the Project's stated objectives have been achieved; and
- an outline of any demonstration/communication activities undertaken

The Final Report shall include text similar to the following italicised text, amended as appropriate:

(a) Research and the collation of information presented in this report was undertaken with funding provided by Environment Australia. The project was undertaken for the Marine Protected Areas Program.
(b) Copyright in this report is vested in the State of Western Australia.
(c) The views and opinions expressed in this report are those of the authors and do not reflect those of the Commonwealth Government, the Minister for the Environment or the Director of National Parks and Wildlife.
(d) The report may be cited as **"**Marine biological survey for a MPA in the Geographe Bay-Capes region" *Copies of the report may be borrowed from the library: Environment Australia, GPO Box 787, CANBERRA ACT 2601 AUSTRALIA*

In addition to the Final Report, the Proponent shall provide:

- a summary of not more than two hundred and fifty (250) words summarising the significance and limitations of the study findings covered by the Scope of the project.
- one (1) copy of the summary on digital media, on 3.5 inch diskettes formatted to IBM compatible specifications, or in a digital format as agreed between the Project Supervisor and the Environment Australia Liaison Officer.
- a copy of data that is brought into existence as part of, or for the purpose of performing the Consultancy Services, is to be supplied in a digital format as agreed between the Project Supervisor and the Environment Australia Liaison Officer if requested.
- colour transparencies (and a descriptive caption) as agreed between the Project Supervisor and the Environment Australia Liaison Officer, in publication quality, thirty-five millimetre, non-textual format of the highlights arising from the project.

Evaluation

The matters to be included in the evaluation of the Project in the Final Report are listed below.

1. Outcomes
The degree to which the Project has achieved the outcomes.

2. Appropriateness
The appropriateness of the approaches used in the development and implementation of the Project.

3. Effectiveness
The degrees to which the Project has effectively met its stated aims.

4. Transferability
The degree to which the approach used to establish, implement and administer the operations of the Project could be applied to other jurisdictions.

The Proponent must also include any other matters, relating to the evaluation in the Final Report, which Environment Australia specifies to be included in the Final Report. Any such requirement will be notified to the Proponent at least 30 days before the Final Report is due.

Insurance

The Proponent shall be responsible for effecting all insurance required under Worker's Compensation legislation and for taking all other action required or appropriate in relation to its employees or agents in undertaking the agreed Project.

Intellectual Property

Clause 6 of the Standard Terms and Conditions in Attachment B of the Partnership Agreement will apply.

Publicity

Further to Section 10 of the Memorandum of Understanding, projects receiving *Coasts and Clean Seas* funding shall give appropriate acknowledgment to *Coasts and Clean Seas* as the source the source of those funds.

Project Variation

Environment Australia should be notified of any proposed variations to project details, budget, timeline or contacts. No variation to this agreement is binding unless it is agreed in writing between all parties.

Attachment 1
WORK SCHEDULE

Marine biological survey for a MPA in the Geographe Bay-Capes region

Objectives/Aims of Project:

- To provide the biological and physical information layers necessary to initiate the establishment of a multiple-use marine reserve in the Geographe Bay-Capes region of Western Australia.
- To provide information on the conservation values of the candidate area for the stakeholder advisory committee and community consultation processes during the implementation phase of this reserve.

Final Product Required:

Written report.

Specific Tasks:

1. Review and collate existing biological and physical data of the area.
2. Map and auto-classify the major benthic habitats from aerial photographs and satellite images.
3. Undertake a ground truthing survey to verify the biological and spatial accuracy of the benthic habitat maps.
4. Undertake a comprehensive survey of the inshore marine biota to quantitatively describe the major benthic communities within representative habitats, in terms of relative diversity and primary productivity.
5. Prepare and submit a Progress Report.
6. Undertake a numerical classification of the data collected during the biological survey to statistically determine relative conservation values based on species diversity, abundance and primary productivity.
7. Develop a preliminary understanding of the broadscale water movements using satellite imagery, computer simulation and field validation techniques.
8. Produce a draft final report summarising the information resulting from the above actions and submit the Final report.

Work Timetable (*variation Nov 1999*)

Tasks	**Jan 99**	**Feb 99**	**Mar 99**	**Apr 99**	**May 99**	**Jun 99**	**Jul 99**	**Aug 99**	**Sep 99**	**Oct 99**	**Nov 99**	**Dec 99**	**Jan 00**
1. Review and collate existing biological and physical data													
2. Map and auto-classify the major benthic habitats.													
3. Undertake a benthic habitat map ground truthing survey.													
4. Undertake a comprehensive survey of the inshore marine biota.													
5. Prepare and submit Progress Report													
6. Undertake a numerical classification of the data from the biological survey													
7. Develop a preliminary understanding of the broadscale water movements.													
8. Prepare draft Final report for comment and submit Final report													

APPENDIX B. Elscot, S.V. & Bancroft, K.P. (1999). CALM Literature Review MRI/CF/GBC-19/1999

Elscot, S.V. & Bancroft, K.P. (1999). A review of existing ecological information for the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve. Literature Review MRI/CF/GBC-19/1999. December 1998. Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia. (Unpublished report).

APPENDIX C. BANCROFT, K.P. (2000A). CALM Data Report MRI/CF/GBC-32/2000

Bancroft, K.P. (2000a). Broadscale habitat map and biological data for the major benthic habitats of the Geographe Bay-Capes-Hardy Inlet region (Geographe Bay to Flinders Bay). Data Report MRI/CF/GBC-32/2000. January 2000. Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia. (Unpublished report)

APPENDIX D. Kendrick, G.A.; Brearley, A.; Prince, J.; Harvey, E.; Sim, C.; Bancroft, K.P.; Huisman, J. & Stocker, L. (1999). CALM Summary Report: MRI/CF/GBC-27/1999.

Kendrick, G.A.; Brearley, A.; Prince, J.; Harvey, E.; Sim, C.; Bancroft, K.P.; Huisman, J. & Stocker, L. (1999). Biological survey of the major benthic habitats in the Geographe Bay-Capes-Hardy Inlet region (Geographe Bay to Flinders Bay) 28 January-8 February 1999. Summary Report: MRI/CF/GBC-27/1999. November 1999. Prepared by the Botany Department, University of Western Australia for the Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia. (Unpublished report).

APPENDIX E. D'Adamo, N. & Mamaev, A. (1999). CALM Literature Review: MRI/CF/GBC-27/1999.

D'Adamo, N. & Mamaev, A. (1999). An overview of oceanography of the proposed Geographe Bay-Capes-Hardy Inlet marine conservation reserve. Literature Review MRI/CF/GBC-28/1999. December 1999. Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia. (Unpublished report).