MARINE RESERVE IMPLEMENTATION:

DEVELOPMENT OF A GENERIC OPERATIONAL FRAMEWORK FOR MARINE RESERVE IMPLEMENTATION IN WESTERN AUSTRALIA

Final Report: MRI – 25/1999

A collaborative project between Environment Australia and
CALM Marine Conservation Branch

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

Prepared by
R W Lawrie
Marine Conservation Branch

March 2000

Marine Conservation Branch
Department of Conservation and Land Management
47 Henry St
Fremantle, Western Australia, 6160

ACKNOWLEDGEMENTS

Direction

- Kieran McNamara - Director, Nature Conservation Division
- Dr Chris Simpson - Manager, Marine Conservation Branch (MCB)

CALM Collaboration

- Dr Colin Pearce – Manager, Information Management Branch

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 *"DEVELOPMENT OF A GENERIC OPERATIONAL FRAMEWORK FOR MARINE RESERVE IMPLEMENTATION IN WESTERN AUSTRALIA Year 3 MRI – 25/1999, Marine Conservation Branch, Department of Conservation and Land Management, Fremantle, Western Australia"*. Copies of the report may be borrowed from the library:

Environment Australia
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

EXECUTIVE SUMMARY

This report summarizes the major activities and outcomes of the third year of a three-year project entitled *Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia.* The progress made against the specific action items detailed in the project specifications is reported on.

The significant progress made in developing the marine GIS within the Marine Conservation Branch of CALM during 1996/97 and 1997/98 has been continued during 1998/99. Protocols for the acquisition of the many relevant data sets held by other agencies and organizations in Western Australia and Australia are well established and uptake is ongoing.

Methods for capture of additional data required for marine reserve implementation and management has been developed for those areas identified by the Western Australian Government in December 1997 as its immediate short-term priorities. This development continues to evolve and is closely linked to the planning for database design and construction that will facilitate an "End to End " approach to data management.

Analysis and product generation of data gathered under this project continue to be integral to the establishment of a statewide system of multiple use marine conservation reserves as part of the National Representative System of Marine Protected areas.

CONTENTS

* * *

LIST OF FIGURES

* * *

LIST OF TABLES

* * *

1. INTRODUCTION

1.1. GENERAL BACKGROUND

In May 1996 the Great Barrier Reef Marine Park Authority (GBRMPA) entered into a cooperative project with the Western Australian Department of Conservation and Land Management (CALM) entitled *Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia*. Since 1997/98, funding support for the project has been provided by Environment Australia under the Marine Protected Areas Program - a Coasts and Clean Seas Initiative. This was the third year of a proposed three-year project that would:

- Continue the data identification and mapping to support the Western Australian program for marine reserve implementation under the CALM Act as outlined in the Government's *New Horizons in Marine Management* policy
- Consolidate relevant information into a single database
- Carry out data and product preparation to assist in the planning and pre - declaration processes for the proposed Jurien Bay, Dampier Archipelago, Montebello/Barrow Islands and Geographe Bay – Capes – Hardey Inlet marine reserves.
- Gather and process Information to provide decision support for marine protected area site selection and subsequent zoning
- Develop a marine GIS within CALM to meet the above objectives for the implementation of marine protected areas

1.2. OBJECTIVES

The project details are outlined in the Project Specifications (see Appendix I) and include five specific action items:

This report summarizes the activities and outcomes of the third year of this project.

2. MAJOR ACTIVITIES AND OUTCOMES

2.1. ACTION 1: CONTINUE ACQUISITION AND CONSOLIDATION OF EXISTING RELEVANT INFORMATION INTO A SINGLE MPA SPECIFIC DATABASE

This action continues to be a primary focus of this position as outlined in previous reports ("Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia" 1997 & 1998).

Acquisition of required data (see Appendix II) has continued unabated over the three years of this project with this past year (1999) no exception.

.

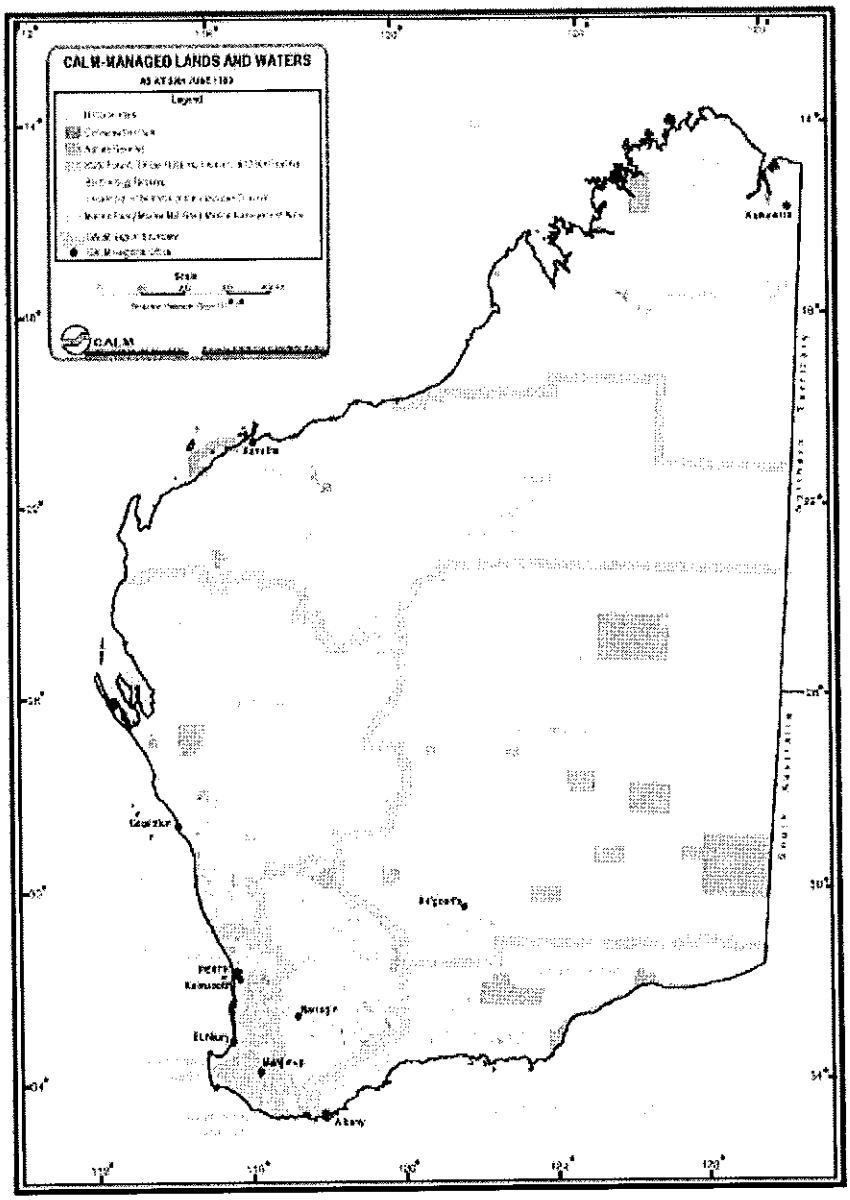


Figure 1. Map of CALM lands and waters showing regional management boundaries.

The primary focus for acquisition over the past year has been on the MPA implementation priority areas (Jurien Bay, Dampier Archipelago, Montebello/Barrow Islands and Geographe Bay – Capes – Hardey Inlet marine reserves).

