

Coral Coast Resort, Mauds Landing

Coral Coast Marina Development Pty Ltd

**Report and recommendations
of the Environmental Protection Authority**

EBV

**Environmental Protection Authority
Perth, Western Australia
Bulletin 796
December 1995**

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's report.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding Environmental Conditions which might apply to any approval.

APPEALS

If you disagree with any of the contents of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of \$10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005
1 December 1995

Your appeal (with the \$10 fee) must reach the Minister's office no later than 5.00 pm on **22 December 1995**.

Environmental Impact Assessment (EIA) Process Timelines in weeks

Date	Timeline commences from receipt of full details of proposal by proponent	Time (weeks)
6/2/95	Proponent Document Released for Public Comment	
31/3/95	Public Comment Period Closed	8
9/5/95	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	5
4/9/95	Proponent response to the issues raised received (final)	16
6/12/95	EPA reported to the Minister for the Environment	12

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Summary and recommendations

This report and recommendations provides the Environmental Protection Authority's advice to the Minister for the Environment on the environmental acceptability of the proposed Coral Coast Resort development at Mauds Landing, north of Carnarvon.

In assessing this development proposal, the EPA has identified the following global environmental protection principles to which this development should adhere:

- (a) sustainable development at Mauds Landing;
- (b) sustaining marine and terrestrial biological diversity in the Mauds Landing area;
- (c) integration of marine and terrestrial environmental management; and
- (d) conservation of areas of significance through the creation of reserves as required.

The EPA believes that the proponent must be able to manage the environment to specific environmental objectives, which are identified as follows:

Environmental objective	Management issue
maintain integrity of primary dune form	manage dunes and control nutrients from proposed golf course. Proponent would be required to remove links from dune area if monitoring indicates an unacceptable impact
maintain integrity of existing shoreline	manage on-going littoral drift processes
maintain acceptable water quality within artificial waterbody (marina) and to protect recognised environmental values of the near shore marine environment	ensure water quality within marina waterbody and near shore marine environment complies with appropriate standards
design, construct and manage proposed coral garden within marina to ensure there are no adverse environmental impacts within the marina water body	design, construct and manage proposed coral garden in accordance with specialist advice
maintain acceptable groundwater standards	manage groundwater quality within appropriate standards
maintain full range and quality of environmental values of terrestrial vegetation and flora	protect terrestrial vegetation and flora
protect subterranean fauna	determine presence of subterranean fauna and minimise adverse impacts where present
manage nutrient input to ensure no impact on terrestrial or marine environment	ensure effective nutrient and irrigation management
maintain full range and quality of environmental values of marine vegetation and flora	protect marine vegetation and flora
maintain full range and quality of environmental values of marine habitats and fauna	protect marine habitats and fauna, particularly protected marine mammals
protect and maintain identified environmental values of Ningaloo Reef	protect Ningaloo Reef from impacts of increased recreational pressure
ensure adequate supply of potable water	provide potable water supply in conjunction with Water Authority and the Shire of Carnarvon

Environmental objective	Management issue
design, locate and maintain associated services and infrastructure to ensure minimisation of adverse impacts on the environment	manage construction and maintenance of associated infrastructure (roads, marina walls, breakwaters, airstrip) and services facilities (landfill site, power)
design and construct Resort development to ensure that building levels take into consideration flood and storm surge risk	build Resort development in accordance with adequate setbacks and accepted minimum floor building levels
ensure that environmental impacts associated with the size and scale of Resort development are adequately managed	implement appropriate management strategies to alleviate adverse environmental impacts
ensure liquid waste is properly treated to agreed standards	plan and build appropriate wastewater treatment plant with capacity to treat sewage from Coral Bay townsite, and make treated water available for selected re-use to conserve water
ensure solid waste collected and properly / effectively manage solid waste to agreed standards	provide organised collection for solid waste and its disposal in a solid waste in landfill site to agreed standards
ensure environmental impacts associated with construction of the Resort development are effectively managed to as to minimise environmental impacts on the adjacent marine and terrestrial environments	provide detailed construction management plans to ensure construction impacts are minimised
ensure that there is adequate provision for long term maintenance of infrastructure	determine responsibility for the long term maintenance of infrastructure
ensure there is adequate provision for the long term management of potential adverse impacts on the environment	determine responsibility for long term management of potential environmental impacts
ensure that there is no long term adverse impact on the existing towns of Coral Bay, Exmouth or Carnarvon as a result of the Coral Coast Marina development	protect the tourist values of Coral Bay, Exmouth and Carnarvon

The EPA considers that the following issues have been adequately addressed by the proponent :

- maintenance of acceptable water quality within the marina and near shore marine environment;
- nutrient management, including liquid waste management;
- protection of marine flora;
- protection of marine fauna;
- potential impact of proposed Resort on Ningaloo Reef;
- maintenance of potable water supply;
- liquid waste (sewage) management;
- solid waste management;
- flood and storm surge risk;
- size and nature of development;
- construction impacts; and
- impact on existing communities of Coral Bay, Carnarvon and Exmouth.

Recommendations :

The EPA has identified the following issues which require additional work by the proponent:

- Potable water supply:
 - the treatment of drinking water needs to comply with accepted water quality standards for potable water; and
 - residual waste water from the potable water treatment facility needs to be disposed of in an environmentally acceptable manner.
- Proposed coral garden within marina:
 - details need to be provided on the source of corals, and design and management of the coral gardens.
- Protection of groundwater quality:
 - the proposed Shallow Groundwater Monitoring programme needs to be prepared to the satisfaction of relevant State Government authorities;
 - monitoring needs to be undertaken prior to development occurring, with specification of proposed remedial action to be undertaken in the event that unacceptable contamination is detected.
- Protection of subterranean fauna:
 - methods need to be identified to determine whether subterranean stygofauna are present at the site; and
 - strategies, methodologies and procedures outlined to minimise impacts on the stygofauna if they are found to be present.
- Protection of terrestrial flora:
 - confirm whether 'Priority 2' flora species and other significant flora species occur on site.
- Impact on littoral drift:
 - the proposed Shoreline Movement Monitoring Plan needs to be continued for a period of five years following construction of the resort development, with review at that time period to determine whether additional monitoring is warranted. Remedial works should be progressively undertaken to ensure the maintenance of the integrity of the dune form.
- Impact on coastal dunes:
 - disturbance to the dunes as a result of the proposed golf course construction needs to be minimised, and the golf course removed if on-going monitoring indicates unacceptable impacts on the dunes.
- Long term maintenance of infrastructure and long term management issues:
 - an 'Agreement' needs to be prepared between the proponent, State Government and the Shire of Carnarvon to address the issues involved in the long term maintenance of infrastructure, the long term management of the marine environment adjacent to the resort, and all proposed monitoring and management programmes .

Conclusion

Subject to the successful implementation of the management plan and compliance with the above conditions the EPA considers the project to be environmentally acceptable.

During this assessment, the EPA has identified the need for an integrated regional strategy combining environmental and planning objectives with development proposals along the Gascoyne Coast. Generally the concentration of the development at a node such as Mauds

Landing will be easier to manage and control environmentally than continuous development along the coast.

Summary of EPA recommendation	
1	Coral Coast Resort development is environmentally acceptable subject to the proponent's commitments and compliance with recommendations made by the EPA in this assessment report.
2	Provide potable water supply which meets accepted water quality standards, and disposes of wastewater from reverse osmosis treatment in an environmentally acceptable manner.
3	Provide to the Department of Environmental Protection and the Department of Conservation and Land Management design and management details of the proposed coral garden within the marina which indicate environmental effects are acceptable.
4	Protect and maintain acceptable groundwater quality.
5	Determine presence of subterranean stygofauna and avoid any adverse impacts.
6	Protect rare terrestrial flora.
7	Protect the coastline to ensure there is no long term erosion or accretion as a result of breakwater structures associated with the marina.
8	Protect the coastal dunes to ensure there is no long term damage as a result of construction of the golf course.
9	Prepare an Agreement between the proponent, Shire of Carnarvon and the State Government to ensure adequate long term management of potential environmental impacts and infrastructure associated with the resort development.

1. Introduction and background

1.1 Purpose of this report

This report and recommendations provides the Environmental Protection Authority's (EPA's) advice to the Minister for the Environment on the environmental acceptability of the proposed Coral Coast Resort development at Mauds Landing.

1.2 Background

In December 1988 the Department of Land Administration together with the Department of Marine and Harbours invited potential developers to register expressions of interest in the development of a marina and tourist facilities at Mauds Landing. Coral Coast Marina Development (CCMD) was subsequently identified as the preferred developer. Level of assessment for the proposal was set by the then EPA as 'Public Environmental Review' (PER) and guidelines to prepare this document were subsequently issued. Environmental assessment of the proposal was subsequently deferred until further planning details associated with the proposal were resolved.

In May 1989 the proposal was granted conditional Cabinet approval, subject to appropriate environmental and planning assessment.

In 1990 the details of a marina and resort proposal at Mauds Landing was forwarded to the EPA for environmental impact assessment by Coral Coast Marina Development Pty Ltd. The guidelines originally set in 1988 were reviewed and subsequently re-issued. In view of the scale and remote location of the proposal, it was considered by the State Government that a regional planning study should be undertaken to determine where the best location for this type of proposal should be, in relation to existing townsites in the vicinity. The Draft 'Gascoyne Coast Regional Strategy' document (ERM Mitchell McCotter, 1994) was subsequently prepared by ERM Mitchell and McCotter on behalf of the former Department of Planning and Urban Development and released for public comment, ending in January 1995. This document makes specific reference to proposed development in the Coral Bay / Mauds Landing area.

Following release of this Strategy document, a PER (Bowman Bishaw Gorham, 1995) was prepared on behalf of the proponent, Coral Coast Marina Development Pty Ltd. This PER was released for an 8 week public review period, ending on 31 March 1995. Figure 1 indicates the location of Mauds Landing.

1.3 Structure of the report

This document has been divided into 7 Sections.

Section 1 describes the historical background to the proposal and its assessment, and describes the structure of this report. Section 2 briefly describes the proposal (more detail is provided in the proponent's Public Environmental Review). Section 3 explains the method of assessment and provides an analysis of public submissions.

Section 4 sets out the evaluation of the key environmental issues associated with the proposal. In each sub section, the objectives of the assessment and an evaluation framework are defined. The likely effect of the proposal, the advice to Environmental Protection Authority from submissions and the proponent's response to submissions are described. Then the adequacy of the response by the proponent is considered in terms of project modifications and environmental management commitments in achieving an acceptable outcome. The Environmental Protection Authority's analysis and recommendations with respect to the identified issues are contained in this section. Where inadequacies are identified, recommendations are made to achieve the environmental assessment objectives.

Section 5 summarises the conclusions and recommendations. Section 6 describes the recommended environmental conditions. References cited in this report are provided in Section 7.

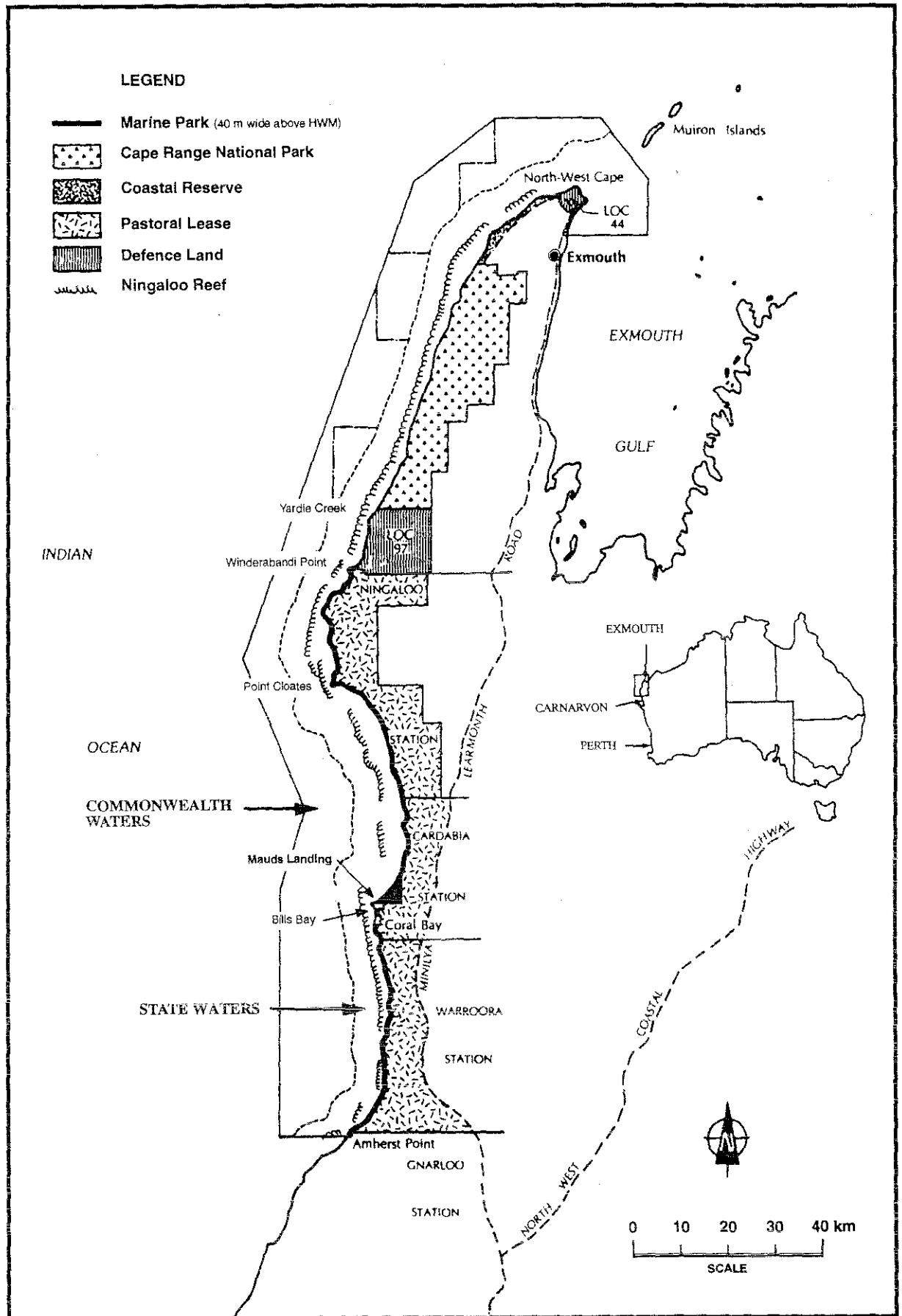


Figure 1. Regional location of Mauds Landing, Western Australia. (Source: Coral Coast Marina Development Pty Ltd)

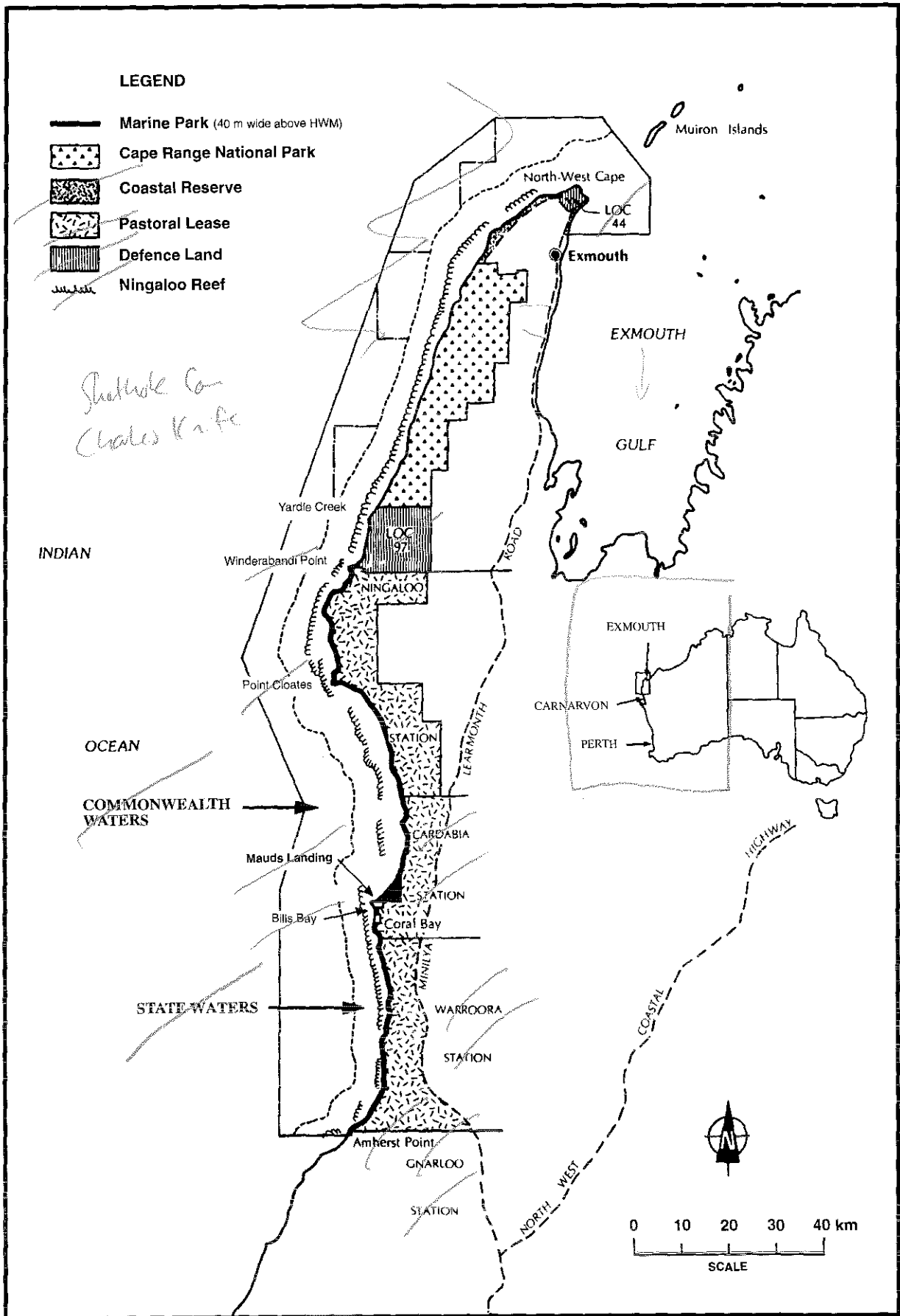


Figure 1. Regional location of Mauds Landing, Western Australia. (Source: Coral Coast Marina Development Pty Ltd)

2. The proposal

The proposed Coral Coast Resort is proposed to be constructed in 4 Stages over a 20 year period.

Stage 1 is proposed to be scheduled over 5 years and includes the following components:

- 'club resort' (400 rooms);
- caravan park (175 bays, 75 chalets);
- back packer hostel (60 beds);
- serviced apartments / townhouses (80 units);
- Visitor Centre, to be run by the Department of Conservation and Land Management;
- a Town Centre, including shopping plaza, retail outlets, tavern, parking facilities, administration buildings, serviced apartments and a visitor and research centre;
- administration facilities;
- a Country Club and 18 hole golf course;
- sports and recreation ground;
- an inland excavated marina (45 ha in area, 3.5 metres deep) protected by 3 off-shore breakwater structures, and associated boat moorings and pens;
- approximately 350 single residential lots, 110 single dwellings, 25 strata dwellings, referred to as the 'West Marina Estate';
- a service / light industrial area; and
- provision of water, sewer and electrical facilities.

Stage 2 is proposed over a 10 year period and would include:

- a 'resort' hotel and convention centre (250 rooms);
- extension to the back packer hostel (additional 60 beds);
- additional 25 serviced apartments / townhouses ;
- extension to the Town Centre facilities;
- a school complex;
- extension to the existing administration facilities;
- approximately 300 single residential lots, 130 single dwellings, referred to as the 'East Marina Estate';
- an extension to the service / light industrial area, and water power and electrical facilities.

Extensions to the Town Centre, administration and school facilities, residential dwellings and service facilities are proposed over a 15 to 20 year time period. It is, in effect, a new town site as no development currently exists on the site.

An artificially constructed coral garden is also proposed within the marina water body, however it is unclear at this stage when this would be constructed.

Figure 2 illustrates the proposed development, and includes an indication of what is proposed to be established in each of the Stages.

3. Environmental impact assessment method

3.1 Steps in the procedure of assessment

The purpose of the environmental impact assessment is to determine whether a proposal is environmentally acceptable or under what conditions it could be environmentally acceptable.

A set of administrative procedures has been defined (refer to flow chart in Appendix 1) in order to implement this method of assessment.

The first step in the method is to identify the environmental issues to be considered. A list of topics (or possible issues) is identified by the Environmental Protection Authority through the preparation of guidelines which are referred to relevant agencies for comment prior to being finalised.

In the next main step these topics are considered by the proponent in the Public Environmental Review, both in terms of identifying potential impacts as well as making project modifications or devising environmental management strategies.

The Public Environmental Review is checked to ensure that each topic has been discussed in sufficient detail by the proponent prior to release for government agency and public comment. The submissions received are summarised by the Department of Environmental Protection on behalf of the Environmental Protection Authority and this process can add environmental issues which need to be evaluated in terms of the acceptability of potential environmental impact.

Proponents are invited to respond to the issues raised in submissions. Appendix 2 contains a summary of the issues raised in submissions and the proponent's response to those issues. A list of submitters appears as Appendix 3. Seventy one submissions were received, of which 15 were from the local and State government agencies, 9 from organised groups, and 47 from members of the public.

The proponent's revised commitments following their response appears in Appendix 4.

This information, namely the Guidelines, the proponent's Public Environmental Review, the submissions and the proponent's response, is then subjected to analysis for environmental acceptability. For each environmental issue, an objective is defined and where appropriate an evaluation framework identified.

The expected impact of the proposal, with due consideration to the proponent's commitments to environmental management, is then evaluated against the assessment objective. The Environmental Protection Authority then determines the acceptability of the impact. Where the proposal, as defined by the proponent, has unacceptable environmental impacts, the Environmental Protection Authority can either advise the Minister for the Environment against the proposal proceeding or make recommendations to ensure the environmental acceptability of the proposal.

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent through preparation of the Public Environmental Review document (in response to guidelines issued by the Environmental Protection Authority), by Department of Environmental Protection officers utilising their own expertise and reference material, by utilising expertise and information from other State government agencies, information provided by members of the public, and by contributions from Environmental Protection Authority members.

The Environmental Protection Authority recognises that further studies and research may affect the conclusions. Accordingly, the Environmental Protection Authority considers that if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Environmental Protection Authority.

3.2 Public submissions

Comments were sought on the proposal from the public, community groups, as well as local and State government agencies. During the public submission period of 6 February to 31 March 1995, seventy one (71) submissions were received. A summary of these submissions was forwarded to the proponent for response. The proponent received copies of the full submissions from each State Government agency.

Submissions received by the Environmental Protection Authority were within the following categories:

- 47 from individual members of the public ;
- 9 from groups and organisations; and
- 15 from State and other government agencies.

To coincide with the middle of the PER public review period, and to encourage input from local residents, public information sessions to describe the proposal were held at the following venues between 4 pm and 8 pm:

- Coral Bay SES Headquarters - 27 February 1995 (attended by approximately 30 people);
- Exmouth Community Hall - 28 February 1995 (attended by approximately 18 people); and
- Carnarvon Arts Centre - 29 February 1995 (attended by approximately 10 people). The principal issues of concern raised in public submissions received during the public submission period and during the public meetings included:
 - justification of the project
 - increased recreational pressure on Ningaloo Marine Park;
 - damage to Ningaloo reef as a result of increased recreational pressure;
 - direct and indirect off-site impacts on the adjacent marine and terrestrial environment, including marine and terrestrial flora and fauna;
 - maintenance of acceptable water quality within the marina and adjacent marine environment;
 - potential pollution of groundwater quality;
 - potential flood risk associated with development so close to the coast;
 - potential impact of breakwaters on off-shore coastal sediment movement;
 - potential impact on coastal dune formations;
 - potential environmental impacts during construction phase;
 - short and long term management issues;
 - septage waste management;
 - aesthetic impact of development on coastal area;
 - impact on the existing community at Coral Bay; and
 - impact on the existing regional communities of Exmouth and Carnarvon.

The Environmental Protection Authority has considered the submissions received. The proponent's response to the submissions was also considered as part of the assessment of the proposal. This response was prepared in draft form in May 1995, and was subsequently amended following further discussion with officers of the Department of Environmental Protection and a site visit to the Mauds Landing site by members of the EPA in August 1995. A final response to the public submissions was received from the proponent on 4 September 1995. This is attached as Appendix 2. In view of the role of the Department of Conservation and Land Management (CALM) as manager of the Ningaloo Marine Park, the proponent has responded separately to CALM's submission (see Appendix 4).

3.3 Synopsis of public submissions

In summary, there were seventy-one submissions received by the Environmental Protection Authority. Forty-seven submissions were received from individual members of the public and twenty-four from individual organisations. More than three quarters of submissions expressed significant concern about the development as described in the PER document. Points raised in submissions opposing the proposed development include:

Biophysical issues:

- impact on Ningaloo Reef through increased recreational use may damage Ningaloo Reef, for example, increased nutrient rich or polluted discharge which may have a detrimental impact on the sensitive coral communities, and increased boat use and associated anchor and diver damage;
- a long term strategic management framework for Ningaloo Marine Park based on carrying capacity is required before any major development is allowed to proceed on its fringes;
- development will result in direct and indirect damage to the coral reef system, which will detract from the ecological value of the Reef;
- the capacity of the artesian formation to supply water to the development has not been adequately demonstrated by the proponent, and that there is a lack of detail regarding the extent of the water supply and its distribution. The practicality of the desalination plant was also questioned;
- there is a lack of information on the establishment and maintenance of a transplanted coral reef system. The long term management of the gardens, and source of coral has also not been addressed. A detailed feasibility study is required before this can be seriously considered;
- the existing nutrient management problem experienced at the Coral Bay townsite should not be used as a justification for establishing a new development at Mauds Landing, just because this development will provide appropriate treatment facilities;
- nutrients originating from the proposed sewage and wastewater treatment facilities, and contaminated run-off from the proposed golf course and urban areas adjacent to the marina will be almost impossible to manage, and is likely to have a detrimental impact on the sensitive coral reef ecosystem;
- groundwater management issues, including appropriate monitoring and effective management commitments are required to ensure there is no adverse impact on groundwater quality;
- noise and risk of collision from increased boating activity, proposed dredging of the entrance channel, artificial lighting and polluted run-off from the resort will have a detrimental impact on protected marine species;
- increased visitors may lead to uncontrolled and over-fishing of recreational fish species, including those resident on nearby reefs outside the Mauds' Sanctuary Zone, which would be difficult to manage;
- the issue of the presence and / or management of stygofauna which may be existing on the site has not been addressed by the proponent;
- the terrestrial fauna and habitats research documented within the PER is inadequate;
- the vegetation and flora survey undertaken and described within the PER document was considered to be inadequate as it was undertaken during the dry part of the year;
- the potential impact of the proposed breakwaters on littoral drift was inadequately addressed, particularly in view of the size of the proposed breakwaters. Further, the implications on long term sand movement have not been adequately addressed, particularly in view of the effects of tropical cyclones;

- part of the proposed golf course is planned to be located on the primary dunes. This was considered to be an inappropriate form of development on this area as it would alter the dune form and may contribute to long term management problems;
- a number of long term management issues were identified, which would require particular attention from the proponent. These included ensuring that all the proposed monitoring and management programmes are fully and appropriately implemented and effective remedial action taken when required, management of dogs and cats, management of residential landscaping and fertiliser use, 4WD activity, disturbance to and collection of marine fauna, management of anchor use and location of fixed moorings to avoid damage to reef and seagrass areas, additional traffic demands along the coastal area, management of fuel storage, and details of the proposed Management Corporation, ie. who will be represented on it, what powers would it hold, and what happens to it in the long term;
- the proposal does not make adequate provision for rising sea levels due to the Greenhouse Effect or climatic change and sea level rise, or storm surges;
- the majority of submissions opposing the development expressed the view that the size and scale of the Coral Coast Marina is too big and out of character with the sort of development most people who currently visit the area would like. The development is considered to be out of scale and context with the Ningaloo area. The area is popular because of its 'natural' appeal, and a large resort will detract from the beauty of the area; and
- the choice of quarry site to provide limestone for the breakwaters needs to be resolved. The environmental impacts of this need to be determined, including the impact on the local population as a result of infrequent truck movements.

Pollution issues :

- it was considered that there is inadequate information on the flushing characteristics of the marina , and concern was expressed that this may lead to water quality problems. It was also considered unclear who will be responsible for marina maintenance (marina walls, dredging, maintenance of acceptable water quality) in the short and long term.
- it was suggested that the issue of solid waste management has not been adequately addressed. Details such as the projected life of the waste disposal site need to be quantified and substantiated in a regional context. It was also considered that the proponent should make a commitment that there will be no sea dumping of any kind; and
- concern was expressed that earthworks associated with the marina and breakwater construction is likely to create turbidity plumes which may have an adverse impact on the adjacent marine environment. Details such as volumes of dredged material and location of proposed settlement ponds should also be detailed.

Social issues :

- concern was expressed that the development will target areas which are adequately catered for by the existing Coral Bay community, and will present direct competition with existing tourist facilities;
- concern was expressed that the proposed development will remove existing tourist opportunities from existing townships such as Carnarvon and Exmouth, and detract from other large developments already planned for the region, such as the Fascine Development at Carnarvon, and the Exmouth Marina; and
- it was considered unclear as to who will take ultimate responsibility for the long term maintenance of all infrastructure.

A number of submissions expressed support for the proposed development. Points raised in support of the proposal include :

- development will provide a boost to the economy of the Gascoyne Region, and open up other areas for development;

- controlled and well managed development at Mauds Landing will discourage 'ad hoc', uncontrolled tourist - oriented development along the coast;
- development will allow for increasing recreational pressure on Ningaloo Reef to be better managed. There is an increasing need for well managed tourist development within easy access distance of Ningaloo Reef;
- development at Point Maud is considered to be the only way to satisfactorily resolve existing environmental problems experienced in the area, for example sewage management at Coral Bay townsite, inadequate potable water and power supply, solid waste management, and increasing physical damage to Ningaloo Reef as a result of increased boat usage; and
- proposed development is expected to focus and facilitate the management of marine and terrestrial resources by appropriate government authorities.

These issues have been described in detail in Appendix 2.

4. Evaluation of key environmental issues

The Environmental Protection Authority has considered the issues raised during the environmental impact assessment process including matters identified in public submissions. Table 1 summarises the topics raised, the comments received in order to identify issues warranting evaluation, the proponent's response to these topics, and the environmental issues requiring evaluation by the EPA.

The Environmental Protection Authority has evaluated the following key environmental issues arising from this proposal, based on existing information, public submissions and advice from Government agencies:

Biophysical issues :

- impact on Ningaloo Reef;
- potable water supply;
- proposed coral garden within marina;
- nutrient management;
- groundwater management;
- impact on marine and terrestrial flora and fauna
- impact on littoral drift processes;
- impact on coastal dunes;
- long term management issues ;
- flood / storm surge risk; and
- size and nature of development.

Pollution issues :

- maintenance of acceptable water quality within the marina;
- solid waste management; and
- construction impacts.

Social issues :

- impact on existing communities; and
- long term maintenance of infrastructure.

It is considered that other issues raised during the environmental impact assessment process can either be appropriately managed by the proponent in accordance with their environmental

management commitments (Appendix 6), or are issues which should be dealt with by the proponent in concert with other agencies.

In giving advice regarding the environmental acceptability and management requirements for the Coral Coast Resort, the Environmental Protection Authority will assess the above key environmental issues.

4.1 Impact on Ningaloo Reef

4.1.1 Objective

The Environmental Protection Authority's objectives are to:

- retain the recreational value of Ningaloo Marine Park; and
- protect the ecological quality and characteristics of the Ningaloo Reef (including coral communities) over the long term.

4.1.2 Evaluation framework

Existing policy framework

'Ningaloo Marine Park Management Plan 1989 - 1999'. Management Plan No. 12, Department of Conservation and Land Management.

This management plan was prepared and adopted in 1989 by the Department of Conservation and Land Management (CALM) to provide a background understanding of the physical attributes of the Park; to define principles and objectives for the on-going management of the Park; and to provide management strategies to achieve these objectives. The Plan is due to be reviewed in the near future.

'A Representative Marine Reserve System for Western Australia'. Report of the Marine Parks and Reserves Selection Working group, CALM.