Data has in the first three years of operation been stored in a directory structure that reflects the Western Australian Department of Conservation and Land Management's (CALM) regional management infrastructure.
Following the experience of increased access by users of the database and the development of more specific identification of data requirements (see ***Action 2:***) a decision has been taken to adopt a more generic directory structure. This approach more closely follows the Australian Coastal Atlas structure of data categories. Statewide datasets are developed where appropriate and naming conventions used to reflect regional datasets.
The migration of data into this directory structure is underway and will result in a database containing data in primarily "Arcview" Shapefile format, "Access" relational database format or Geo - referenced image format. As data will be accessed primarily with "Arcview" software, Point, Line and Polygon data will be in non - projected geographical format whilst geo referenced image data will be stored as UTM projected data using the appropriate AMG zone. All data will be stored using AGD 84 as the map datum until the implementation of GDA 94 across CALM.

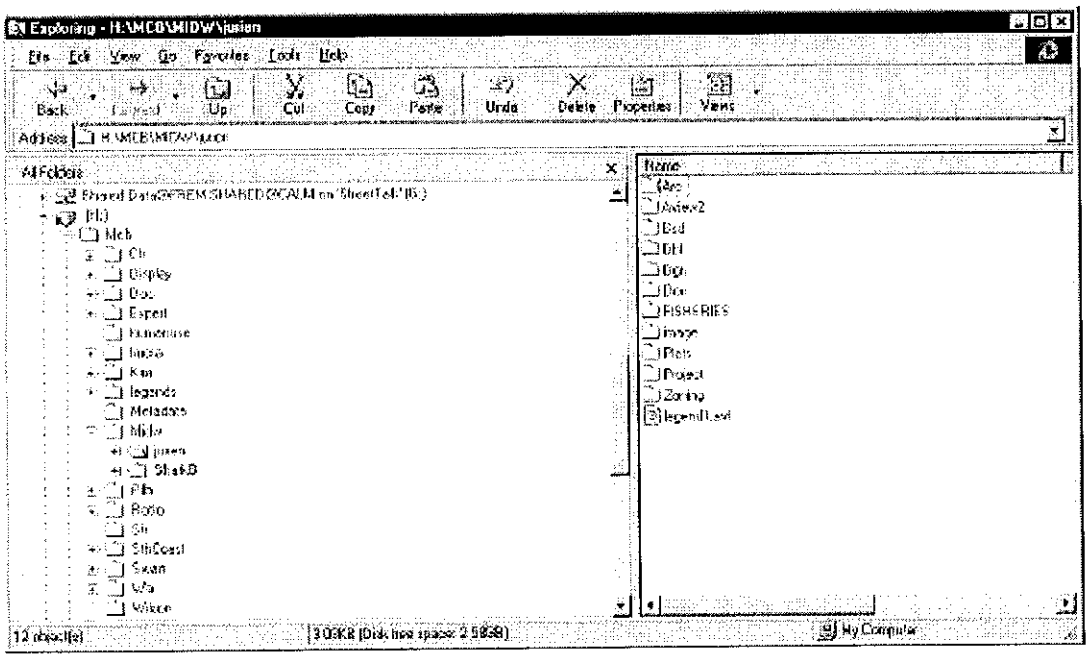


Figure 2. Existing CALM regional directory structure

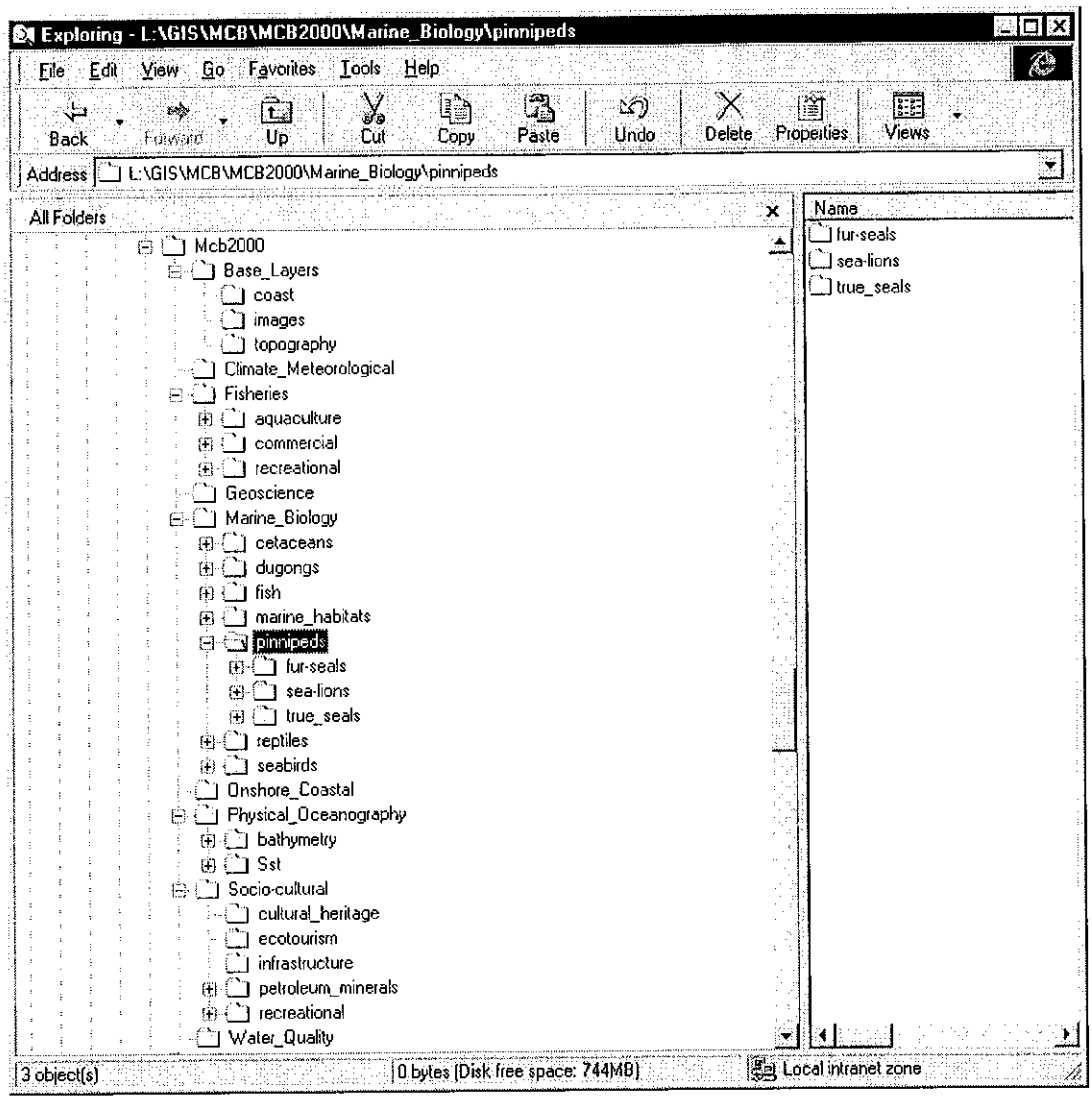


Figure 3. Generic directory structure for CALM's marine spatial database.

The 'stand alone' nature of the database has allowed for a rapid uptake of data on a relatively low cost platform. This database has been and continues to be the information base for stakeholder decision making and community education in Western Australia's marine reserve implementation program.

Use of Arcview (ESRI) file formats along with the above directory structure will facilitate easy access and integration into the emerging CALM GIS strategy. This strategy will in the short term see marine data added to the CALM Operational Graphic program (SmartCOG) and delivered on CD to Regional, District and Reserve managers. SmartCOG includes a 'user – friendly' interface and overcomes the immediate need for software purchase. Longer - term strategy for GIS delivery across CALMs intranet/internet networks using Esri Spatial Database Engine software (SDE) is currently under review.

2.2. ACTION 2: IDENTIFY GAPS IN EXISTING DATA AND PROGRAM CAPTURE AND CONSOLIDATION TO MEET MPA IMPLEMENTATION PRIORITIES (JURIEN BAY, DAMPIER ARCHIPELAGO, MONTEBELLO/BARROW ISLANDS AND GEOGRAPHE BAY – CAPES – HARDEY INLET MARINE RESERVES.)

Specific information requirements under the major categories: Physical, Biological and Human Use were identified in the report A *Spatial Analysis Model for CALM's Marine Reserve Implementation Program* (see 1997 Final Report appendix II) and have been used as a guide to data assemblage. The draft internal report entitled *Generic Information Requirements for Marine Reserve Management in Western Australia* (see 1997 Final Report Appendix III) also relevant to this action item is currently being reviewed and finalized.

Following the above reports and the past 2-3 years experience dealing with stakeholder and community groups a more specific table of datasets required for the implementation of Marine Protected Areas (MPAs) has been developed and is included in this report (see Appendix II). This table also indicates the progress to date with respect to data capture.

In addition, with the drafting of the discussion paper "*NO TAKE* AREAS IN WESTERN AUSTRALIA'S MULTIPLE-USE MARINE CONSERVATION RESERVE SYSTEM" a list of required information layers is included in the tabular guide to the selection of ***"No Take Areas"*** within MPAs (See Table 1).

These two tables are used as guide to determining gaps in existing data and programming of data capture programs for those priority areas outlined above.

Table 1. Guide to selection of 'No Take' areas in the Proposed Montebello – Barrow Islands Marine Reserve.

SELECTION OF 'NO TAKE AREAS'			
CRITERIA	GIS COVERAGE	CONDITION	COMMENTS
1. Be representative of all Major habitat types	Major marine habitats		
2. have high diversity	Relative diversity within and across major habitats		
3. Have high productivity	Relative primary productivity within and across major habitats		
4. Be a 'source 'reef	Oceanography – residual current	Net drift during Nov - April	
5. Not vulnerable to pollution (e.g. TBT, oil spills etc)	Oceanography – current speed and direction Human usage	Upstream of aquaculture, pipelines, shipping etc…	
6. Not vulnerable to cyclonic waves	Relative cyclonic wave energy	Protected from cyclonic wave damage	
7. Not vulnerable to temperature stress	Seasonal temperature maxima and minima	Between 20 and 30 degrees centigrade	
8. Not subject to anoxia stress	Oceanography – current speed and direction	< 10 m/s for 2 hours or more during March – April	
9. Not within 200 metres of existing surface infrastructure	Surface infrastructure	Avoid channels and channel markers, aquaculture sites, mooring areas etc…	
10. Not near most popular fishing sites	Recreational fishing areas	Avoid most popular recreational fishing	

		areas	
11. Not near commercial fishing grounds	Commercial fishing grounds	Not within 2 km of commercial fishing grounds	
12. Should be an adequate size		Not < 5 square Km	
13. Should be replicated			
14. Should be buffered			

Existing datasets from both industry and government sources require evaluation, verification, modification and in some cases replacement. Some of this work is outlined below along with data capture in 'Gap' areas

2.2.1. Physical Oceanography

Broadscale bathymetry over all of the waters off Western Australia (0 - >5000 metres) and some high resolution sounding data from Transport W.A. is held in the CALM database. Agreement has been reached with Apache Energy to supply high-resolution seismic data over the proposed Montebello – Barrow Islands Marine Reserve. This seismic data will be essential for biological and bathymetric modeling over this priority area.
Using marine habitat data prepared by CALM and CSIRO's oceanographic modeling expertise a project is underway to develop a coral larvae 'Source – Sink' dataset.

2.2.2. Meteorological

As part of the development of CALM/EA development of decision support software for use in the Montebellos – Barrow Islands Marine Reservation process a **cyclone intensity dataset** is being developed from Bureau of Meteorology data.

2.2.3. Marine Biology

Marine habitat information at both regional and local scales over areas proposed for reservation is considered to be a primary dataset. Mapping is under way in the following areas of WA:

- A major impediment to the development of amalgamated habitat datasets has been the lack of a standard approach to marine benthic habitat classification. To address this problem CALM Marine Conservation Branch has developed a set of regional classifications (See Appendix V) and is applying them to new mapping and to rationalization and amalgamation of existing datasets. CALM, as one of the primary custodians of marine benthic habitat data has presented these classifications to the Western Australian Land Information System (WALIS) Marine Group and has invited feedback from other interested agencies.
- Regional benthic habitat mapping over the Central West Coast area from Landsat TM imagery and aerial photography is complete with GIS coverage now extending over some 250 Km of this bio - region.
- Habitat ground truth surveying of Geographe Bay – Capes – Hardey Inlet has been carried out and generation of GIS polygon coverage of regional marine benthic habitats has been completed.
- Assessment of existing mapping has been undertaken over the proposed marine reserve area in the Montebello Islands/Barrow Island and Dampier Archipelago - Cape Preston area of Northwest Western. Additional ground truthing has been carried out by CALM (MCB) and some 20 datasets from industry and government sources are being processed into one GIS dataset covering the North - West shelf Area
- A biological and habitat ground truth survey over the area proposed for extension to the Ningaloo Marine Park has been completed. With data collected on an earlier CALM/DEP/AIMS/ field survey, regional marine benthic habitat mapping over some 300km of coral fringing reef is complete.

- Work to extend the mapping of marine habitats in the Shark Bay area in order to consider proposed extensions to the Shark Bay Marine Park is in progress.
- Spatial rectification and ground truth data gathered over the Rowley Shoals has facilitated the completion of habitat mapping and the generation of high resolution orthophotomaps over each of the three shelf edge atolls.
- As part of the GIS mapping program a relational database for habitat ground truth survey data has been developed. The database stores site number, position, depth, time, substrate, habitat classification, biological assemblage, etc.... This database can be linked to arcview and all site data collected and entered can be interrogated and analyzed spatially. In addition a prototype interface to interactively display the video or photo data at each point has also been successfully developed. To date only the Geographe Bay – Capes survey data and some Ningaloo data has been loaded. As well as incorporating future survey data, the intention is to load as much of the existing ground truth data as possible in order to build a statewide database. Further development of this database is planned as is the development of a relational database to store biological survey data

2.2.4. Socio-Cultural

Much of this data has been developed on a statewide basis. The most difficult area of data collection continues to be the recreational activity data particularly with regard to the short time frames associated with the MPA process. In lieu of hard data gathered as part of CALM's management and monitoring responsibilities and in order to meet priority MPA goals, an 'expert knowledge' approach has been adopted. User groups with "local knowledge' have been consulted and the results worked up into GIS usage layers.

2.2.5. Fishing

Fishing license areas covering WA waters have been supplied by Fisheries WA department however principal fishing areas over priority areas are not yet available. The Fisheries W.A. recreational fishing database has been useful in the proposed Jurien Bay reserve implementation process however data coverage does not extend to the Dampier Archipelago and Montebello – Barrow Islands area. In these areas an 'expert knowledge' approach has been adopted.

2.2.6. Aerial Photography

Some suitable aerial photography exists over marine reserve areas (proposed and existing). Existing coastal photography has not always been flown at optimal conditions to facilitate water penetration. In addition the delivery of paper aerial photo prints as an end product has been of only limited assistance to marine habitat mapping and boundary determination.
A project under way with Curtain University and CALM's GIS section using "Soft Photogrametry" techniques has delivered high resolution (spatial and spectral) digital orthophotomaps over the proposed Jurien Bay Marine Reserve and the Rowley Shoals Marine Reserve. These datasets have wide application in marine reserve implementation and management including

- habitat mapping
- rectification base for other remotely sensed data
- rectification base for historical data
- accurate boundary definition
- contextual data for stakeholder and community liaison
- planning and management tool

To this end through the WMG future applications to the State Land Information Capture Program (SLICP) to fly selected marine areas with appropriate equipment at suitable times for water penetration and will request as the deliverable, high resolution digital orthophotomaps.