This report was prepared by the Marine Parks and Reserves Selection Group for the Minister for the Environment in 1994, and was published on behalf of the Working Group by CALM. The Report makes recommendations for the creation of a representative system of marine reserves along the WA coastline. The document makes reference to the existing Ningaloo Marine Park, and defines the Park boundaries

Government Position Paper - New Horizons in Marine Management (1994)

This document explains the Western Australian State Government's policies for marine management in WA. It specifically refers to the creation of new marine conservation reserves, the need to manage these, the formation of the proposed new Marine Parks Authority, and need for a balanced approach for conservation of the marine environment while encouraging commercial activities. The policy of no drilling for oil in Ningaloo Marine Park is stated in this document.

Technical information

Environmental Guidelines for Marinas in the Great Barrier Reef Marine Park (GBRMPA, 1994)

This publication lists in detail the potential environmental impacts of a marina type development on a coast nearby to existing coral reefs.

The proposed marina and resort development site is located on a north - west facing bay at Point Maud, approximately 5 kilometres north of the existing settlement of Coral Bay (also known as Bills Bay). The Ningaloo Reef is located approximately 2 kilometres west of the townsite at its closest point.

Table 1. Identification of issues requiring Environmental Protection Authority evaluation

Proposed Coral Coast (marina) resort				
<i>Biophysical issues</i>				
Topics	Local, State and Commonwealth Government advice to EPA	Public submissions	Proponent's responses	Issues
Increased recreational pressure on Ningaloo Marine Park	<p>The Department of Conservation and Land Management (CALM) advises that management structures need to be established with the proponent to ensure there is no adverse effect on the environment, and to ensure CALM can manage the conservation estate as well or better than before and be no worse off financially, and there must be no risk or cost to Government associated with the development.</p> <p>CALM also points out that an increase in tourist and resident numbers may exceed the carrying capacity of the marine environment, and increase cost of on-going management to local and state government.</p> <p>A firm commitment for a guaranteed income is required, and management structures agreeable to both proponent and CALM need to be established. Proponent also needs to demonstrate how increased pressure within and outside the 'Maud Sanctuary Zone' in the Marine Park as a result of increased visitor numbers will be handled.</p> <p>Shire of Carnarvon questions the proponent's claim that development will take pressure off the marine ecosystem, because it is not made clear how this would be done.</p>	<p>Concern was expressed that the impact on Ningaloo Reef through increased recreational use may damage Ningaloo Reef, for example, increased nutrient rich or polluted discharge which may have a detrimental impact on the sensitive coral communities, and increased boat use and associated anchor and diver damage.</p> <p>It was considered that a long term strategic management framework for Ningaloo Marine Park based on carrying capacity is required before any major development is allowed to proceed on its fringes.</p>	<ul style="list-style-type: none"> • Development will be staged over a 20 year period and management of Marine Park will adapt in response to increasing pressure. • Recommendations of the Ningaloo Marine Park Management Plan will be implemented. • proponent will liaise with CALM and Fisheries Department on management of Marine Park and help fund management from income generated by the proposed Visitors Centre, and will implement a 'Coral Community Monitoring Programme'. • Ningaloo Reef is already under pressure, and management measures proposed by the proponent will help to reduce this pressure. 	<p>Development will increase the number of people using the Ningaloo Reef and marine ecosystem which requires EPA evaluation.</p>

Direct impact on Ningaloo Reef	<p>The Department of Environmental protection (DEP) advise that direct recreational pressure on the Ningaloo Reef will continue to increase.</p> <p>CALM acknowledges that direct impacts on the reef are likely to result from people visiting the proposed Resort. In order to manage this impact, CALM considers the proponent should make a commitment to contribute to the cost of managing and rectifying impacts of the increased numbers of boats on the reef.</p>	Development will result in direct and indirect damage to the coral reef system, which will detract from the ecological value of the Reef.	<p>The proponent recognises the potential for damage to the reef due to anchors from higher levels of boat use and acknowledges the need to liaise with CALM to manage this.</p> <p>Commitments have been undertaken to prepare a Construction Management Plan, to minimise impacts during construction phase, and to educate visitor and resident boat owners via signs and literature. A commitment to design and implement a Coral Community Monitoring Programme has also been made.</p>	Disturbance during construction and post construction as a result of increased recreational activity. This has implications on management of the Reef by CALM which requires EPA evaluation.
Potable water supply	<p>The Water Authority of Western Australia (WAWA) advises that the proponents will be required to obtain a licence to drill for water prior to any drilling for artesian or non-artesian supplies.</p> <p>The Department of Minerals and Energy (DOME) advise that use of water within the Birdrong Sandstone is acceptable. If this is insufficient, the Bundera Formation may be used.</p>	Concern was expressed that the capacity of the artesian formation to supply water to the development has not been adequately demonstrated by the proponent, and that there is a lack of detail regarding the extent of the water supply and its distribution. The practicality of the desalinisation plant was also questioned.	Proponent proposes to extract groundwater from the artesian Birdrong aquifer. Specialist advice confirms that this aquifer will be adequate for anticipated water supply purposes. Untreated groundwater is proposed to be used for irrigation and household purposes. Treated water using 'reverse osmosis' processes to accepted water quality standards will be provided for drinking. The viability of using desalinisation plant technology is well recognised and has been well researched by the proponent.	Maintain a ready supply of potable water to acceptable water quality standards, and ensure that effluent generated as a result of reverse osmosis treatment is disposed of in an acceptable manner. This requires EPA evaluation.

Proposed coral garden within marina	CALM and Ministry for Planning raise the point that there is no explanation of how such a garden is to be established or action taken in the event that monitoring indicates the marina environment is unhealthy for coral.	Concern was expressed that there is a lack of information on this issue, particularly the establishment and maintenance of a transplanted coral reef system. The long term management of the gardens, and source of coral has also not been addressed. A detailed feasibility study is required before this can be seriously considered.	The proponent acknowledges that the coral garden will require detailed feasibility and design studies. Specific commitments regarding the construction, maintenance and on-going operation responsibilities for the garden will be undertaken in association with CALM.	Inadequate detail is presented regarding the feasibility and details of establishing and maintaining a coral garden in the proposed marina which requires evaluation by the EPA.
Nutrient management - existing situation	<p>CALM, the National Parks and Nature Conservation Authority (NPNCA), Gascoyne Development Commission (GDC), Ministry for Planning, Shire of Carnarvon and WAWA advise that there is already an existing nutrient management problem emanating from the Coral Bay townsite as a result of inappropriately managed septage waste disposal.</p> <p>CALM believe it should be a condition of development that the proposed sewage and effluent plant proposed as part of the Coral Coast Resort be capable of accepting and treating the sewage from the Coral Bay settlement.</p> <p>The DEP acknowledges existing problem at Coral Bay, and advises that this is considered to be a separate issue which requires fixing as soon as possible. The Coral Coast Resort proposed is viewed as an opportunity to resolve this problem, but not a justification.</p>	Concern was expressed that the existing nutrient management problem experienced at the Coral Bay townsite should not be used as a justification for establishing a new development at Mauds Landing, just because this development will provide appropriate treatment facilities.	Proponent acknowledges this problem and advises that the proposed wastewater treatment facility will be capable of treating effluent from the Coral Bay townsite in addition to waste from the proposed resort. However the proponent has reiterated that Coral Cast will not be responsible for the connection of the townsite to the new services.	One positive benefit of implementation of the Coral Coast Resort proposal is to allow connection of the existing Coral Bay townsite to a properly constructed wastewater treatment facility at Mauds Landing. However there is no firm commitment to ensure this occurs. Connection therefore relies on action and expenditure by other parties particularly State Government the Local Authority and leasees. This issue requires further investigation by the EPA.

Nutrient management - following construction	<p>CALM suggests that the commitment for a Nutrient and Irrigation Plan should include a low water approach to gardens, and indicate how it will be implemented.</p> <p>The Government Chemistry Centre advise they should be involved in this.</p>	<p>Concern was expressed that nutrients originating from the proposed sewage and wastewater treatment facilities, and contaminated run-off from the proposed golf course and urban areas adjacent to the marina will be almost impossible to manage, and is likely to have a detrimental impact on the sensitive coral reef ecosystem</p>	<p>Proponent has undertaken a commitment to prepare a 'Nutrient Input Management Plan' and educate residents about nutrient management and control. A 'Shallow Groundwater Monitoring Programme' and a 'Water Quality and Sediment Monitoring Programme' are also proposed by the proponent, which will be designed to monitor and manage water quality in the vicinity of the development site, to ensure there is no impact on the adjacent marine ecosystem.</p>	<p>Development is close to the coast. Urban development, nutrient rich run-off from the golf course, and discharge from wastewater treatment facilities may contribute to nutrient run-off into nearshore marine environment, and requires evaluation by the EPA.</p>
Groundwater Management	<p>Potential groundwater contamination from contamination as a result of the proposed development and need for appropriate monitoring and remedial action when required was raised by the Fisheries Department (FDWA), DOME and the WAWA.</p>	<p>Groundwater management issues, including appropriate monitoring and effective management commitments are required to ensure there is no adverse impact on groundwater quality. The potential impact of polluted groundwater flows into the marine environment should also be addressed.</p>	<p>Proponent has undertaken a commitment to prepare a 'Shallow Groundwater Management Plan'.</p>	<p>Potential for leachate from proposed wastewater treatment facility and landfill site to pollute groundwater. Details of appropriate remedial action is required if monitoring indicates adverse impacts, and requires evaluation by the EPA.</p>
Impact on marine flora and fauna, particularly protected marine species (turtle, Dugong, whale)	<p>Commonwealth Environmental Protection Agency (EPA) raises issue of protection of marine animals.</p>	<p>Concern was expressed that noise and risk of collision from increased boating activity, proposed dredging of the entrance channel, artificial lighting and polluted run-off from the resort will have a detrimental impact on protected marine species such as dugong and turtles. It was considered that this issue has not been adequately addressed.</p>	<p>Proponent has undertaken a commitment to prepare a Turtle Nesting Surveillance Programme, and will educate Park users at the proposed Visitors Centre.</p>	<p>Intensive urban development and artificial waterway (marina) may impact on protected marine species such as Dugong, turtles and whales feeding and nesting in the area, and requires evaluation by the EPA.</p>

Impact on fish	CALM and Fisheries Dept. advise that as visitor numbers increase, the potential for over exploitation of fish stocks will occur. A commitment should therefore be given to provide the means to control, manage and rectify this problem, and indicate how this will be achieved.	Concern was expressed that increased visitors may lead to uncontrolled and over-fishing of recreational fish species, including those resident on nearby reefs outside the Maud Sanctuary Zone, which would be difficult to manage.	Proponent will participate and contribute to the long term monitoring and management of this issue in consultation with Fisheries and CALM.	Impact on fish species, particularly recreational fish species, as a result of increased use of the Reef requires evaluation by the EPA.
Subterranean fauna (stygo fauna)	The GDC and the Western Australian Museum (WAM) advise there is inadequate information presented on potential impact on subterranean fauna, for example through groundwater draw-down as a result of marina construction, and through nutrient and chemical contamination of groundwater.	Concern was expressed that the issue of the presence and / or management of stygo fauna which may be existing on the site has not been addressed by the proponent.	Proponent believes that stygo fauna are unlikely to be present on site due to local geological features, and salinity of groundwater.	The potential impact on subterranean (stygo faunal) and troglobitic fauna requires evaluation by the EPA.
Terrestrial fauna	GDC and Commonwealth EPA raise point that terrestrial faunal survey presented in PER is inadequate.	It was claimed that the terrestrial fauna and habitats research documented within the PER is inadequate, as the data referred to within the PER document relied on a desk top survey only, not on actual field surveys.	Proponent acknowledges that no on-site field surveys were undertaken. However, a review of relevant reports, consideration of habitat types and discussion with officers of CALM and the Royal Australasian Ornithologists Union is considered to be adequate by the proponent.	The potential impact on terrestrial fauna as a result of limited habitat study requires evaluation by the EPA.
Terrestrial flora	GDC and Commonwealth EPA request clarification as to distribution of two priority 2 flora species and 5 other species identified as significant. Confirmation sought as to whether they occur elsewhere.	The vegetation and flora survey undertaken and described within the PER document was considered to be inadequate as it was undertaken during the dry part of the year. Also the cumulative impact on samphire flats has not been addressed.	It is considered that an adequate terrestrial flora survey has already been undertaken as part of the PER preparation.	Distribution and impact on significant species, which requires evaluation by the EPA.

Littoral drift	<p>The DEP advises that the proposed breakwaters (> 300 metres long) may impact on coastal sediment dynamics and that a detailed and effective monitoring and management programme is required to ensure no long term impact on the coast.</p> <p>The GDC and Department of Transport (DOT) consider proposed monitoring programme is inadequate.</p> <p>CALM advises there should be a commitment to rectify any adverse situation revealed by proposed shoreline monitoring. The Ningaloo Marine Park boundary extends to 40 metres above high water mark.</p>	<p>It was considered that this issue was inadequately addressed, particularly in view of the size of the proposed breakwaters. Further, the implications on long term sand movement have not been adequately addressed, particularly in view of the effects of tropical cyclones.</p>	<p>Proponent has undertaken a commitment to prepare a 'Shoreline Movement Monitoring Plan' which would monitor coastal dynamics and sediment accumulation north and south of the marina entrance, and to undertake remedial action if considered necessary.</p>	<p>The potential impact of breakwaters on off-shore sediment movement and coastal stability, and adequacy of monitoring approach, which requires evaluation by the EPA.</p>
Impact on coastal dunes (especially golf course)	<p>Ministry for Planning advises that coastal dunes need to be carefully managed (pedestrian access etc).</p> <p>The DEP advises that the dune system is vulnerable, especially in an arid and windy environment. It advised that a golf course on the dunes is an inappropriate form of land use within the dunes, and may contribute to nutrient rich run-off into the nearshore marine environment.</p>	<p>Concern was expressed that part of the proposed golf course is planned to be located on the primary dunes. This was considered to be an inappropriate form of development on this area as it would alter the dune form and may contribute to long term management problems.</p>	<p>Proponent will prepare a Foreshore Management Programme to ensure dunes are managed and to control public access to the beach, a Nutrient and Irrigation Management Programme to monitor and manage nutrient discharge, and dune protection works during and following construction of the marina. A 'links style' course will be developed to minimise the area to be irrigated. Other dune areas are proposed to be rehabilitated and revegetated using native grasses. Works would be designed to minimise alteration of existing dune form.</p>	<p>On-going management of the coastal dunes, and location of golf course on the primary dune system requires evaluation by the EPA.</p>

<p>Long term management issues (specific and general)</p>	<p>CALM states that adequate rubbish bins and sewer toilets should be provided in public areas around the marina; induction courses should be conducted about the environmental sensitivity of the area; and a commitment given to landscape areas disturbed by construction but not required for resort purposes. A commitment is also required to manage and control the substantial potential impact of residents (over 900 blocks are planned for) on the environment, and define how this will be done, e.g. 4WD management.</p> <p>DEP advises of concern that the developer cannot deliver management guarantees for areas outside of the development site. Concern was also expressed by the DEP that there is no realistic forecast of long term impacts and associated management of these impacts, for example the maintenance of the integrity of the foredunes.</p> <p>Shire of Carnarvon is unsure of the details of the proposed 'Management Corporation' as described in the PER, or what role the Council will play in this Corporation.</p>	<p>A number of long term management issues were identified, which would require particular attention from the proponent. These included ensuring that all the proposed monitoring and management programmes are fully and appropriately implemented and effective remedial action taken when required, management of dogs and cats, management of residential landscaping and fertiliser use, 4WD activity, disturbance to and collection of marine fauna, management of anchor use and location of fixed moorings to avoid damage to reef and seagrass areas, additional traffic demands along the coastal area, management of fuel storage, and details of the proposed Management Corporation, i.e. who will be represented on it, what powers would it hold, and what happens to it in the long term.</p>	<p>Specific and general long term management issues are proposed to be addressed by management commitments which have been detailed in response to the public submissions (Appendix 2). The proponent also states that the formation of a Management Corporation is a planning issue which is being dealt with separately under negotiation with the Shire of Carnarvon, Department of Land Administration, and the Ministry for Planning. This Corporation would be responsible for the maintenance of all infrastructure and monitoring for a minimum period of five years. It is expected that management responsibilities will ultimately transfer to the Local Authority.</p>	<p>Adequacy of management and enforcability of commitments. Agreement is needed to ensure adequate and effective management beyond 5 years. This issue requires evaluation by the EPA.</p>
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Potential flood risk	<p>CALM advises there may be a need to review the amount of excavated material needed to prepare the site as development is based on excavated material from the marina raising building levels above storm surge height, at mean sea level.</p> <p>CALM, DOT, GDC question anticipated building floor levels. Allowance needs to be made for the fact that the highest astronomical tide is 0.93 metres above mean sea level.</p>	Concern was expressed that the proposal does not make adequate provision for rising sea levels due to the Greenhouse Effect or climatic change and sea level rise, or storm surges.	Proponent has provided a analysis of how recommended building floor levels have been determined, and reiterates that these floor building levels are acceptable.	The coast is prone to cyclonic activity and building floor levels need to take into account high tides, storm surges, cyclonic activity and Greenhouse effect. Appropriateness of building floor levels in relation to storm surge needs to be evaluated by the EPA.
Size and nature of development (tourist and urban)	<p>DEP advised that it has concerns regarding the form and scale of development as proposed in the PER. Concern was expressed that a permanent residential population is more concentrated and involves specific management difficulties. It believes that a precautionary principle should be adopted, and development should be allowed to proceed with a focus on tourism use, with a limited residential component. Further development would be subject to a review of acceptable environmental management of the first stage after 5 years.</p> <p>Ministry for Planning has advised it is likely to support tourism oriented development, with minimum urban development at Mauds Landing, in the final 'Gascoyne Coast Regional Strategy'.</p>	Concern was expressed in the majority of submissions opposing the development that the size and scale of the Coral Coast Marina is too big and out of character with the sort of development most people who currently visit the area would like. The development is considered to be out of scale and context with the Ningaloo area. The area is popular because of its 'natural' appeal, and a large resort will detract from the beauty of the area.	The Resort is proposed to cater a new permanent population and for a number of different visitor groups, principally interstate tourists and overseas visitors. These groups have a variety of different needs and expectations which would be catered for by the Resort. Development is proposed to be staged over a 20 year period, and a mix of urban and tourist development is required to ensure the economic viability of the proposal.	The form and scale of development has an influence on the nature and extent of potential environmental impacts, which requires EPA evaluation.

Limestone Quarry	CALM state that the source and method of extraction of limestone and other building materials must be evaluated so that its environmental impact can be determined, unless materials are sourced from existing quarries.	The choice of quarry site to provide limestone for the breakwaters needs to be resolved. The environmental impacts of this need to be determined, including the impact on the local population as a result of infrequent truck movements.	Proponent has reiterated that details regarding sources of limestone will be determined at a later date, and be undertaken to satisfaction of appropriate agencies.	Environmental impacts associated with limestone extraction for construction of the breakwaters requires EPA evaluation.
<i>Pollution</i>				
Maintenance of water quality in the marina and adjacent marine environment	<p>CALM believes the proposed emergency contingency plan should include a commitment to rectify any problems, whether due to nutrients in the groundwater or stormwater into the marina, which the proposed monitoring may reveal, how these problems would be dealt with, and a general commitment to implement any necessary remedial action to maintain water quality within the proposed marina. Also should include a commitment to prevent or eliminate TBT entering the marina via large boats.</p> <p>DOT advises that projected flushing rates may be inaccurate.</p>	It was considered that there is inadequate information on the flushing characteristics of the marina , and concern was expressed that this may lead to water quality problems. It was also considered unclear who will be responsible for marina maintenance (marina walls, dredging, maintenance of acceptable water quality) in the short and long term.	It was reiterated that the proposed Management Corporation will be responsible for monitoring and maintenance of the marina during the first five years following construction. Clarification of the anticipated flushing mechanisms for the marina were also reiterated, to confirm that water quality problems are not anticipated. The proponent has also committed to prepare a Shallow Groundwater Management Plan, Water Quality and Sediment Monitoring Programme, a commitment that there shall be no direct discharge of stormwater into marina water body, and implementation of an 'Emergency Response Plan' to manage spills of fuel or other undesirable discharge into the marina waterbody. Other detailed commitments to manage water quality (including control of TBT use) are also made.	Adequacy of management plans in relation to maintenance of acceptable water quality within the marina, and consequent impact on water quality in nearshore marine environment requires EPA evaluation.

Solid waste management	<p>The DEP considers the proposal to provide a site to service both communities' i.e. Coral Coast Marina and Coral Bay townsite has advantages over the existing landfill site. Exact location and management issues would be more closely examined during the formal approval process of the site, as required under the Health Act.</p> <p>It was noted by the DEP that if the proposed site were established, the possibility of bird strikes may impinge on the proposed future development of the airstrip close to the service area. US Federal Aviation Administration Guidelines require a buffer distance of 1500 metres and 3000 metres between landfill sites and runways, for prop and turbo craft respectively.</p>	It was suggested that the issue of solid waste management has not been adequately addressed. Details such as the projected life of the waste disposal site need to be quantified and substantiated in a regional context. It was also considered that the proponent should make a commitment that there will be no sea dumping of any kind.	The proponent has stated that the final siting of the land fill site will give consideration to an alternative location further inland to avoid bird strikes, in consultation with the Shire of Carnarvon. Management of the site would be in accordance with requirements of the Office of Waste Management. The proponent has also undertaken a commitment that there will be no direct sea dumping of effluent or wastes of any kind.	The location of landfill site to avoid conflict with airstrip and to protect groundwater and the marine environment requires EPA evaluation.
Turbidity associated with the construction of marina and breakwaters	Ministry for Planning points out that activities associated with marina construction may have an adverse impact on nearshore water quality.	Concern was expressed that earthworks associated with the marina and breakwater construction is likely to create turbidity plumes which may have an adverse impact on the adjacent marine environment. Details such as volumes of dredged material and location of proposed settlement ponds should also be detailed.	Proponent has undertaken a commitment to prepare a 'Dewatering Management Plan' to manage potential sediment plumes generated through marina construction. This will includes details such as the location of the settlement ponds.	The potential impact on water quality in the nearshore marine environment during construction of the marina and breakwaters requires EPA evaluation.

Social surroundings

Aesthetic impact		Concern was expressed that a development of this scale would have an unacceptable aesthetic impact on the coast.	The proponent has responded that the Resort is planned to harmonise with the environment, and that careful consideration will be given to residential design and construction materials to reduce potential aesthetic impacts.	The EPA acknowledges that the final design of the Resort development is yet to be finalised. The EPA expects that the potential aesthetic impact of the Resort would be taken into consideration by the proponent during the final detailed design phase. This is not considered to be a significant environmental issue which requires evaluation by the EPA.
Coral Bay townsite	The GDC has expressed concern regarding the creation of what is effectively a new town with a predicted population over 5,000 persons (the size of Margaret River), and the detrimental impact this may have on the existing community of Coral Bay.	Concern was expressed that the development will target areas which are adequately catered for by the existing Coral Bay community, and will present direct competition with existing tourist facilities.	The proponent does not consider that the proposed development will have an unacceptable impact on the existing community at Coral Bay. The existing community caters principally for the intra-state market, however the proposed Resort is aimed at the inter-state and overseas tourist market. It is considered that the Resort would benefit the locality and reduce the present seasonality of the market.	The potential impact on existing community within Coral Bay Townsite. This is not considered to be a significant environmental issue which requires evaluation by the EPA.

Impact on existing communities at Exmouth and Carnarvon	Shire of Carnarvon and the GDC advise that the proposed development may have adverse impact on established town centres, and detract from economic activity in these areas.	Concern was expressed that the proposed development will remove existing tourist opportunities from existing townships such as Carnarvon and Exmouth, and detract from other large developments already planned for the region, such as the Fascine Development at Carnarvon, and the Exmouth Marina.	The proponent has responded that the proposed development at Mauds Landing is likely to enhance the growth and economic potential of existing communities at Carnarvon and Exmouth, as it would provide a 'catalyst' and strengthen the demand for tourism and residential opportunities in those existing towns.	The proposed development has the potential to compete with already established town centres of Exmouth and Carnarvon. This is not considered to be a significant environmental issue which requires evaluation by the EPA.
Long term maintenance of infrastructure	The GDC, Ministry for Planning and CALM advise the importance of ensuring that there is no long term cost to government (State or Local) as a result of long term management of infrastructure. Particular reference was made to the marina beaches, and maintenance of marina water quality	It was considered unclear as to who will take ultimate responsibility for the long term maintenance of all infrastructure.	These management issues will be addressed via the proposed management Corporation.	The long term maintenance of infrastructure associated with Coral Coast Resort development requires evaluation by the EPA.

Comments from key Government agencies

The Department of Conservation and Land Management (CALM) advises that management structures need to be established, possibly in the form of a 'Memorandum of Understanding', with the proponent. This needs to include provisions which ensure there is no adverse effect on the environment, especially the coastal dunes and coral reef, to ensure commitments to manage, rectify and control existing and potential problems associated with the proposal effectively, to ensure CALM can manage the conservation estate as well or better than before and be no worse off financially, and acknowledge that there must be no risk or cost to Government associated with the development. CALM also points out that an increase in tourist and resident numbers may exceed the carrying capacity of the marine environment, and increase cost of on-going management to local and State government. Finance generated from the proposed 'Visitor Centre' is estimated by the proponent to be \$250,000. CALM points out that there is no guarantee that this figure will be realised. A firm commitment for a guaranteed income is required. The proponent also needs to demonstrate how increased pressure within and outside the 'Maud Sanctuary Zone' in the Marine Park as a result of increased visitor numbers will be handled, for example increasing numbers of boats on the reef.

In view of CALM's role as manager of the Ningaloo Marine Park, a copy of CALM's submission has been included in full in Appendix 3.

The Shire of Carnarvon notes the proponent's claim that development will take pressure off the marine ecosystem, but points out that the proponent has not made it clear how this would be done.

The Department of Environmental Protection (DEP) advises that recreational pressure on the Ningaloo Reef is increasing.

4.1.3 Public submissions

In summary, submissions from the public advised that Ningaloo Reef is an extremely important regional recreational area which is experiencing increasing recreational pressure. The Reef should be very carefully protected to ensure it is not destroyed as a result of damage from tourists in boats, particularly anchor and mooring damage to corals, and overfishing, and ad hoc uncontrolled tourist development along the coast.

Concern was also expressed that the proposed resort development will increase recreational pressure on coastal areas adjacent to the Point Maud development site.

4.1.4 Response from the proponent

The proponent acknowledges that Ningaloo Reef is a fragile environment which needs to be carefully managed. The proposed development will be staged over a 20 year period and management of Marine Park will adapt in response to increasing pressure. Commitments made by the proponent with respect to this issue include :

- recommendations of the Ningaloo Marine Park Management Plan will be implemented (see Commitment 55, Appendix 6);
- proponent will liaise with CALM and Fisheries Department on management of Marine Park and help fund management from income generated by the proposed Visitors Centre' (see Commitments 50, 51, 52, 53 and 54, Appendix 6).

It is considered by CCMD that management measures proposed by the proponent will help to reduce existing and future recreational pressure on the Reef.

The proponent also recognises the potential for damage to the reef due to anchors from higher levels of boat use, and acknowledges the need to liaise with CALM to manage this. Commitments have been undertaken to manage these impacts including :

- preparation of a Construction Management Plan, to minimise impacts during construction phase of the marina and resort development (see Commitment 6, Appendix 6);

- education programme for visitor and resident boat owners via signs and literature (see Commitment 53, Appendix 6). This information would be designed to raise the awareness of the recreational potential of the terrestrial and marine habitats and their environmental limitations; and
- design and implementation of a Coral Community Monitoring Programme. This programme is proposed to be prepared in consultation with CALM and the DEP. Monitoring is planned to be commenced prior to marina construction, and will continue at representative sites in the Sanctuary Zone, and various locations on the coral reef at six monthly intervals following construction over a period of five years (see Commitment 9, Appendix 6).

The proponent has also responded in specific detail to issues raised within CALM's submission. This response is included as Appendix 4.

4.1.5 Evaluation

The EPA recognises that the Ningaloo Reef is of national importance, and is a natural resource of special interest. The Reef is vulnerable to increasing tourist pressure, particularly due to its close proximity to the mainland. This concern was expressed very clearly in the majority of public submissions received by the EPA. Tourism and recreational pressure is also increasing. This pressure is evident at existing tourist destinations such as Coral Bay, where damage to corals has occurred through anchor drag, temporary moorings and boat propeller damage. The EPA believes that it is vital that the Reef is managed and protected, to ensure that the ecological and recreational values of the Reef are maintained.

In assessing this development proposal, the EPA acknowledges that the development will increase the number of people using the reef. The proponent's commitments regarding proposed management are noted. The EPA views the development and associated management commitments as an aid in the long term management of Ningaloo Reef.

The EPA also acknowledges that there is potential for damage to coral reefs as a result of increased recreational pressure on the reef. However, it considers that the alternative, safe and better managed mooring facility as proposed within the marina development may help to reduce damage to the Reef as a result of increased recreational activity.

The EPA endorses the proponent's commitments to minimise impacts on Ningaloo Reef through the education of members of the public, to ensure that the environmentally sensitive nature of the coral reef environment is better understood, and by providing an alternative safe and well managed mooring site within the proposed marina, and by undertaking a co-ordinated coral reef monitoring programme.

The EPA concludes that the proponent's commitments to protect the Ningaloo Reef are adequate, provided they are implemented effectively.

Potential environmental impacts on Ningaloo Reef also require co-ordinated long term monitoring and management. This issue is discussed further in Section 4.10 of this report.

4.2 Potable water supply

4.2.1 Objective

The Environmental Protection Authority's objective is to ensure that the supply of potable water to residents of the proposed development does not have an adverse impact on the environment.

4.2.2 Evaluation framework

Existing policy framework

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

These guidelines define the standards for the treatment of raw water to acceptable drinking standards.

Technical information

PER Appendix C : 'Evaluation of Groundwater Conditions Near Mauds Landing'.

This appendix describes work undertaken by 'Rockwater' (Groundwater Consultants) on behalf of the proponent, and provides an evaluation of groundwater conditions near Mauds Landing. It concludes that water supplies for the proposed marina and land development near Mauds Landing will be available from the Birdrong Formation aquifer at a depth of about 800 metres. Water salinity will be about 5,3000 mg/L TSS, and desalination would be required to obtain fresh water for domestic use.

PER Appendix D : 'Options for Water Supply and Treatment'.

This appendix describes work undertaken by Hi-Tech Water (Australia) Pty Ltd on behalf of the proponent. It describes the options for water supply and treatment for the proposed development.

In summary, storage of rainwater to supply water is not feasible by the proponent due to low rainfall and high evaporation rates. Neither groundwater nor surface water to potable standards is available at the development site, however raw water suitable for treatment to acceptable standards is available in unconfined aquifer groundwater supplies, and artesian aquifers. 'Reverse Osmosis' was identified by Hi-Tech (Australia) as the most common approach to desalination, to provide potable water supplies. Treating seawater is not considered to be an economically viable option by the proponent.

Comments from key Government agencies

The Water Authority of WA (WAWA) advises that the proponent would be required to obtain a license to drill for water prior to any drilling to the artesian or non-artesian aquifer.

The Department of Minerals and Energy (DOME) recommend that regular monitoring of the hydraulic head and groundwater quality in the Birdrong Sandstone should be undertaken, and be incorporated as part of the on-going groundwater monitoring programme (see Section 4.5). The parameters to be monitored and monitoring frequency should be stipulated by the Water Authority of WA through license conditions. The suggestion was made that depending upon the type of lithology encountered, more than one monitoring bore on each site may be required as part of the proposed monitoring programme. Final bore locations and site numbers should be determined in consultation with the Geological Survey Division of DOME.

4.2.3 Public submissions

Concern was expressed that there is a lack of detailed information presented by the proponent regarding water supply. For example, the capacity of the artesian formation to supply water to the proposed development has not been demonstrated.

4.2.4 Response from proponent

The proponent proposes to extract groundwater from the artesian Birdrong aquifer. Untreated groundwater is proposed to be used for irrigation and non-potable household purposes. Water treated by 'reverse osmosis' processes to accepted water quality standards will be provided for drinking requirements.

The proponent has also undertaken a commitment to apply for appropriate licenses for groundwater in accordance with the requirements of the WAWA (see Commitment 32, Appendix 6).