2.2.7. *Remote Sensing*

The Marine Conservation Branch of CALM has long recognized the importance of remotely sensed data to the management and sustainable use of Western Australia's marine environment
CALM's corporate GIS area has recently announced the setting up of remote sensing section, which under service level agreements will facilitate the development of marine remote sensing expertise within the Marine Conservation Branch.

As mentioned in the report ("Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia" 1998), CALM's Marine Conservation Branch chairs a Marine Working Group (MWG) to the State Liaison Committee on Remote Sensing (SCLORS). The CALM marine GIS links across to this program as does the WALIS Marine Group discussed previously.

Acquisition and utilization of Landsat TM and NOAA data continue where applicable to marine reserve implementation, monitoring and management.

Other sources of remotely sensed data such LANDSAT 7 and Digital Multi Spectral Video (DMSV) is being assessed for marine mapping applications. Development of auto classification techniques for marine habitat mapping is underway

2.2.8. *Metadata*

Recording and developing metadata is an integral part of the data gathering and storage of marine data within the Marine Conservation Branch. With the construction of the generic directory structure mentioned above a more user friendly approach to documentation and metadata will be developed.
ANZLIC compliant metadata recorded in this way would by included in CALM's corporate GIS and be available to WALIS and the Australian Coastal Atlas.

2.2.9. *Liaison*

In an effort to facilitate access to existing data and to program data capture in a consistent and cost effective way, this position has been instrumental in encouraging the council to approve the formation of the Western Australian Land Information System (WALIS) Marine Group (WMG). The WMG has developed a strategic plan (see Appendix III) that encourages co-operation in all areas of marine spatial information and makes recommendations to WALIS Council to facilitate a whole of government approach.
Agencies in the group are as follows:

- CALM(Marine Conservation Branch)
- Department of Transport (Coastal Infrastructure Branch)
- Department of Minerals and Energy
- Ministry for Planning
- Department of Land Administration
- Department of Environmental Protection
- WALIS / Australian Coastal Atlas (WA node)
- Fisheries WA
- Oil Spills Response Atlas
- WA museum
- State Land Information Capture Program Marine Working Group on Remote Sensing

Interaction with Commonwealth and local government as well as industry groups continues as required.

2.3. PREPARE DATA FOR STAKEHOLDER ADVISORY COMMITTEE PROCESSES AND PUBLIC PARTICIPATION PROGRAMS FOR THE ABOVE FOUR PROPOSED MARINE PROTECTED AREAS

2.3.1. Data preparation

Generation of products for operational, educational, planning and management purposes continues to be a significant function of this position. Due to short timelines and the 'rapid response" nature of this process, the bulk of this work is done in house. Longer lead-time projects are covered under the service level agreement with CALM's corporate GIS area. The increased use of the GIS system within MCB by a range of staff for product generation, planning and analysis has to some extent reduced the impact of increased demand.
Over the past year emphasis has been on products specific to the Marine Reserve implementation process. Examples of hardcopy products used in the public participation process for zoning and boundary determination are enclosed with this report.

These include the following items:

- **Zoning History Jurien Bay Marine Reserve**
- **Zoning proposals for Jurien Bay Marine Reserve**
- **Proposed sanctuary zones for Jurien Bay Marine Reserve**
- **Dampier / Montebello Habitat Map**
- **Rowley Shoals Orthophoto & Habitat Map**

2.3.2. Decision Support System

A key area of data preparation for use in the education / stakeholder advisory process associated with MPA implementation has been the use of interactive digital display of the GIS data layers. This approach has in the proposed Jurien Bay marine reserve negotiations successfully overcome the difficulty of dealing with layers of fixed scale hardcopy maps and has sped up resolution of boundary positioning at fine scales.
To take this approach a step further CALM have entered into agreement with Environment Australia's Marine Group to adapt and develop the **Reservation Selection Tool** (REST) for Marine applications. REST is an interactive land allocation software program whose primary purpose is to allow users to develop and evaluate options for design of a reserve system to protect biodiversity and environmental values.
Progress to date indicates that the REST tool will deliver the data based options that will facilitate an analytical approach to reserve boundary definition and zoning by stakeholders. Training and documentation in the use of the tool is in progress. The key to this method rests with development of appropriate datasets (See Table 1).

3. STATEMENT OF EXPENDITURE

3.1. COMMONWEALTH FUNDS

Professional officer salary + salary on-costs (35%) - (0.85 fte x L5 year 2)	$53,105
Contract support staff salary + salary oncosts [0.15 fte x L2 Year2]	$4895
Total	$58,000

3.2. CALM RESOURCES

Infrastructure (office, etc) on-costs for Professional Officer - (1.35 x salary)	$53,105
CALM Information Management Branch (in-kind support)	$23,000
Infrastructure (office, etc) on-costs for Technical Officer - (1.35 x salary)	$4895
Software	$5000
Hardware and materials purchase	$5000
Training	$2000
Total	$93,000

4. EVALUATION

This evaluation addresses the aims outlined in Project Specifications (Appendix 1).

"Aims

The project will continue the development of a generic operational framework relevant to the implementation of a statewide system of marine reserves in Western Australia. Specific outcomes include:

- Ongoing data identification, acquisition and mapping to support the Western Australian program for marine reserve implementation.
- Consolidation of relevant information into a single database.
- Data and product preparation to assist in the planning and pre declaration processes for the proposed Jurien Bay, Dampier Archipelago, Montebello Islands and Geographe Bay – Capes _ Hardey Inlet marine reserves.
- Information Gathering and processing to provide decision support for site selection and subsequent zoning.
- Development of a marine GIS within CALM to meet the above objectives for the implementation MPAs."

4.1. OUTCOMES

Over the Western Australian government's priority areas for marine reservation listed below, all requirements for data, products and decision support were met.

- Jurien Bay
- Dampier - Montebellos
- Geographe Bay - Capes - Hardey Inlet

Acquisition and consolidation of existing relevant information over the whole state has significantly increased with focus on Dampier Archipelago, Montebellos Islands - Barrow Island and Geographe Bay - Capes - Hardey Inlet

The Database design is complete and strategies in place to consolidate the existing CALM regional database into a single generic database (see section 2.1). Over the WA priority areas migration of existing data into the new structure has commenced and will run parallel to the acquisition program as demand and resources permit.

4.2. APPROPRIATENESS

The 'stand alone' nature of the database has allowed for a rapid uptake of data on a relatively low cost platform. This database has been and continues to be the information base for stakeholder decision making and community education in Western Australia's marine reserve implementation program.

Use of Arcview (ESRI) file formats along with the above directory structure will facilitate easy access and integration into the emerging CALM GIS strategy. In addition this approach facilitates ease of integration of data and methods from other agencies both government and industry. Active promotion of the WALIS marine group (see section 2.2.9) has encouraged custodial responsibility for Western Australia's marine information and has resulted in most data being available in ESRI file formats.

4.3. EFFECTIVENESS

Development of a generic operational framework is ongoing with the following stages in place:

- Identification of required information layers, location of information and planning for gap areas all in place. This has been achieved with effective linkages to relevant industry and government agencies through the establishment of the Western Australian Land Information System (WALIS) Marine Group.