4.2.5 Evaluation

A potable water supply is required to be provided to meet the needs of people who will live and visit the resort complex. The EPA notes that the proponent has committed to extract water from the Birdrong aquifer for use by the community, and that appropriate groundwater licenses will be obtained from the WAWA. Water is proposed to be treated via 'reverse osmosis' to potable drinking standards.

The EPA recommends that this method of providing potable water is environmentally acceptable, provided that :

- **the treatment of drinking water complies with standards specified in the 'Australian Water Quality Guidelines for Fresh and Marine Waters'; and**
- **residual 'bleed water' resulting from reverse osmosis treatment is discharged in a way which is acceptable to the EPA.**

4.3 Proposed coral garden within the marina

4.3.1 Objective

The Environmental Protection Authority's objective is to ensure that water quality within the marina is sufficient to maintain the proposed coral garden in a healthy condition.

4.3.2 Evaluation framework

Existing policy framework

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

This document identifies acceptable standards for water discharge to ensure that accepted water quality standards are maintained for a number of uses, under a series of categories. These categories include the protection of aquatic ecosystems, recreational water quality, drinking water, agricultural water use and industrial water quality. In the context of this assessment the first two categories are relevant, ie. the protection of ecological values of aquatic ecosystems, and recreational water quality .

These standards would apply to water quality within the marina (recreational water quality), and near-shore marine environment (protection of ecological values of aquatic ecosystems) which may have been contaminated as a result of activities associated with the resort development.

Technical information

Survey of water quality, groundwater, sediments and benthic habitats at Coral Bay, Ningaloo Reef, Western Australia (DEP, 1995)

This report was prepared by the DEP for the Department of Conservation and Land Management. The report was prepared in response to the perceived decline in water quality in the marine environment adjacent to the town of Coral Bay. Sewage leachate originating from sewage treatment lagoons via groundwater seepage was thought to contribute to this water quality problem. An analysis of water quality, including nutrient concentrations and heavy metal contamination was undertaken to examine these issues in greater detail.

Conclusions drawn from results obtained in this survey suggest that in general, nutrient concentrations and phytoplankton biomass are low, as would be expected in tropical waters. In relation to this assessment, it can be concluded that in order for an artificially planted coral garden to be successful in the proposed marina water body at Mauds Landing, nutrient concentrations and phytoplankton biomass would be required to be low.

Comments from key Government agencies

The Ministry for Planning has advised that information presented within the PER does not support the establishment and maintenance of a transplanted coral reef system. It is considered by the Ministry that coral reef ecosystems are generally found in high energy systems with high flushing rates and high light attenuation, which would not be the case in the proposed marina.

Water quality and temperature ranges to sustain such an ecosystem would be difficult to achieve in such a shallow low flushed system, and the issue of light regimes has not been addressed within the PER at all. Corals are likely to become abraded by sediment movements. A detailed feasibility study is required before this aspect of the development can be seriously considered. Further, concern was expressed that the long term management of the proposed coral gardens has not been addressed within the PER after CCMD transfers responsibility. This needs to be given serious consideration in view of the fact that local government may not have the funding, staffing or expertise to maintain the coral gardens. Further there is no mention of the coral garden construction or maintenance in the construction and operation phase of the development, or any commitments made in relation to it.

The Commonwealth EPA expressed concern regarding the collection of coral for the proposed coral gardens. This may only be achieved through the removal of coral from areas within the marine park. This would establish an undesirable precedent. Also information regarding which species would be used and how many further attempts will be made to establish the gardens if the corals die needs to be provided. Also, it is unclear how many coral heads would be acquired for use in the garden.

4.3.3 Public submissions

It was claimed in some submissions that the idea of coral gardens may not be feasible at this site. Further, no specific details are given regarding the source of corals, or how the gardens would be managed.

4.3.4 Response from the proponent

The proponent has stated that specific commitments regarding the construction, maintenance and on-going operation responsibilities for the coral garden would be subject to a detailed feasibility and design study which would be undertaken at a later date in consultation with CALM. However, no specific commitment to undertake this study is given by the proponent.

4.3.5 Evaluation

EPA notes that a coral garden idea is proposed to be established within the marina, however the garden is at a concept at this stage. The EPA considers that careful consideration needs to be given to detailed issues such as the source of corals for use within the coral garden. The EPA also considers that the maintenance of a high standard of water quality within the marina will be essential to ensure that this idea is successful.

The EPA recommends that the proponent provide to CALM and the EPA specific design and management details of the proposed coral garden within the marina which indicate that the environmental effects are acceptable, when details are known. This information should include where coral are proposed to be taken from, to colonise the garden.

4.4 Nutrient management

4.4.1 Objective

The Environmental Protection Authority's objective is to protect the marine and terrestrial environments from elevated nutrient levels which exceed sustainable limits.

4.4.2 Evaluation framework

Existing policy framework

Health Department of WA wastewater treatment standards

These standards identify acceptable treatment standards with which treated wastewater must comply with before it is permitted to be discharged.

National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

This document identifies acceptable standards for water discharge to ensure that accepted water quality standards are maintained for a number of uses, under a series of categories. These categories include the protection of aquatic ecosystems, recreational water quality, drinking water, agricultural water use and industrial water quality. In the context of this assessment the first two categories are relevant, ie. the protection of ecological values of aquatic ecosystems, and recreational water quality .

These standards would apply to water quality within the marina (recreational water quality), and near-shore marine environment (protection of ecological values of aquatic ecosystems) which may have been contaminated as a result of activities associated with the resort development.

Southern Metropolitan Coastal Waters Study (1991 - 1994) : Perth Western Australia (DEP, report in prep.)

This report presents the findings and recommendations of the Southern Metropolitan Coastal Waters Study, which was undertaken over the years between 1991 and 1994. The primary aims of the Study were to develop an understanding of the cumulative impacts and long-term environmental consequences of contaminant input to these waters, and to develop a comprehensive environmental management strategy for the southern metropolitan coastal waters of Perth. Environmental Water Quality Objectives (EQO's) were identified as part of this Study by the EPA and DEP.

While this Study was undertaken for the Perth metropolitan coastal waters, the EQO's identified as part of the Study are considered to be equally applicable to the coastal waters in the vicinity of Mauds Landing. In summary, these objectives have been identified as follows :

- biodiversity values should be protected;
- the maintenance of the ecological integrity of the coastal waters should be protected in terms of ecosystem structure and function. Three levels or classes of protection have been described in the context of this objective, ie. Class 1 'Conservation Zone' (maximum protection); Class 2 'Multiple Use Zone' (high level of protection); and Class 3 'Industrial Buffer Zone' (moderate level of protection);
- protection of recreation values; and
- protection of aesthetic values of the marine environment.

Technical information

Review of Sewage disposal at Coral Bay (Bradley and Latto 1995 - unpublished report to the EPA)

This report was prepared for the EPA by officers of the DEP in response to a number of concerns raised by some EPA members regarding the current management of sewage at Coral

Bay townsite following a visit to the site in August 1995. The report describes in detail the existing sewage treatment and disposal systems at Coral Bay, including introductory background information regarding the townsite and management of development to date.

Survey of water quality, groundwater, sediments and benthic habitats at Coral Bay, Ningaloo Reef, Western Australia (DEP, 1995)

This report was prepared by the DEP for the Department of Conservation and Land Management. The report was prepared in response to the perceived decline in water quality in the marine environment adjacent to the town of Coral Bay. Sewage leachate originating from sewage treatment lagoons via groundwater seepage was thought to contribute to this water quality problem. An analysis of water quality, including nutrient concentrations and heavy metal contamination was undertaken to examine these issues in greater detail.

Results obtained in this survey indicate the presence of elevated concentrations of inorganic nitrogen and faecal coliforms in the groundwater along the shoreline of Coral Bay. The report recommends that an alternative sewage disposal system to the current leach drain system currently operating should be implemented as soon as practicable. This alternative disposal system should prevent contaminants from domestic waste disposal entering the adjacent marine environment. The report also recommends that a comprehensive baseline study of contaminants be undertaken by the proponents of the proposed Coral Coast Marina, prior to the construction of the proposed marina at Mauds Landing.

PER Appendix E 'Report on the chemical and physical properties of soils from Mauds Landing, Coral Bay and Cardabia'

This appendix describes work undertaken on behalf of the proponent by R. C. Jeffery (Principal Research Scientist, Agricultural Chemistry Laboratory) on the chemical and physical properties of soils in the vicinity of the Coral Coast marina development site. The report concludes that :

- salt would be readily leached from reclaimed soils because the proportion of coarse plus fine sand exceeds 95%;
- reclaimed soils may be suitable for direct establishment of turf, eg. saltene couch, and may not need topdressing or additional nutrient input;
- saltene couch is not suitable for golf course greens, and a selection of suitable moderately salt tolerant species of grass would need to be considered for use on the golf course greens;
- there may need to be 'regular flushing events' to prevent excessive salt accumulation in the root zone at the proposed golf course as a result of applications of irrigation water;
- soils would need to be imported for golf greens construction; and
- the development of an irrigation strategy for the golf course needs to be given consideration.

Comments from key Government agencies

Existing situation at Coral Bay

CALM, National Parks and Nature Conservation Authority (NPNCA), Gascoyne Development Commission (GDC), Ministry for Planning, Shire of Carnarvon and the WAWA advise that there is already an existing nutrient management problem emanating from the Coral Bay townsite as a result of inappropriately managed septage waste disposal. CALM believe it should be a condition of development that the proposed sewage and effluent plant proposed as part of the Coral Coast Resort be capable of accepting and treating the sewage from the Coral Bay settlement. DEP acknowledges the existing problem at Coral Bay, and advises that this is considered to be a separate issue which requires fixing as soon as possible. The Coral Coast Resort proposal is viewed as an opportunity to resolve this problem, but problems at Coral Bay should not be used as a justification.

DEP advises that the existing treatment of sewage waste at the Coral Bay townsite is unacceptable. Leachate from unlined sewage ponds have had an effect on water quality in the near-shore marine environment in this locality.

Future management following development of Coral Coast Resort

CALM suggest that the commitment for a Nutrient and Irrigation Plan (NIMP) should include a low water approach to gardens, and indicate how it will be implemented. Government Chemistry Centre has advised that they should be involved in the preparation and implementation of the NIMP.

DEP advises that a wastewater treatment plant would require a licence under Part V of the Environmental Protection Act.

4.4.3 Public submissions

Several submissions made specific reference to the existing unacceptable sewerage treatment situation at Coral Bay. The view was expressed that a development at Mauds Landing should only be allowed to proceed if there is a firm assurance that the existing Coral Bay community would be connected to headworks proposed as part of the Coral Coast Resort development.

4.4.4 Response from proponent

Existing situation

The proponent acknowledges the problem currently experienced at Coral Bay and advises that the proposed wastewater treatment facility described within the PER as part of the Coral Coast Resort will be capable of treating effluent from the Coral Bay townsite in addition to waste from the proposed resort. However the proponent has reiterated that Coral Coast will not be responsible for the connection of the townsite to the new services.

Future management following development of Coral Coast Resort

The proponent has undertaken the following commitments:

- construct a wastewater treatment plant which would have the capacity to treat all effluent from the proposed resort, and effluent from Coral Bay (see Commitment 2, Appendix 6);
- design stormwater handling and disposal facilities so as to direct stormwater away from the marina and marine environment as far as practical (see Commitment 3, Appendix 6). It is considered by the proponent that run-off from most rainfall events will be managed so that all water will be directed away from the marina, with the majority directed inland to the low lying area to the east;
- prepare a 'Nutrient and Irrigation Management Plan' (NIMP) (see Commitment 36, Appendix 6); and
- educate residents about nutrient management and control (see Commitment 42, Appendix 6).

4.4.5 Evaluation

Existing situation

The EPA acknowledges the existing nutrient management problem at the Coral Bay townsite. The EPA considers that this problem needs to be resolved as a matter of urgency, and has advised the Minister for the Environment of this concern.

A report to the EPA which describes the existing sewage management at the town of Coral Bay has been prepared by officers of the DEP (Bradley and Latto, 1995). A survey of water quality, groundwater, sediments and benthic habitats at Coral Bay has also been undertaken by the DEP (DEP, 1995) for CALM. Results obtained in this survey indicate the presence of elevated concentrations of inorganic nitrogen and faecal coliforms in the groundwater along the shoreline of Coral Bay. The report recommends that an alternative sewage disposal system to the current leach drain system currently operating should be implemented at Coral Bay as soon as practicable. This alternative disposal system should prevent contaminants from domestic waste disposal entering the adjacent marine environment.

The issue of long term management of sewage disposal at Coral Bay is currently being addressed by the DEP, outside the context of this assessment report.

The DEP report also recommends that a comprehensive baseline study of contaminants be undertaken by the proponents of the proposed Coral Coast Marina, prior to the construction of the proposed marina at Mauds Landing. This issue is discussed further in Section 4.10.5 of this assessment report.

Future management following development of Coral Coast Resort

The EPA considers it essential that potential nutrient export from the development site is well controlled and managed so there is no adverse impact on the adjacent environment, particularly in view of the sensitive nature of the adjacent marine and terrestrial environments.

The EPA considers that the proposed development has the potential to significantly increase nutrient levels in the adjacent marine and terrestrial environments. The EPA endorses the preparation and implementation of the NIMP by the proponent to ensure that nutrient input is monitored and managed on the development site. The NIMP should include in the irrigation design flushing to prevent excessive salt accumulation in the grass root zone in the golf greens. The EPA also expects that the EQO's which have been identified for the 'Southern Metropolitan Coastal Waters Study for Perth, Western Australia' (DEP, 1995 unpublished draft report) would be applied by the proponent in the context of the NIMP to ensure that the following objectives are met for the nearshore marine waters:

- protection of biodiversity values;
- protection of the maintenance of the ecological integrity of the coastal waters;
- protection of recreation values; and
- protection of aesthetic values of the marine environment.

The EPA notes that a wastewater treatment plant is proposed to be constructed. This plant would be required to be constructed in accordance with requirements of Part V of the Environmental Protection Act.

The EPA also notes that a NIMP is to be prepared, to ensure nutrient input associated with the resort development is managed and controlled. The EPA concludes that these commitments are satisfactory, and that nutrient management issues associated with the proposed development can be adequately addressed.

4.5 Groundwater quality management

4.5.1 Objective

The Environmental Protection Authority's objective is to protect and maintain acceptable groundwater quality, to satisfy the beneficial uses for direct contact recreation, the protection of aquatic ecosystems, and phreatophytic vegetation.

4.5.2 Evaluation framework

Existing policy framework

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

This document identifies acceptable standards for water discharge to ensure that accepted water quality standards are maintained for a number of uses, under a series of categories. These categories include the protection of aquatic ecosystems, recreational water quality, drinking water, agricultural water use and industrial water quality. In the context of this assessment the

first two categories are relevant, i.e.. the protection of ecological values of aquatic ecosystems, and recreational water quality .

These standards would apply to water quality within the marina (recreational water quality), and near-shore marine environment (protection of ecological values of aquatic ecosystems) which may have been contaminated as a result of activities associated with the resort development. The standards of groundwater quality discharge into the marina and adjacent marine environment is likely to have a significant impact on water quality standards.

Guidelines for Groundwater Monitoring at Municipal Landfill sites (DOME, 1993)

These guidelines specify acceptable limits for groundwater nutrient and contamination levels under landfill sites. These levels are required to be regularly monitored at strategically located bores to ensure leachate emanating from the site is not contaminating groundwater.

Technical information

PER Appendix C 'Evaluation of Groundwater conditions near Mauds Landing'.

This appendix describes work undertaken by 'Rockwater' (Groundwater Consultants) on behalf of the proponent, and provides an evaluation of groundwater conditions near Mauds Landing. It concludes that water supplies for the proposed marina and land development near Mauds Landing will be available from the Birdrong Formation aquifer at a depth of about 800 metres. Water salinity will be about 5,3000 mg/L TSS, and desalination would be required to obtain fresh water for domestic use.

Comments from key Government agencies

The potential groundwater contamination as a result of the proposed development, and the need for adequate monitoring and remedial action when required, was raised by Fisheries Department, Department of Minerals and Energy and the WAWA.

The Department of Minerals and Energy also suggested that in addition to the parameters identified in the shallow groundwater and water quality monitoring programmes, regular monitoring should also be undertaken of water quality at the marina outflow, and the hydraulic head and groundwater quality in the Birdrong Sandstone.

4.5.3 Public submissions

It was suggested that the consultant's report on groundwater states that nutrients and other contaminants that might be produced by urban development will tend to flow towards the coastline and marina. The impact of such a flow on the marine environment is not addressed and should be included.

Concern was also expressed that the proposed groundwater monitoring includes no contingency plans in the event that groundwater contamination is discovered. Further, no baseline studies have been undertaken or are proposed to be undertaken to compare future monitoring results. It was suggested that at least 2 years baseline data is required before borefields become operational. Several monitoring bores should be established prior to any ground disturbing activities, which should be sampled for a suite of parameters that require monitoring once the project is established. The bores should be located in areas that are not disturbed by project construction and are representative of groundwater conditions.

It was suggested that acceptable levels for the parameters to be measured in the bores in the Shallow Groundwater Monitoring Programme should be set after the baseline data have been collected. These levels should be determined by the Water Authority of WA and the Department of Environmental Protection and the proponent should be committed to remedial action when necessary.

4.5.4 Response from proponent

Proponent has undertaken commitments to :

- prepare a 'Shallow Groundwater Monitoring Programme'(see Commitment 37, Appendix 6). This Plan would include the installation of shallow groundwater monitoring bores, the collection of baseline data, quarterly measurement of groundwater quality within the bores, the establishment of scientific criteria for environmental performance, and contingency responses in the event of exceedence; and
- apply for appropriate licences and abstract and monitor groundwater in accordance with the requirements of the WAWA (see Commitment 32, Appendix 6).

4.5.5 Evaluation

EPA notes that land use activities associated with the proposed development has the potential to contaminate groundwater. This includes the land fill site, waste water treatment plant, and nutrient applications. The pollution of groundwater supplies has implications on water quality within the marina and near-shore marine environment.

The EPA notes that the proponent has committed to prepare a Shallow Groundwater Monitoring Programme, to monitor groundwater flowing beneath the development site. This Plan is proposed to be formulated by the proponent in conjunction with the DEP to the satisfaction of the Water Authority of Western Australia.

The EPA believes that in order for the potential impacts on groundwater to be accurately determined, baseline monitoring should be undertaken as early as possible prior to the development commencing. This should be designed to provide data for the site, and especially those portions which have the potential to contaminate the groundwater. The EPA also considers that the Geological Survey Division of the Department of Minerals and Energy should be involved in the preparation and review of the Plan, in view of this Department's expertise in this area. Further, the EPA considers that as part of the Plan, the proponent should specify clearly remedial action which would be undertaken in the event that on-going monitoring indicates an unacceptable impact on groundwater quality.

Accordingly, the EPA recommends that the Shallow Groundwater Monitoring Programme is environmentally acceptable provided that :

- **the Plan is prepared and undertaken to the satisfaction of the EPA on advice from the WAWA, and Geological Survey Division of the Department of Minerals and Energy;**
- **the proponent undertake groundwater monitoring prior to development occurring; and**
- **the proponent specify remedial action which would be undertaken in the event that groundwater monitoring indicates unacceptable levels of contamination, to the satisfaction of the EPA and the WAWA.**

4.6 Impact on marine flora and fauna

4.6.1 Objective

The Environmental Protection Authority's objectives are to :

- protect marine mammals from direct and indirect environmental impacts; and
- protect and preserve fish species (including recreational and commercial fish species);

4.6.2 Evaluation framework

Existing policy framework

Ningaloo Marine Park Management Plan 1989 - 1999'. Management Plan No. 12, Department of Conservation and Land Management.

This management plan was prepared and adopted in 1989 by the Department of Conservation and Land Management (CALM) to provide a background understanding of the physical attributes of the Park; to define principles and objectives for the on-going management of the Park; and to provide management strategies to achieve these objectives. The Plan was is due to be reviewed in the near future.

Government Position Paper - New Horizons in Marine Management (1994)

This document explains the Western Australian State Government's policies for marine management in WA. It specifically refers to the creation of new marine conservation reserves, the need to manage these, and the proposed new Marine Parks Authority, and need for a balanced approach for conservation of the marine environment while encouraging commercial activities. The policy of no drilling for oil in Ningaloo Marine Park is stated in this document.

Conservation Through Reserves for WA - System 9 (EPA 1975)

EPA's System 9 recommendation 9.3 relates to the 'Ningaloo Reef Tract'. This recommendation was made in 1975, and consists of 6 parts. Those parts of the recommendation which relate to the proposed development site include the recommendation to create the Ningaloo Marine Park, which was subsequently gazetted under State legislation in 1987; and a recommendation that '*no proposal to develop any part of the coastal areas up to 2 km inland from high water mark lying within the boundaries of the Ningaloo, Cardibia, and Warroora pastoral leases be approved without the concurrence of the National Parks Board and the Director of Fisheries and Wildlife*'. The National Parks and Nature Conservation Authority (NPNCA) and the Fisheries Department of WA have provided submissions on this development proposal.

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

This document identifies acceptable standards for water discharge to ensure that accepted water quality standards are maintained for a number of uses, under a series of categories. These categories include the protection of aquatic ecosystems, recreational water quality, drinking water, agricultural water use and industrial water quality. In the context of this assessment the first two categories are relevant, i.e., the protection of ecological values of aquatic ecosystems, and recreational water quality .

These standards would apply to water quality within the marina (recreational water quality), and near-shore marine environment (protection of ecological values of aquatic ecosystems) which may have been contaminated as a result of activities associated with the resort development. .

Technical information

Survey of water quality, groundwater, sediments and benthic habitats at Coral Bay, Ningaloo Reef, Western Australia (DEP, 1995)

This report was prepared by the DEP for the Department of Conservation and Land Management. The report was prepared in response to the perceived decline in water quality in the marine environment adjacent to the town of Coral Bay. Sewage leachate originating from sewage treatment lagoons via groundwater seepage was thought to contribute to this water quality problem. An analysis of water quality, including nutrient concentrations and heavy metal contamination was undertaken to examine these issues in greater detail.

Results obtained in this survey indicate the presence of elevated concentrations of inorganic nitrogen and faecal coliforms in the groundwater along the shoreline of Coral Bay. The report recommends that an alternative sewage disposal system to the current leach drain system currently operating should be implemented as soon as practicable. This alternative disposal system should prevent contaminants from domestic waste disposal entering the adjacent marine environment. The report also recommends that a comprehensive baseline study of contaminants be undertaken by the proponents of the proposed Coral Coast Marina, prior to the construction of the proposed marina at Mauds Landing.

Comments from key Government agencies

Commonwealth EPA (CEPA) raised the issue of protection of marine animals. It was considered that the potential impacts of the development, including future recreation usage on the following species, needs to be more thoroughly investigated :

Loggerhead Turtle (*Caretta caretta*) - listed as an endangered species and protected under the *Endangered Species Protection Act 1992* ;

Green Turtle (*Chelonia mydas*) - listed as vulnerable and protected under the *Endangered Species Protection Act 1992* ;

Leathery Turtle (*Dermochelys coriacea*) - listed as vulnerable and protected under the *Endangered Species Protection Act 1992* ;

Hawksbill Turtle (*Eretmochelys imbricata*) - listed as vulnerable and protected under the *Endangered Species Protection Act 1992* ; and

Humpback Whale (*Megaptera novaengliae*) - listed as endangered and protected under the *Endangered Species Protection Act 1992* .

CEPA also claims that the PER does not make reference to the Convention on the 'Conservation of Migratory Species of Wild Animals' (Bonn Convention). The Dugong (*Dugon dugon*) and four species of turtle mentioned above are listed under this convention.

CALM advises that as visitor numbers increase, the potential for over-exploitation of fish stocks will occur. A commitment should therefore be given by the proponent to provide the means to help to control, manage and rectify this problem, and indicate how this will be achieved.

The Fisheries Department has indicated that it will require extra resources and accompanying funds in addition to the office space offered in the PER document. There will also be a need to check compliance with catch regulations and to carry out research to gain an indication of the impact of the resort on fish species and fish habitats. This would allow the Department to make alterations in catch regulations and fishing practices considered necessary for the maintenance of a satisfactory level of fish stocks in the area and to detect any deleterious changes to nearby reefs.

4.6.3 Public submissions

It was suggested that the results of marine faunal studies included within the PER indicate that effects on dugong and turtles, which frequent the area, are inadequately addressed and understated. Concern was expressed that increased boating activity on the area will result in increasing incidences of turtle and dugong strike. Noise associated with increased boating activity may also drive away marine fauna such as turtle, dugong and manta rays.

It was suggested that lights originating from navigation aids, the resort development, and boats moored within 1.5 kilometres of the shore, will disturb and disorient turtles, particularly hatchlings. This has implications on local turtle nesting behaviour. This impact has been documented at turtle nesting sites elsewhere in Australia. Concern was expressed that baseline study of marine fauna described in the PER document is considered to be inadequate. Baseline data needs to be accumulated over a period of time, to ascertain appropriate indicator species of benthic fauna. Monitoring of these identified species then needs to be continued over time as the project proceeds. This method is considered to more accurately reflect the ongoing quality of the water.

Concern was also expressed that the proposed development may have an adverse impact on seagrass meadows (*Posidonia coriacea* and *Halophilia ovalis*) in Bateman Bay through polluted surface run-off, nutrient enriched groundwater flows, anchor and propeller damage. Further research is needed to determine the extent of the seagrass meadows before any development which has the potential to impact on it can occur, so accurate monitoring of any impacts can take place. It was stressed that seagrass cannot be regrown once removed from a location. Any damage to seagrass meadows could have implications for the marine faunal population over a much wider area.

4.6.4 Response from proponent

In response to the concerns raised in the submissions, the proponent has undertaken additional commitments to :

- prepare and implement a Turtle Management and Turtle Nesting Surveillance Programme which includes management of the effects of lights (see Commitment 44, Appendix 6) and will educate Park users at the proposed Visitors Centre. Further details of this Programme are included in Appendix 6; and
- prepare and implement a Coral Community Monitoring Programme (see Commitment 9, Appendix 6).

The proponent has also undertaken to provide office space to serve as a 'Visitor and Research Centre' within the resort development for use by CALM and Fisheries Department staff (see Commitment 50, Appendix 6). Revenue generated through use of this centre would be used to fund on-going research and monitor long term impacts on marine flora and fauna.

The proponent considers that the incidences of boat strike on dugongs and turtles would be minimal due to the relatively small number of dugongs and turtles which occur in the vicinity of the proposed development. However, the proponent has acknowledged these concerns and has undertaken to co-operate with CALM to implement boating activities, with an aim of minimising impacts.

In relation to potential impact on seagrass communities, the proponent points out that the nearest patches of seagrass to the proposed development occur approximately 4 kilometres north - east of the development area, and is therefore unlikely to have a direct impact on seagrass communities. Indirect impacts are proposed to be managed via the implementation of the NIMP and the Shallow Groundwater Management Plan.

4.6.5 Evaluation

The EPA considers that the construction and on-going use of the resort development by permanent residents and tourists has the potential to impact on marine flora and fauna. The presence of protected marine mammals and turtles in the marine environment is considered to be especially important. The EPA is of the view that any potential impacts need to be carefully managed to ensure that there is no adverse impact on these species.

The EPA notes the information provided by the proponent in the PER and response to issues raised in public submissions, and the proponents comments and commitments in relation to the management of potential environmental impacts on marine flora, including seagrass communities, and fauna.

The EPA notes and endorses the proponent's additional commitment to prepare and implement a Coral Community Monitoring Programme, which has been undertaken in response to concerns raised in public submissions. This Programme would include an initial baseline survey of coral communities at identified monitoring sites prior to commencement of construction of the marina, in consultation with CALM, however it does not include a commitment to undertake remedial action in the event that an adverse impact on the coral community is detected as a result of on-going monitoring. This issue is discussed further in Section 4.10.5 of this assessment report.

The EPA also notes and endorses the proponent's additional commitment to undertake turtle management and a 'Turtle Nesting Surveillance Programme'. This programme is proposed to take into consideration details such as the control of lighting within the proposed Resort so as to reduce any impacts on nesting turtles or hatchling turtles, and to rescue any disoriented turtles.

The EPA also notes the commitment to provide a Visitors Centre, which is expected to generate revenue for on-going research by CALM and the Fisheries Department.

The EPA considers that this proposal will lead to a substantial increase in pressure on the Ningaloo Marine Park, and lead to higher levels of management requirements by State Government agencies with statutory management

responsibilities. The EPA considers that it is particularly important that the proponent guarantee a minimum level of funds and resources to ensure that an adequate level of management of the adjacent marine environment by CALM and the Fisheries Department is maintained, at no additional expense to the State Government.

The EPA's requirements for the on-going monitoring and management of marine flora and fauna is specified in more detail in Section 4.10.5.

4.7 Impact on terrestrial flora and fauna

4.7.1 Objective

The Environmental Protection Authority's objectives are to :

- protect subterranean fauna from adverse environmental impacts;
- protect terrestrial fauna from adverse environmental impacts; and
- protect terrestrial flora from adverse environmental impacts.

4.7.2 Evaluation framework

Existing policy framework

Ningaloo Marine Park Management Plan 1989 - 1999'. Management Plan No. 12, Department of Conservation and Land Management.

This management plan was prepared and adopted in 1989 by the Department of Conservation and Land Management (CALM) to provide a background understanding of the physical attributes of the Park; to define principles and objectives for the on-going management of the Park; and to provide management strategies to achieve these objectives. The Plan was is due to be reviewed in the near future.

Conservation Through Reserves for WA - System 9 (EPA 1975)

EPA's System 9 recommendation 9.3 relates to the 'Ningaloo Reef Tract'. This recommendation was made in 1975, and consists of 6 parts. Those parts of the recommendation which relate to the proposed development site include the recommendation to create the Ningaloo Marine Park, which was subsequently gazetted under State legislation in 1987; and a recommendation that *'no proposal to develop any part of the coastal areas up to 2 km inland from high water mark lying within the boundaries of the Ningaloo, Cardabia, and Warroora pastoral leases be approved without the concurrence of the National Parks Board and the Director of Fisheries and Wildlife'*. The National Parks and Nature Conservation Authority (NPNCA) and the Fisheries Department of WA have provided submissions on this development proposal.

Technical information

PER Appendix H 'A flora and vegetation survey and assessment of conservation values for flora and vegetation in the area proposed for the Coral Coast Marina'.

This appendix was prepared on behalf of the proponent by Malcolm Trudgen in 1994. No declared rare flora were recorded, however some species recorded were considered to be possibly at risk, or for which the population within the Study Area has some particular significance. Two priority species were also recorded - *Acacia ryaniana* and *Eremophila glabra*. (Priority species are referred to as those species which CALM considers may need to be gazetted as declared rare flora after proper surveying, or which are not currently threatened but which require regular monitoring.)

PER Appendix I 'Coral Coast Marina project - vertebrate fauna and habitats assessment'.

This appendix was prepared on behalf of the proponent by 'Ecologia' Environmental Consultants in 1994. This was a 'desk top' study which documents the terrestrial vertebrate fauna and habitats within the proposed development site.

Three faunal habitats were identified, i.e.. samphire flats and associated salt lakes; sparsely vegetated beach front; and coastal heath/scrub. These were considered to be widely distributed on a regional scale. The report concluded that the project area is not expected to contain regional endemic species or locally restricted species of vertebrate fauna.

Fauna species, which are recognised as being rare, threatened with extinction, or as having high conservation value, which are protected under the Wildlife Conservation Act 1950, and which may be present within the project area have been identified as:

- Red tailed Tropicbird *Phaethon rubricauda*
- Grey Falcon *Falcon hypoleucos*
- Loggerhead Turtle *Caretta caretta*
- Peregrine Falcon *Falco peregrinus*

Species which are protected by the ANZECC agreement that potentially occur within the project area have been identified as:

- Loggerhead Turtle *Caretta caretta*
- Green Turtle *Chelonia mydas*
- Hawksbill Turtle *Eretmochelys imbricata*

A number of transequatorial migrant waterbird species which may visit the project area were also identified, and which are protected by the China and Australia Migratory Bird Agreement.

Advice from the Western Australian Museum

Advice from Dr Bill Humphreys (WA Museum) regarding the possible presence of subterranean fauna

Comments from key Government agencies

The GDC and WA Museum advise there is inadequate information presented on potential impact on subterranean fauna, for example through groundwater draw-down as a result of marina construction, and through nutrient and chemical contamination of groundwater. It was considered that the proponents need to establish whether a significant stygofauna inhabits the area as its presence may 'dictate acceptable procedures for development', i.e. whether or not the marina should be dredged under wet or dry conditions, and will also have an influence on the proposed Shallow Groundwater Monitoring Programme (SGMP).