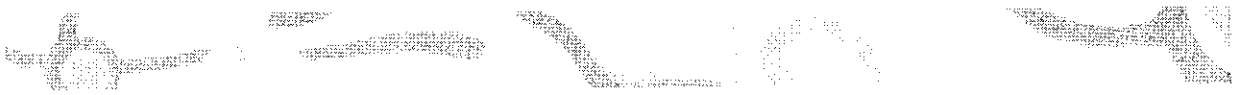
- Data has been consolidated into a single CALM focused database from the beginning of the project. This data is now being transferred into a more generic directory structure (see section 2.1)
- All planning and predeclaration processes have been well serviced by this project and full development of the DSS will substantially assist the development of MPAs in WA.
- Access to marine GIS within CALM on an Arcview CD distribution basis is available immediately over selected areas and the marine GIS database design will enable easy integration into the evolving CALM corporate GIS distribution strategy.

4.4. TRANSFERABILITY

The approach taken in this project is easily transferred to other jurisdictions regardless of size. The list of required datasets (see appendix II) is a guide for acquisition of data that, if stored in the logical directory structure outlined above will easily cope with changes to project size and data volume. The relatively low budget approach of this project using PC based "off the shelf software" to gather analyze, distribute and present data is also easily scaled up when required due once again to the integrity of the database

The placing of this project within an agency responsible to a state government for marine reserve management and implementation has provided a ready focus for information and strategic requirements. In addition existing links to data sources across government and industry have been a good starting point requiring only the introduction of a marine focus.

5.1. APPENDIX I: PROJECT SPECIFICATIONS



FINANCIAL AGREEMENT *1998-1999*

This Agreement is made on the _____ day of _____, 19___

between

The Commonwealth of Australia ('the Commonwealth'), represented by Environment Australia and

The State of Western Australia ('the State'), represented by Department of Conservation and Land Management

for the purpose of providing Commonwealth financial assistance to the State under section 19 of the *Natural Heritage Trust of Australia Act 1997*, section 16 of the *National Parks and Wildlife Conservation Act 1975* and/or section 5 of the *Natural Resources Management (Financial Assistance) Act 1992;*

for the purpose of linking Commonwealth and State priorities and programs agreed between the parties, as outlined in the *Coasts and Clean Seas* Memorandum of Understanding and Attachment D of the Partnership Agreement; and

for specified activities to enable the State, with the financial assistance provided, to achieve, in part, the outcomes sought in the *Coasts and Clean Seas* Memorandum of Understanding in relation to the following programs of the Natural Heritage Trust's *Coasts and Clean Seas*:

- Marine Protected Areas

The titles of the activity under this component of financial assistance for specified outputs, outcomes and reports in the Project/Program Details described herein are

- **Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia -- Year 3.**

This Agreement comprises the entire terms and conditions for carrying out the activities described herein, and includes:

(a) the Project Details, including any Special Terms and Conditions set out in or attached to this Agreement;

(b) the Project Proposal referred to in the Attachments;

(c) the Standard Terms and Conditions as currently agreed between the parties in Attachment B of the Partnership Agreement;

(d) the *Coasts and Clean Seas* Memorandum of Understanding; and

(e) the Partnership Agreement.

SIGNED for and on behalf of the COMMONWEALTH of AUSTRALIA:

Dr Conall O'Connell

.....
(Signature)

In the Presence of:

.....
(Full Name)

.....
(Signature)

SIGNED for and on behalf of the State of WESTERN AUSTRALIA

.....
(Full Name)

.....
(Signature)

In the Presence of:

.....
(Full Name)

.....
(Signature)

PROJECT DETAILS

Project No. and Title: WA9802 Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia --Year 3.

Project Supervisor:	**Dr Chris Simpson**
Agency:	CALM, Marine Conservation Branch
Contact Address:	47 Henry Street FREMANTLE WA 6160
Telephone:	(08) 9432 5101
Facsimile:	(08) 9430 5408
Email:	chriss@calm.wa.gov.au
Environment Australia Liaison Officer:	**Edward Kleverlaan**
Agency:	Environment Australia
Contact Address:	Marine Conservation Section GPO Box 787 CANBERRA ACT 2601
Telephone:	(02) 6274 1750
Facsimile:	(02) 6274 1771
Email:	edward.kleverlaan@ea.gov.au

Aims

The project will continue the development of a generic operational framework relevant to the implementation of a statewide system of marine reserves in Western Australia. Specific outcomes include:

- Ongoing data identification, acquisition and mapping to support the Western Australian program for marine reserve implementation.
- Consolidation of relevant information into a single database.
- Data and product preparation to assist in the planning and predeclaration processes for the proposed Jurien Bay, Dampier Archipelago, Montebello Island Barrow Island and Geographe Bay-Capes-Hardy Inlet marine reserves.
- Information gathering and processing to provide decision support for site selection and subsequent zoning.
- Development of a marine GIS within CALM to meet the above objectives for the implementation of MPAs.

Scope

Specific Tasks

1. Continuing acquisition and consolidation of existing relevant information into a single MPA specific database
2. Identification of gaps in existing data and programming of capture and consolidation to meet MPA implementation priorities (Jurien Bay, Dampier Archipelago, Montebello Island Barrow Island and Geographe Bay-Capes-Hardy Inlet).
3. Prepare and submit a Progress Report.
4. Preparation of data for stakeholder advisory committee processes and public participation programs for the above four proposed marine protected areas.
5. Prepare draft Final for comment and submit Final report.

Financial Payments and Reporting Schedule

The total financial payment for the project is $58,000 payable by the instalments specified in Table 1:

Table 1

Payment	Report	Date	Amount
Initial	Work Schedule	January 1999	$23,200
	Progress	May 1999	$23,200
	Draft Final	July 1999	$0
Final	Final	August 1999	$11,600
		Total	$58,000

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

Two (2) 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 "Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia --Year 3." *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

Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia --Year 3

Objectives/Aims of Project:
The project will continue the development of a generic operational framework relevant to the implementation of a statewide system of marine reserves in Western Australia. Specific outcomes include:

- Ongoing data identification, acquisition and mapping to support the Western Australian program for marine reserve implementation.
- Consolidation of relevant information into a single database.
- Data and product preparation to assist in the planning and predeclaration processes for the proposed Jurien Bay, Dampier Archipelago, Montebello Island Barrow Island and Geographe Bay-Capes-Hardy Inlet marine reserves.
- Information gathering and processing to provide decision support for site selection and subsequent zoning.
- Development of a marine GIS within CALM to meet the above objectives for the implementation of MPAs.

Final Product Required:

Written report.