The GDC and CEPA raise the point that the terrestrial faunal survey presented in PER is inadequate. Clarification as to the distribution of two priority 2 flora species (taxa which are known from one or a few populations, at least some of which are not believed to be under immediate threat, i.e. not currently endangered, but are in urgent need of further survey) and 5 other species identified as significant is sought and confirmation sought as to whether they occur elsewhere.

4.7.3 Public submissions

Concern was expressed that terrestrial fauna and habitats research as document in the PER was considered to be inadequate as no field surveys of fauna were undertaken as part of the PER research required by the EPA and no reference was made to WA Museum records. Accurate research cannot be based purely on old records.

It was also considered that the vegetation and flora survey was inadequate as the survey was undertaken during the dry part of the year, following a dry season. Further investigation should be undertaken to determine the extent of the two 'Priority 2' species recorded (PER Section 4.2.1.2) at the site prior to any development.

Concern was also expressed that the cumulative impact on samphire flats has not been addressed. Although these are widely distributed between Carnarvon and Onslow, if none of them are included within conservation areas, incremental damage (through resort development and pastoral activities) may impact seriously on the conservation values of these areas.

It was claimed that the botanical survey presented in the PER states that the saline flats at Mauds Landing have significant conservation value for vegetation. It was considered that the plan for development does not adequately take into account these values, particularly the proposed golf course.

4.7.4 Response from proponent

The proponent believes that stygofauna is unlikely to be present on site due to local geological features, and salinity of groundwater.

In relation to the terrestrial fauna, the proponent acknowledges that no on-site field surveys were undertaken. However, a review of relevant reports, consideration of habitat types and discussion with officers of CALM and the Royal Australasian Ornithologists Union was considered to be adequate.

It is considered that an adequate terrestrial flora survey has already been undertaken as part of the PER preparation and that no further work on this issue is required.

4.7.5 Evaluation

The EPA considers that the construction and on-going use of the resort development by permanent residents and tourists has the potential to impact on terrestrial flora and fauna, including subterranean stygofauna. The EPA is of the view that any potential impacts need to be carefully managed to ensure that there is no adverse impact on these species.

The EPA notes the information provided by the proponent in the PER and response to issues raised in public submissions, and the proponents commitments in relation to terrestrial flora and fauna.

In view of the concern expressed regarding the potential impact of the proposed development on stygofauna, additional advice from the WA Museum has been received following receipt of the proponent's response on the issue of stygofauna. This additional advice indicates that the potential impact on stygofauna has still not been adequately addressed by the proponent, as there has been inadequate research in the development area for stygofauna. In view of this advice, the EPA considers that additional work is required to be undertaken by the proponent to ensure that any adverse impacts are minimised.

The EPA recommends that the proponent liaise further with officers of the Western Australian Museum prior to the construction phase of the development, to identify methods which would be adopted to determine whether subterranean stygofauna are present at the site. If fauna is located at the site through these mechanisms or through development, measures should be undertaken to the satisfaction of the EPA, on advice from the WA Museum, to minimise any adverse impacts.

The EPA also notes the concerns raised by members of the public regarding the inadequacy of the terrestrial fauna survey, and the cumulative impact of the proposed development on samphire flats, in a regional context. The EPA has considered the proponent's response to these concerns and has concluded that further research by the proponent in relation to these issues is not warranted.

However, the EPA has concerns regarding level of detail of the terrestrial flora and vegetation survey. The EPA is particularly concerned that uncertainty remains regarding the distribution of two priority 2 flora species and other flora species which have been identified within the PER document as significant. The EPA considers that this issue has not been adequately addressed by the proponent, and that it requires additional research.

The EPA recommends that the proponent confirm whether 'Priority 2' flora species and other significant flora species identified on site are represented in the vicinity of the proposed development site, to the satisfaction of the EPA with advice from CALM, prior to construction of the resort development commencing.

4.8 Impact on littoral drift

4.8.1 Objective

The Environmental Protection Authority's objective is to ensure that the development, including the proposed breakwaters, do not have a significant impact on existing coastal processes.

4.8.2 Evaluation framework

Technical information

PER Appendix G 'Mauds Landing Coastal Engineering Study'

This appendix was prepared by M P Rogers and Associates Pty Ltd and describes the meteorology and oceanography in the vicinity of the development area, including a description of the effects of tropical cyclones and storm surge, the current regime, and wave climate; water quality and anticipated flushing mechanisms and rates within the proposed marina water body to maintain acceptable water quality standards; an assessment of proposed building levels within the Resort, which takes into consideration tides, storm surge, climatic change (including Greenhouse Effect) and wave run-up; coastal processes and shoreline stability along the adjacent coast; and an assessment of the marine structures such as breakwaters and edge walling, which would be required if the development were to proceed.

Comments from key Government agencies

CALM advises that there should be a commitment to rectify any adverse situation revealed by proposed shoreline monitoring, which result from the marina development and associated breakwater structures.

The GDC and Department of Transport consider the proposed monitoring programme is inadequate. Statements made within the PER in relation to coastal processes are based on a two year analysis. This is not considered sufficient, especially when aerial photographic records are known to exist for the last 45 years (i.e. since 1949). There may be long term shoreline change trends which have not been detected, and could be affected by the breakwater structures. Recent research by the University of WA in the Exmouth region has highlighted variations in currents, sediment transport and shoreline change between bays on the west coast.

The DEP advises that the proposed breakwaters (in excess of 300 metres long) may impact on coastal sediment dynamics and that a detailed and effective monitoring and management programme is required to ensure no long term impact on the coast. The Ningaloo Marine Park boundary extends to 40 metres above high water mark.

4.8.3 Public submissions

It was claimed that the proposed breakwaters are likely to have a significant impact on sand movement along the coast. Previous experience elsewhere along the Australian coast of similar scale of breakwaters has resulted in expensive beach maintenance programmes to maintain beach renourishment programmes. This is a sandy coast, and construction of three rock groynes, the longest approximately 400 metres long, is likely to lead to costly sand bypass operations being required. Implications of the breakwater construction on sand movements have not been researched properly in the PER.

It was considered that further information regarding the prediction of the effects of tropical cyclones is required. Statements included within the PER document are considered to be too general. It was also claimed that the proposed beach renourishment plan described in the PER document ignores that fact that the Ningaloo Marine Park boundary extends to 40 metres above high water mark. Sediment disturbance as a result of beach renourishment programmes are likely to have a detrimental impact on the Marine Park.

4.8.4 Response from proponent

The CCMD has undertaken a commitment to prepare and implement a 'Shoreline Movement Monitoring Plan' (see Commitment 38, Appendix 6). This Plan is proposed to monitor coastal dynamics and sediment accumulation north and south of the marina entrance, and to undertake remedial action if considered necessary.

4.8.5 Evaluation

The EPA notes that a breakwater extending over a distance of 300 metres off-shore is proposed to be constructed as part of the marina entrance. Plans for the marina breakwaters indicate that they will be constructed at least 1 kilometre from the closest point of the Ningaloo Reef.

The EPA considers that the marina breakwater structures have the potential to interrupt local coastal processes, which may result in the accretion of sand along one side of the breakwater, and / or the erosion of sand along the beach foreshore.

In order to monitor the beach profile in the vicinity of the marina entrance, the EPA notes the proponent has undertaken a commitment to formulate and implement a Shoreline Movement Monitoring Plan. This Plan is proposed to survey the beaches for 2 kilometres on each side of the breakwaters, and the bathymetry of the marina entrance channel, for three years following development of the marina, to the satisfaction of CALM and the Department of Transport. Survey profile intervals will be to the satisfaction of the regulatory authorities. The proponent has also undertaken to move accumulations of sand, i.e. by-pass the sand, using conventional earth moving equipment if considered to be necessary.

The EPA acknowledges this commitment, however it considers that the monitoring plan should be continued for a minimum of five years following construction of the marina and associated breakwater structures. Following this five year period, the EPA considers that it would be appropriate to review the results obtained over the past five years, to determine whether further monitoring is required, and subsequent remedial action if considered necessary is warranted.

The EPA recommends that the Shoreline Movement Monitoring Plan be continued for a period of five years following development, with a review of monitoring results by the EPA, on advice from the Department of Transport and CALM, after the first 5 year period following construction to determine whether further monitoring and subsequent remedial action is warranted.

The EPA is aware that the Ningaloo Marine Park boundary extends to 40 metres above high water mark, and that the primary dune system is extremely vulnerable to erosion, especially if disturbed. In view of this concern, the EPA considers that any remedial works which may be undertaken as a result of sand build up adjacent to the breakwaters should be undertaken carefully to avoid damage to the dune forms.

The EPA recommends that if, as a result of monitoring, a significant build up of sand occurs at one side of the breakwaters, or alternatively beach erosion is occurring as a result of the breakwater construction, the proponent should be required to implement remedial works. These details and extent of works should be undertaken to maintain the integrity of the dune forms, to the satisfaction of the EPA on advice from CALM, DOT and the DEP.

The EPA acknowledges that secure long term funding arrangements are required to ensure that on-going monitoring of the beaches north and south of the proposed marina development (and

remedial action if required) is undertaken after the initial five year period. This issue is addressed in further detail in Section 4.10.5 of this assessment report.

4.9 Impact on coastal dunes

4.9.1 Objective

The Environmental Protection Authority's objective is to retain the integrity of the foredune area.

4.9.2 Evaluation framework

Existing policy framework

WA Planning Commission Policy (formerly State Planning Commission) Policy No. DC 6.1 Country Coastal Planning Policy. Section 3.6 Land Preservation

This policy provides a guide to setbacks for developments and subdivisions proposed along the coast in view of the susceptibility of coastal landforms and wind, wave and water erosion. The setback gives consideration to public amenity, and protection of features of natural, scientific, visual and cultural significance. On sandy coasts, the minimum setback distance is recommended to be 100 metres, where landforms are stable. The line of permanent vegetation is used as the datum for setbacks.

Technical information

PER Appendix G 'Mauds Landing Coastal Engineering Study'

This appendix was prepared by M P Rogers and Associates Pty Ltd and describes the meteorology and oceanography in the vicinity of the development area, including a description of the effects of tropical cyclones and storm surge, the current regime, and wave climate; water quality and anticipated flushing mechanisms and rates within the proposed marina water body to maintain acceptable water quality standards; an assessment of proposed building levels within the Resort, which takes into consideration tides, storm surge, climatic change (including Greenhouse Effect) and wave run-up; coastal processes and shoreline stability along the adjacent coast; and an assessment of the marine structures such as breakwaters and edge walling, which would be required if the development were to proceed.

Comments from key Government agencies

Ministry for Planning advises that coastal dunes need to be carefully managed, to ensure they are not damaged by uncontrolled pedestrian access, or 4WD activity.

The DEP advises that the dune system is vulnerable, especially in an arid and windy environment. It advised that a golf course on the dunes is considered to be an inappropriate form of land use, and could contribute nutrient rich run-off into the near-shore marine environment.

4.9.3 Public submissions

It was suggested that all residential development needs to be adequately set back from the coast to avoid localised dune erosion. A dune stabilisation programme is also considered to be required for temporary and permanent disturbance to the dunes. Further details regarding a foreshore reserve and management plan need to be outlined as part of this programme.

It was considered that more information is needed to assess the possible impacts of developing terraced townhouses on existing dunes and villas on the inter-dunal swales, particularly in relation to dune stability and excavation methods.

Finally, the view was expressed that the proposed golf course on the dunes to the north of the marina entrance is an inappropriate form of land use for the foredune area. It was suggested that

this area should be retained within a foreshore reserve which excludes any form of development other than dual use paths to facilitate public access. Public access to this reserve should be retained and managed carefully through the implementation of a foreshore management plan, prepared in consultation with the Ministry for Planning.

4.9.4 Response from proponent

The proponent has undertaken to prepare:

- a Construction Management Plan (see Commitment 6, Appendix 6), which will identify and protect dune conservation areas during the construction phase of the resort development;
- a Foreshore Management Plan (see Commitment 8, Appendix 6) to ensure dunes are managed and to control public access to the beach; and
- dune protection works during construction of the marina (see Commitment 28 and 29, Appendix 6).

The proponent has also proposed to develop a 'links style' golf course, to reduce the area to be irrigated. It is understood that the links would be designed to reduce alteration of existing dune form. Any dune areas which are irrigated would be managed according to the proposed 'Nutrient and Irrigation Management Plan (see Commitment 36, Appendix 6). Further, all areas disturbed by construction activities, including dune areas, which are not proposed to be developed will be stabilised and revegetated (see Commitment 41, Appendix 6)

4.9.5 Evaluation

The EPA is aware that the dunes at Mauds Landing are extremely vulnerable to erosion as a result of the arid, exposed and windy location. Any disturbance to the dune forms, as a result of increased pedestrian or vehicle activity, through the construction of the proposed golf course, through disturbance as a result of earthmoving activities, or through loss of native vegetation cover has the potential to create significant erosion and consequent dune management problems. The proposed development includes golf 'links' on the dunes as part of an 18 hole golf course. Recreation facilities, a kiosk / cafe / changeroom facility and residential development is also proposed on and near the coastal dune areas. The construction of these facilities need to be carefully undertaken to limit alteration of and damage to the dune forms, and to control long term coastal management problems.

The EPA notes the proponent's commitments to undertake a Construction Management Plan and Foreshore Management Plan to reduce and control impacts on dunes during construction phase and following completion of development. These Plans will address issues such as control of vehicle access on the dunes during the construction, control of public access to the beach areas from the resort and associated residential development following construction, landform stabilisation and revegetation programmes, fire management procedures, the clear delineation and fencing off of sensitive areas, and appropriate signage for public education. This implementation of these Plans is endorsed by the EPA.

In view of the fragile and vulnerable nature of the coastal dunes, the EPA is expects that the golf course is managed so that use of the golf course does not create dune erosion problems.

The EPA recommends that the proponent should be required to remove links from dune area if on-going monitoring as part of the Foreshore Management Plan indicates an unacceptable impact on dunes.

4.10 Long term management issues

4.10.1 Objective

The Environmental Protection Authority's objective is to ensure protection and adequate management of the environmental values of the marine and terrestrial environment in the long term.

4.10.2 Evaluation framework

Existing policy framework

'Ningaloo Marine Park Management Plan 1989 - 1999'. Management Plan No. 12, Department of Conservation and Land Management.

This management plan was prepared and adopted in 1989 by the Department of Conservation and Land Management (CALM) to provide a background understanding of the physical attributes of the Park; to define principles and objectives for the on-going management of the Park; and to provide management strategies to achieve these objectives. The Plan was is due to be reviewed in the near future.

'A Representative Marine Reserve System for Western Australia'. Report of the Marine Parks and Reserves Selection Working group, CALM.

This report was prepared by the Marine Parks and Reserves Selection Group for the Minister for the Environment in 1994, and was published on behalf of the Working Group by CALM. The Report makes recommendations for the creation of a representative system of marine reserves along the WA coastline. The document makes reference to the existing Ningaloo Marine Park, and defines the Park boundaries.

Government Position Paper - New Horizons in Marine Management (1994)

This document explains the Western Australian State Government's policies for marine management in WA. It specifically refers to the creation of new marine conservation reserves, the need to manage these, and the proposed new Marine Parks Authority, and need for a balanced approach for conservation of the marine environment while encouraging commercial activities. The policy of no drilling for oil in Ningaloo Marine Park is stated in this document.

Conservation Through Reserves for WA - System 9 (EPA 1975)

EPA's System 9 recommendation 9.3 relates to the 'Ningaloo Reef Tract'. This recommendation was made in 1975, and consists of 6 parts. Those parts of the recommendation which relate to the proposed development site include the recommendation to create the Ningaloo Marine Park, which was subsequently gazetted under State legislation in 1987; and a recommendation that *'no proposal to develop any part of the coastal areas up to 2 km inland from high water mark lying within the boundaries of the Ningaloo, Cardibia, and Warroora pastoral leases be approved without the concurrence of the National Parks Board and the Director of Fisheries and Wildlife'*. The National Parks and Nature Conservation Authority (NPNCA) and the Fisheries Department of WA have provided submissions on this development proposal.