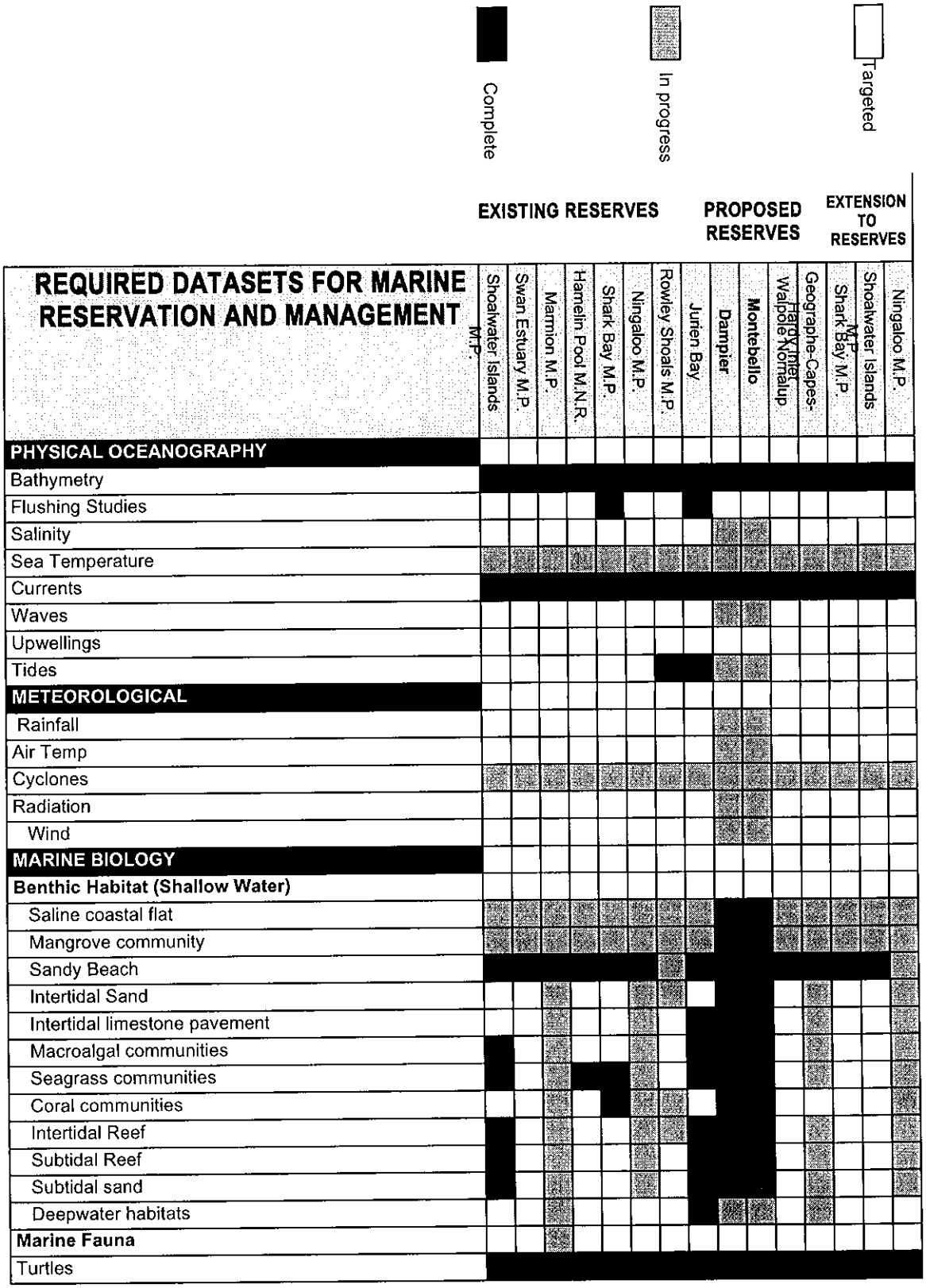
Specific Tasks:

1. Continuing acquisition and consolidation of existing relevant information into a single MPA specific database
2. Identification of gaps in existing data and programming of capture and consolidation to meet MPA implementation priorities (Jurien Bay, Dampier Archipelago, Montebello Island Barrow Island and Geographe Bay-Capes-Hardy Inlet).
3. Prepare and submit a Progress Report.
4. Preparation of data for stakeholder advisory committee processes and public participation programs for the above four proposed marine protected areas.
5. Prepare draft Final for comment and submit Final report.

Work Timetable

Tasks	Jan 99	Feb 99	Mar 99	Apr 99	May 99	Jun 99	Jul 99	Aug 99
Continuation, acquisition and consolidation of existing relevant information into a single MPA specific database.								
Identification of gaps in existing data and programming of capture and consolidation to meet the MPA implementation priorities.								
Progress Report								
Preparation of data for stakeholder advisory committee processes and public participation programs for the above four proposed marine protected areas								
Prepare draft Final for comment and submit Final report								

APPENDIX II: REQUIRED DATASETS FOR MARINE RESERVATION AND MANAGEMENT



Pinapeds
Dugongs
Crocodiles
Sea snakes
Fish
Seabird
Fish Spawning and Nursery Areas
Cetaceans
SOCIO - CULTURAL
TENURE
Territorial Water Limits
Existing Management/Ownership
Conservation Reserve (CALM)
Other Reseves (Govt /vested)
Private / Leasehold / VCL
Proposed Conservation Reserve
Marine Park Zoning
Petroleum Leases
Mining Leases
Aboriginal Claim Boundaries
Historical
Australian Heritage Commission areas
Aboriginal Sacred and Ceremonial Sites
Heritage / Historical Sites
Shipwrecks
URBAN & TOURIST DEVELOPMENT
Urban
existing
proposed
roads
airstrips
helipads
Resort
existing
proposed
Camping
existing
wild (free)
proposed
INDUSTRIAL DEVELOPMENT
shipping
oil & gas exploration
oil & gas production
mining
other industry
MARITIME INFRASTRUCTURE
anchorages
shipping lanes
port facilities
marina facilities
moorings
groynes

jetties
boat ramps
navigation markers
fish attracting devices
lighthouses
RECREATION
Boat Based Recreation
power boats
hovercraft
water skiing
jet skiing
parasailing
float planes
sailing vessels
paddle boats
kayaks/canoes
windsurfing
diving
snorkelling
wildlife viewing
wildlife interaction
Shore Based Recreation
scuba diving
snorkelling
surfing
swimming
reef walking
beach walking
beach launching
wildlife interaction
OFF RESERVE INFLUENCES
shipping
oil & gas exploration
oil & gas production
mining
other industry
SCIENTIFIC
Management Related
research & monitoring
extractive
non-extractive
FISHING
Commercial Fishing
licence areas and usage data
trawling
wetline fishing
netting
fish-trapping
rock lobster
abalone
aquaculture
collection

invertebrates	
vertebrates	
Recreation Fishing	
rod & line fishing	
boat based	
shore based	
netting	
set	
haul	
throw	
drop netting	
spearfishing	
shell collection	
rock lobster	
crabbing	
abalone	
GEOSCIENCE	
Coastal Type	
Sediment	
Subsrate	
WATER QUALITY	
Nutrients	
Turbidity	
Salinity	
Temperature	
Chlorophyll	
Base/Contextual data	
Satelite Imagery	
Air Photos	
Study area	
Coastline	
Topography	
Management Unit	
Video/photographic	

APPENDIX III: WESTERN AUSTRALIAN LAND INFORMATION SYSTEM (WALIS) MARINE GROUP – DRAFT STRATEGIC PLAN.

DRAFT

WALIS MARINE GROUP STRATEGIC PLAN

Draft 0.1 28 June 28, 1999 for discussion by members

The outline of the plan follows the standard business plan hierarchy of vision, objectives, strategies and actions, guided by statements of principle.
Vision

The vision of the WALIS Marine Group is:

To effectively manage marine data to best support the conservation and ecologically sustainable management of Western Australia's marine environment for the benefit of present and future generations

In this context, marine data management includes data collection, processing, storage, access and dissemination.

Objectives

Facilitate cross-agency cooperation in marine data collection and management between Commonwealth, State and Local Government and the private sector
Improve the management of marine data in Western Australia.

Strategies

In order to achieve our objectives, and to contribute to our vision strategies for the next three years (1 July 1999 – 30 June 2002) of the WALIS Marine Group are:

Gain WALIS endorsement of the roles and responsibilities of the WALIS Marine Group.
Coordinate and steer the successful implementation of the Western Australian Node of the Australian Coastal Atlas.
Clearly identify, develop and promote the use of primary datasets e.g. coastline, marine habitats, human usage, tenure.

Actions

In order to implement the strategies, the action plan of the WALIS Marine Data Group for 1 July 1999 – 30 June 2000 are:

Finalize strategic plan
Submit plan to WALIS Council for endorsement
2.1 Determine three-year funding outlook from Environment Australia
2.2 Direct 12-month program for data collection.
3.1 WMG to compile a Marine Data List and identify appropriate custodial agency.
3.2 WMG to promote the consolidation of existing datasets into custodial datasets.

WMG to facilitate identification of gaps in primary datasets and develop a prioritized program to address these gaps.
WMG to promote the generation of primary datasets as a State Government initiative
Develop effective techniques for collection and use of data. (MWG, SCLORS, SLICP, CSIRO)

Principles

The principles of the WALIS Marine Data Group are:

To work co-operatively.

Respect the roles and responsibilities of individual members and their agencies.

To be cost effective.

Encourage creativity and open interchange of ideas.

Performance Monitoring

The WALIS Marine Data Group will measure its effectiveness by:
Quarterly monitoring against this strategic plan, especially the annual Action Plan.
By requesting feedback from the WALIS Council.
Through an annual survey of WALIS Marine Data Group members.

5. APPENDICES

APPENDIX IV: DRAFT MARINE HABITAT CLASSIFICATION SCHEME

HABITAT CLASSIFICATION	TIDAL RANGE	SUBSTRATE TYPE	TROPICAL	TEMPERATE	RELIEF	MACROBIOLOGY	SUB-CATEGORIES	COMMENTS
1. **Island**	Supratidal	Sand igneous metamorphic sedimentary	✓	✓	high & low	Can be vegetated or bare		• Permanent land above HWM • May have seasonal vegetation • Seabirds, terrestrial mammals & reptiles • Important for marine mammals as haul out or breeding areas
2. **Rocky shore**	Intertidal Supratidal	igneous metamorphic sedimentary	✓	✓	high & low	bare		• continuous rocky shore • cliff, boulders, pavement • around HWM • *"uncomfortable to walk on"*
3. **Beach**	Intertidal Supratidal	sand	✓	✓	low	bare		• continuous intertidal sand • unvegetated • mobile sands • *"comfortable to walk on"*
4. **Salt marsh**	Intertidal Supratidal	mud silt	✓	✓	n/a	samphire saltmarsh blue-green algal mats can be bare		• continuous salt marsh cover (>1 ha) • on protected or low energy coastline • often landward of mangals and estuaries • includes unvegetated coastal saline flats
5. **Mangal**	Intertidal	Muds silts	✓	✓	n/a	mangroves		• continuous mangrove cover (>1 ha) • mud/sand/intertidal reef/shoreline reef may be present • intertidal gastropods and other invertebrates may be present
6. **Mudflat**	Intertidal	mud silts	✓	✓	low	bare blue-green algal mats		• continuous intertidal mudflat • includes mudflats behind mangals • intertidal gastropods and other invertebrates may be present

HABITAT CLASSIFICATION	TIDAL RANGE	SUBSTRATE TYPE	TROPICAL	TEMPERATE	RELIEF	MACROBIOLOGY	SUB-CATEGORIES	COMMENTS
7. **Sand shoal**	Intertidal	sand	✓	✓	low	bare little macroalgae		• Often in offshore macrotidal areas • medium to coarse sand • highly mobile sand
8. **Shoreline reef platform**	Intertidal	igneous metamorphic sedimentary	✓	✓	low	bare, algal turf		• continuous reef platform along the shoreline • may be bare or have macroalgal turf or sand patches • intertidal gastropods and other invertebrates may be present
9. **Offshore intertidal reef**	Intertidal	igneous metamorphic sedimentary	✓	✓	low	coralline algae, macroalgal turf, macroalgae		• Offshore reef • Intertidal or very shallow • intertidal gastropods and other invertebrates may be present
10. **Coral reef**	Intertidal & subtidal	n/a	✓		high & low	hard & soft corals other sessile invertebrates	• **Subtidal coral reef** - subtidal, often high live coral cover , coral colonies with sand patches in lagoons ➢ **Seaward reef slope** ➢ **Deep lagoon** • **Intertidal coral reef flat** - intertidal or shallow, often live coral is low, ➢ **Reef crest** ➢ **Back reef** ➢ **Reef flat** ➢ **Shallow lagoon**	• typical coral reef community-hard coral, soft coral, sponges, bryozoans, ascidians, etc. • seaward reef slope, reef crest, back reef, reef flat and individual bommies • some sand, pavement, macroalgae or seagrass interspersed
11. **Rubble**	Subtidal	dead coral	✓		low	sparse live coral sparse vegetation		• lagoonal areas • mainly unconsolidated coral rubble
12. **Subtidal reef platform**	Subtidal	igneous metamorphic sedimentary	✓	✓	low	diverse algae sessile invertebrates (including sponges, sea-whips, sea-	• **High relief reef platform** - >1 m high • **Low relief reef platform** -	• includes limestone pavement or low relief reef • may be covered with macroalgae or seagrass, patchy mobile sands

HABITAT CLASSIFICATION	TIDAL RANGE	SUBSTRATE TYPE	TROPICAL	TEMPERATE	RELIEF	MACROBIOLOGY	SUB-CATEGORIES	COMMENTS
						pens)	<1 m high	
13. Macroalgae dominated limestone reef	Subtidal	sedimentary	✓	✓	high & low	large fleshy macroalgae invertebrates	• **Macroalgae dominated high relief limestone reef** - >1 m high • **Macroalgae dominated low relief limestone reef** - <1 m high	• typically covered in macroalgae with diverse invertebrate life in overhangs & caves

HABITAT CLASSIFICATION	TIDAL RANGE	SUBSTRATE TYPE	TROPICAL	TEMPERATE	RELIEF	MACROBIOLOGY	SUB-CATEGORIES	COMMENTS
14. Macroalgae dominated granite reef	Subtidal	igneous metamorphic	✓	✓	high & low	Large fleshy macroalgae invertebrates	• **Macroalgae dominated high relief granite reef** - >1 m high • **Macroalgae dominated low relief granite reef** - <1 m high	• typically covered in macroalgae with diverse invertebrate life in overhangs & caves
15. Seagrass meadows	Subtidal	sand pavement	✓	✓	low	seagrasses	• **Dense seagrass** - Very little substrate showing ➢ **Dense ephemeral seagrass** ➢ **Dense perennial seagrass** • **Medium seagrass** - substrate cover < seagrass cover ➢ **Medium ephemeral seagrass** ➢ **Medium perennial seagrass** • **Sparse seagrass** - substrate cover > seagrass cover ➢ **Sparse ephemeral seagrass** ➢ **Sparse perennial seagrass**	• continuous seagrass coverage (>1 ha) • ephemeral seagrass species *Halophila* • perennial seagrass species *Amphibolis,* *Cymodocea,* *Enhalus,* *Halodule,* *Heterozostera,* *Posidonia,* *Syringodium,* *Thalassia* *Thalassodendron,* *Zostera*
16. Sand	Subtidal	Sand (generally white)	✓	✓	low	Bare may have seagrass or macroalgal patches		• little or no vegetation • may have patches of other habitat • may overlay reef platform • may have patches of seagrass or macroalgae • may have seasonal vegetation
17. Silt	Subtidal	muds silts	✓	✓	low	bare		• marine and/or terrigenous muds & silts • little or no vegetation • may have seasonal vegetation

Attachment 2

PROPOSED JURIEN BAY MARINE PARK

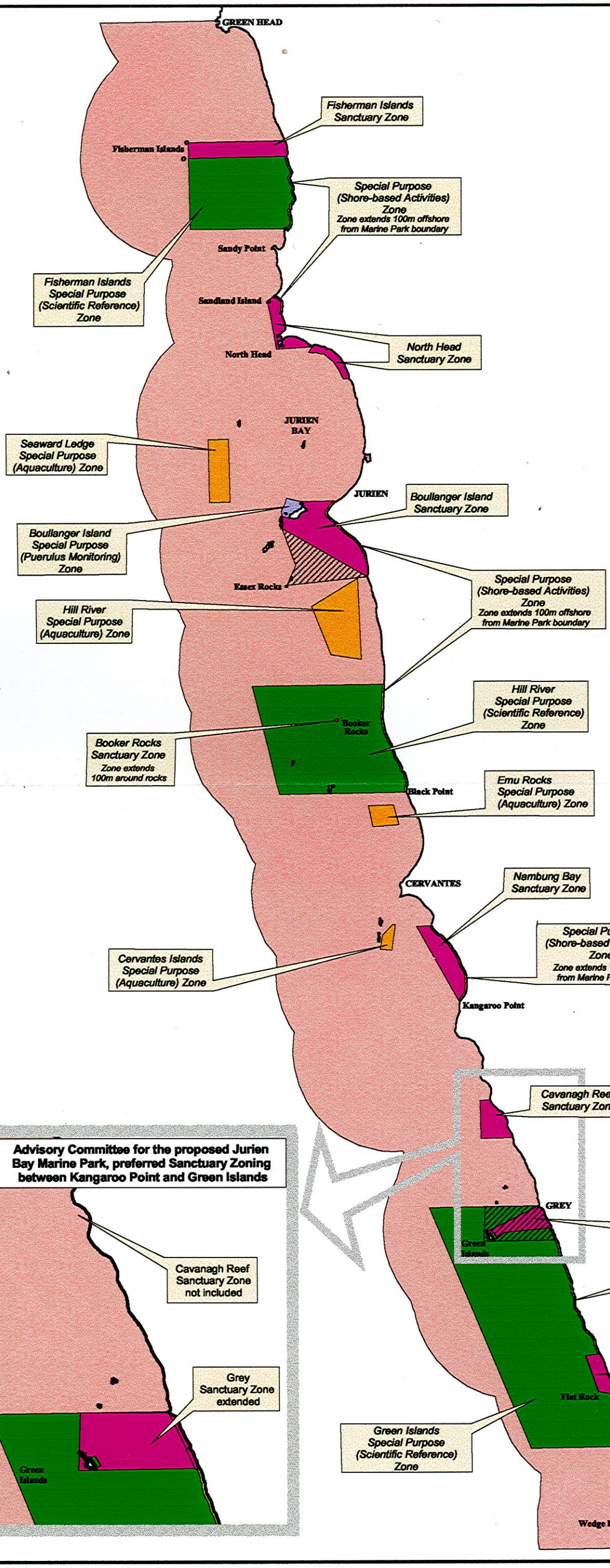
DRAFT ZONING SCHEME (5)

Endorsed by the Advisory Committee for the Proposed Jurien Bay Marine Park with conditions and comments from some Committee members as recorded in the minutes of meeting 7 (18-19 August 1999), of the Committee. Exact location of zones to be determined by ground truthing.

August 19th 1999

Environment Australia

Conservation and Land Management



Simplified guide to major activities by zones

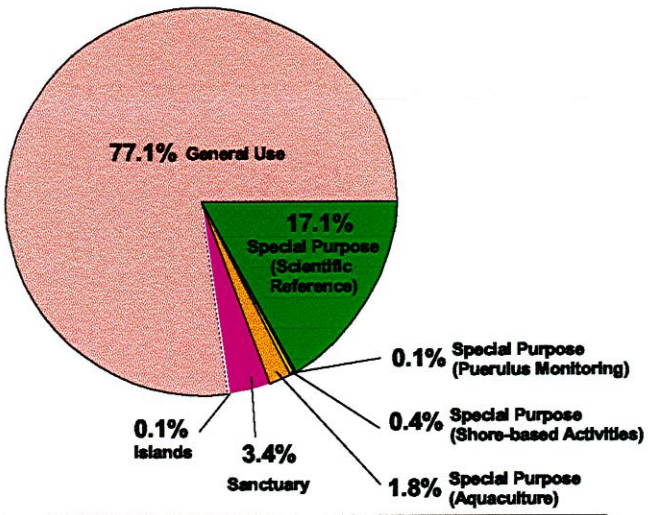
TYPICAL ACTIVITIES	Sanctuary	Special Purpose (Scientific Reference)	Special Purpose (Puerulus Monitoring)	Special Purpose (Aquaculture)	Special Purpose (Shore-based Activities)	General Use
Commercial Fishing - Rock Lobster	NO	YES	NO	YES	NO	YES
Commercial Fishing - Other	NO	NO	NO	YES	YES●	YES
Aquaculture	NO	YES*	NO	YES	YES*	YES
Tourism	YES	YES	YES	YES	YES	YES
Recreational Fishing - Boat	NO	NO	YES	YES*	NO	YES
Recreational Fishing - Beach	NO	NO	YES	Not Applicable	YES	YES
Diving, Surfing, Boating	YES	YES	YES*	YES*	YES	YES
Manipulative Science	NO	YES	NO	YES	YES*	YES
Petroleum Exploration	NO	Assess	NO	Assess	Assess	Assess

* Only permitted if compatible with primary purpose of Special Purpose Zone

● Shore based commercial fishing only

Assess = Assessment by Environmental Protection Authority

Zones as a Percentage of Total Area



LEGEND
- Sanctuary
- Advisory Committee's preferred Sanctuary Zones
- Special Purpose (Scientific Reference)
- Special Purpose (Puerulus Monitoring)
- Special Purpose (Aquaculture)
- Special Purpose (Shore-based Activities)
- General Use
- Island

SCALE 5 0 5 Kilometers

N W E S

zone3.apr 24/9/99 v1

Scale in Metres

1000 0 1000 2000

N

ARCVIEW SHAPEFILE

ORTHOPHO

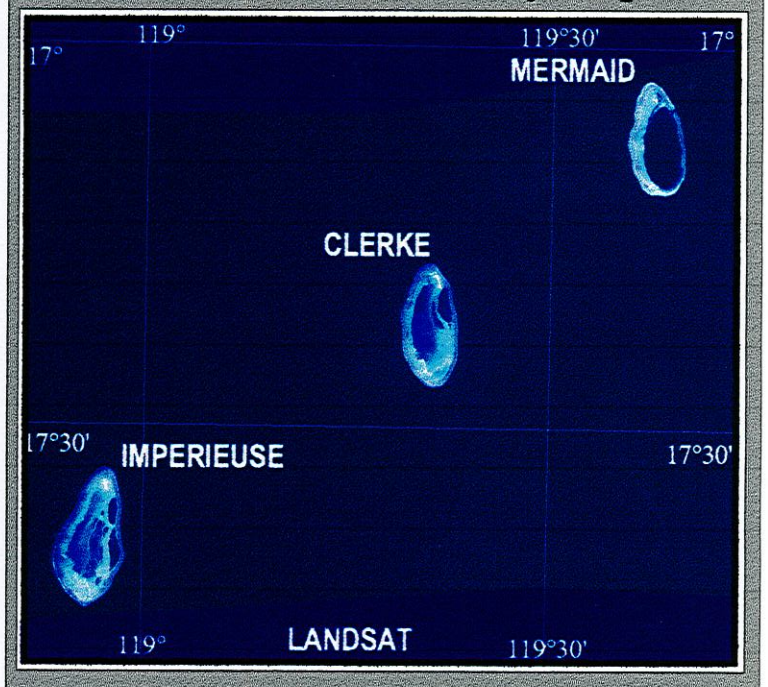
CLERKE

LEGEND

- Back Reef
- Deep Lagoon (Coral/Sand)
- Lagoon (Coral/Sand)
- Passage
- Reef Slope
- Sand
- Sand Cay
- Shallow Lagoon (Coral/Sand)

Note: this work is in progress and will take in all three shoals of the Rowleys

Rowley Shoals Locality Map



AIMS CALM Environment Australia