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

This document identifies acceptable standards for water discharge to ensure that the ecological values of aquatic ecosystems are protected. In the context of this assessment, these standards would apply to groundwater discharging into the marina and near-shore marine environment which may have been contaminated as a result of land use activities associated with the resort

Resource Assessment Commission - Coastal Zone Inquiry (1993)

This is a report prepared by the Resource Assessment Commission for the Commonwealth Government, pursuant to section 16 of the Resource Assessment Commission Act 1989. The

report details the findings of the Commission's inquiry into the management and use of resources of Australia's coastal zone. The report includes detailed conclusions and recommendations on the future use and management of the coastal zone throughout Australia.

Technical information

PER Section 6 'Operational Stage Environmental Impacts'

This section of the PER describes the anticipated effects of the proposed development on the terrestrial and marine environment in the 'operational phase' of the resort development.

Potential environmental impacts on the terrestrial environment have been identified as : discharge of stormwater effluent, solid waste disposal, potential emissions as a result of power generation, and land based recreation activities such as 4WD activity.

Potential environmental impacts on the marine environment have been identified as: the interruption of coastal processes, maintenance of marina water quality and impact on near shore marine water quality, impact on groundwater quality, and impacts of increased recreation on Ningaloo Marine Park through beach activities, boating, recreational fishing, diving and commercial tourist concessions.

PER Section 7 'Environmental Management and Monitoring'

This section of the PER describes the proposed environmental management and monitoring of issues identified in Section 6 of the PER. These issues have been acknowledged by the proponent as having the potential to impact on the terrestrial and marine environment in the operational phase of the development.

Comments from key Government agencies

CALM states that adequate rubbish bins and sewerage toilets should be provided in public areas around the marina; induction courses should be conducted about the environmental sensitivity of the area; and a commitment given to landscape areas disturbed by construction but not required for resort purposes. A commitment is also required to manage and control the substantial number of the potential impact of residents (over 900 blocks are planned for) on the environment, and define how this will be done, eg. 4WD vehicle management.

The DEP expressed concern that the developer cannot deliver management guarantees of areas adjacent to the development site because CCMD has no direct control outside of the development site. Concern was also expressed by the DEP that there is no realistic forecast of long term impacts and associated management of these impacts.

The Shire of Carnarvon is unsure of the details of the proposed 'Management Corporation' as described in the PER, or what role the Council will play in this Corporation.

The Main Roads Department raised the issue of coastal access. It was suggested that this would need to be managed and maintained north of the proposed development. PER Commitments 6 and 13 need to be modified to reflect the following : 'Allowance for existing coastal access between Coral Bay and Ningaloo will be maintained at the north eastern edge of the Coral Coast Resort development, in lieu of the Roads 2020 review of the need for further extension and rationalisation of coastal access in the area'.

4.10.3 Public submissions

A variety of management issues were raised within public submissions. These include issues such as the management of domestic animals, specifically dogs and cats, costs of providing staff or on-going maintenance costs, and residential landscaping. Concern was expressed that commitments to manage these issues in the PER are untenable and unenforceable. The issue of effective management of off-road vehicle activity along the beaches was raised, particularly inter-tidal areas. An integrated approach needs to be made with CALM, local pastoralists and the proponent to manage coastal land via joint agreements.

The suggestion was made that a detailed 'Public awareness' campaign is needed to educate the public on environmentally sensitive issue. This campaign needs to address issues such as

discouraging hand feeding of silver gulls. Consideration should be given to form a community association to protect the environment. This would reduce need for authoritative policing and administration.

It was also suggested that the proponent should discourage regular use of anchors, and support installation of fixed moorings within the marina.

It was claimed that the proponent has not undertaken an economic study to justify statements made within the PER regarding fees generated by the proposed visitor centre. Operating a marine programme to manage the potential impact of the significant increase in number of visitors as a result of the resort development will far exceed the willingness of visitors to pay for entry into the proposed interpretation centre.

The view was expressed that there needs to be a process established to complete development to ensure there are no long term adverse impacts on the environment through incomplete works. Further, details regarding the proposed 'Management Corporation' are unclear, i.e. which groups / bodies will be represented on the Corporation, what powers will it hold, and what happens after the designated 5 year period. Consideration should be given to extending the 5 year period to a 10 year period. Additional details are required regarding handover to local Government of aspects of the project such as sewerage, marina, and foreshore reserve management.

The suggestion was made that in relation to Commitment 26 that the proponent liaise with the Department of Conservation and Land Management and Greening Australia on the proposed tree planting programme for the development site.

4.10.4 Response from proponent

Specific and general long term management issues are proposed to be addressed via a number of management commitments. These include :

- drainage and nutrient management (see Commitment 3, Appendix 6);
- waste management (see Commitment 4 and 5, Appendix 6);
- foreshore management (see Commitment 8, Appendix 6);
- 'Coral Community Monitoring Programme' (see Commitment 9, Appendix 6);
- 'Emergency Response Plan' (see Commitment 25, Appendix 6);
- 'Water Quality and Sediment Monitoring Programme' (see Commitment 26, Appendix 6);
- 'Nutrient and Irrigation Management Plan' (see Commitment 36, Appendix 6);
- 'Shallow Groundwater Monitoring Programme' (see Commitment 37, Appendix 6);
- 'Shoreline Movement Monitoring Programme' (see Commitment 38, Appendix 6);
- a variety of townsite management commitments (see Commitments 39 to 43 inclusive, Appendix 6);
- marina and townsite management commitments (see Commitments 45 to 49 inclusive, Commitment 56, Appendix 6);
- resource management commitments (see Commitments 50 to 55 inclusive, Appendix 6);
- a specific long term management of infrastructure commitment (see Commitment 59.1, Appendix 6); and
- commitments to establish a 'Management Corporation' to manage day to day services and maintenance of essential functions associated with the resort development (see Commitments 59.2 and 59.3, Appendix 6).

4.10.5 Evaluation

The EPA is aware that a development of this size has the potential to have a significant environmental impact on the adjacent terrestrial and marine environment in the long term if not properly managed.

The proposed development and associated commitments made by the proponent are considered by the EPA to be an aid to the long term management of Ningaloo Marine Park and Cape Range National Park for CALM, as they may aid in the control and management of the increasing number of tourists visiting the area, drawn by the attractions of the Ningaloo Reef. The EPA is aware that tourist facilities that currently exist in the area are overloaded during peak holiday periods, and that the environmental impacts of large numbers of tourists are extremely difficult to control, particularly given the lack of appropriate facilities and management presence in the area.

It is also noted by the EPA that funds generated via the establishment of the 'Visitors Centre' are proposed to be provided by the proponent for use by CALM and the Fisheries Department to help in the long term management of the Ningaloo Reef. Further, the implementation of the proposed plans and programmes listed in Section 4.9.4. above are intended to ensure that the long term environmental impacts associated with the development are effectively controlled and managed.

It is considered essential by the EPA that funds are available to ensure effective management is undertaken, in the short term i.e. up to the first five years following commencement of development, and in the longer term, i.e. after the first five years following development. Issues which have been identified as requiring particular attention to monitoring include the need for the long term monitoring and management of potential environmental impacts on Ningaloo Reef (Section 4.1.5), a comprehensive baseline survey of contaminants prior to construction of the marina (Section 4.4.5), the need for a long term coral community monitoring programme (Section 4.6.5) and a long term shoreline movement monitoring programme (Section 4.8.5). This view is consistent with 'General principles for Resource Management' identified in the Resource Assessment Commission's 'Coastal Zone Inquiry', i.e.

Principle 24

As a general rule the cost of development in coastal areas, including infrastructure costs, the costs of environmental management and monitoring, and the costs of managing natural hazards, should be borne by development proponents and ultimately by the users. It should not be a burden to present or future communities.

The EPA understands that the Ministry for Planning will ensure that technical planning and financial viability of the development, and in particular the financial commitments made to protect the environment, are guaranteed. Clause 8 of the 'Heads of Agreement' between the proponent and the Minister for Planning and the Minister for Lands requires the Company to provide: "*evidence to the satisfaction of the Minister for Planning demonstrating the availability of finance necessary for the carrying out and completion of the whole of the proposed development and the readiness of the Company to embark upon and proceed to carry out all operations....*"

The EPA endorses the approach that sufficient funds will be given to CALM by the proponent for environmental protection of the adjacent environment which is located within conservation estates, i.e. Ningaloo Marine Park. The EPA considers it important that this amount is commensurate with the management burden imposed by this development.

To ensure that adequate funds are available for long term management, the EPA considers that it may be prudent for the proponent to provide a 'performance bond' prior to the commencement of development. These funds would ensure that management requirements are met, in the event that funds generated via the proposed Visitors Centre are inadequate to meet management needs.

The EPA also believes that there is a need to acknowledge the responsibility of local government to look after aspects of the environment outside the conservation estate.

The EPA has concluded that the whole of the development proposal as described within the PER document is environmentally acceptable. In reaching this conclusion, the EPA considers

that it is essential that the proponent to be able to demonstrate acceptable environmental impacts through each stage of the development. In order to achieve this, the EPA requires a review of all monitoring and management programmes and plans proposed after Stage 1 is completed, i.e. after the first 5 year period. The ability to proceed with subsequent stages should be dependent upon annual audits of performance and this detailed overall review after the initial five year period. The EPA considers that this formal review may need to be achieved through direct agreement with proponent.

In view of these concerns, the following recommendation is made:

The EPA recommends that an 'Agreement' be prepared between the proponent, State Government and the Shire of Carnarvon. This Agreement should address the following issues :

- **details associated with the marine management component, including baseline studies, management infrastructure and on-going monitoring costs. These should be agreed with the Minister for the Environment, on advice from CALM and the Fisheries Department, prior to commencement of construction. Technical details should be discussed in detail with CALM and Fisheries;**
- **monitoring and management plans to be prepared by the proponent, to include but not be restricted to the environmental objectives identified by the EPA in this assessment report;**
- **audit performance of all monitoring and management programmes on an annual basis, with a major review of these results after the first five years following construction and each stage following Stage 1;**
- **a requirement for the EPA to undertake a detailed review of the development and results of the monitoring and management programmes after the first five years and each stage thereafter;**
- **details of long term maintenance of infrastructure associated with the resort development; and**
- **further development beyond five years proposed as part of the Coral Coast Resort development to be in accordance with the EPA's advice (to the Minister) following review of the audit performance after the first five year period.**

In view of the sensitive nature of the marine environment, and fact that it is included within the Ningaloo Marine Park, the EPA considers it important that this Agreement should address specific components of proposed marine management such as costs of baseline surveys, number of personnel proposed to be employed to manage the marine environment, and building and management infrastructure, for example vehicles and boats.

The EPA also expects that the proponent will implement water sensitive urban design principles when developing the Resort. This should include the implementation of water harvesting measures in the land form design, as a water conservation measure.

4.11 Flood / storm surge risk

4.11.1 Objective

The Environmental Protection Authority's objective is to protect infrastructure and members of the public from flood and storm surge risk.

4.11.2 Evaluation framework

Technical information

PER Appendix G 'Mauds Landing Coastal Engineering Study'

This appendix was prepared by M P Rogers and Associates Pty Ltd and describes the meteorology and oceanography in the vicinity of the development area, including a description of the effects of tropical cyclones and storm surge, the current regime, and wave climate; water quality and anticipated flushing mechanisms and rates within the proposed marina water body to maintain acceptable water quality standards; an assessment of proposed building levels within the Resort, which takes into consideration tides, storm surge, climatic change (including Greenhouse Effect) and wave run-up; coastal processes and shoreline stability along the adjacent coast; and an assessment of the marine structures such as breakwaters and edge walling, which would be required if the development were to proceed.

Department of Transport advice

Department of Transport information on tide ranges and storm surge / cyclone flood levels. This information is based on records from past events, and provides a guide for tidal range and the anticipated effects of storm surges associated with particular climatic events.

Comments from key Government agencies

CALM advises there may be a need to review the amount of excavated material needed to prepare the site as development is based on using excavated material from the marina to raise building levels above storm surge height, at mean sea level.

Department of Transport and the GDC question the adequacy of the calculated building levels. Concern was expressed that development behind the built up areas would only be protected from inundation if there is a continuous barrier above the storm surge level. It was suggested that in planning for a worst case scenario, the highest astronomical tide or the mean high water spring tide levels should be used in the floor level calculations. Allowance needs to be made for the fact that the highest astronomical tide is 0.93 metres above mean sea level. It was also considered unclear as to whether the calculations for building setbacks include the impact of the site when fully developed, i.e. after construction of the harbour entrance and the marina.

4.11.3 Public submissions

The view was expressed that the proposal does not make provision for rising sea levels due to the Greenhouse Effect, or climatic change and sea level rise. This was considered to be particularly important in view of the low lying nature of the site.

4.11.4 Response from proponent

The proponent has responded to this issue by stating that the approach used in the PER document to determine the required building levels is an appropriate use of joint probability to determine the 100 year return period water level caused by ocean storm surge. These calculations include a sensitivity analysis using higher and less frequent tidal levels with more frequent and lower storm surge values.

4.11.5 Evaluation

The EPA is aware that the Mauds Landing is located within a cyclone prone area. A temporary increase tidal ranges or storm surge events which may occur as a consequence of cyclonic activity may result in localised flooding. It is therefore considered to be important that the proposed development make adequate allowance for risk associated with flood events or storm surge. Concern regarding this issue was reflected in submissions received from both members of the public and State Government agencies.

In view of these concerns, specific advice was requested by the DEP from the WAWA on this issue. Advice subsequently received from the WAWA states that '*the approach used by the proponent to determine minimum floor levels that will provide adequate flood protection to future development from extreme tidal events is considered to be quite sound*'.

In view of this additional advice from the WAWA, the EPA concludes that this issue has been adequately addressed.

4.12 Size and nature of development

4.12.1 Objective

The Environmental Protection Authority's objective is to ensure environmental impacts associated with the proposed development are acceptable and minimised.

4.12.2 Evaluation framework

Existing policy framework

Coral Bay Draft Coastal Management Plan (DCE, 1984)

This document was prepared to address specific land use and coastal management issues at Coral Bay. This was prepared prior to the establishment of Ningaloo Marine Park, and recognised the overcrowding during peak holiday periods and problems with lack of adequate service facilities. It recognised the sensitivity of the coral communities, and the need for carefully planned environmental management. Specific recommendations relate to the relocation of the boat ramp to avoid damage to coral communities, and the need for proper management of the coastal dunes.

Coral Bay Planning Strategy (DPUD, 1992)

This document is a Strategy for the planning and management of the Coral Bay townsite, prepared by the Department of Planning and Urban Development. The document is supported by planning and management goals, and provides guidance on the future allocation of land for limited expansion of the settlement, allocation of land away from the settlement for service facilities such as rubbish disposal and effluent disposal, and a rationalised transport network to alleviate boating congestion problems.

The Study recognised that the growth of Coral Bay is constrained by lack of appropriate power, water and effluent disposal facilities, and recommended that no further development be allowed to occur outside committed areas until the settlement is properly serviced.

'North West Cape Tourism Development Study' by Jones Lang Wootton (1993)

This document was prepared by Jones Lang Wootton for an interdepartmental steering committee chaired by the Department of Resources and Development in 1993. It identified a number of sites with the potential for development as a tourism destination. Key outcomes of the Study were the identification of the need to protect important development sites, and to facilitate appropriate development sites.

The report concluded that 'the proposals for a marina / townsite at Mauds Landing needs to be evaluated in terms of the development of a town with associated servicing and resource management issues. A management plan was also identified as being needed for the coastline between Coral Bay and Ningaloo.

Draft Gascoyne Coast Regional Strategy (1994)

The draft 'Gascoyne Coast Regional Strategy' was released for public comment in November 1994, and is due to be finalised in 1995. The Strategy reviewed the suitability of development along the Gascoyne coast, i.e. between Carnarvon and Exmouth, and took into particular consideration the Coral Coast Resort proposal. The Strategy concluded that there is a preference for tourism only development at Mauds Landing. However if urban development is proposed,

the draft Strategy acknowledges that Mauds Landing is the most appropriate location. It also concluded that residential development should only be permitted if there is no potential for long term harm to the reef system. The Draft Strategy also suggests that traditional urban subdivision should be avoided, and development should adopt water sensitive design principles.

Technical information

PER Document

Coral Coast Resort - Master Plan

This document was prepared by Koltasz Smith and Partners (1995) to satisfy the planning requirements of the Shire of Carnarvon and the State Planning Commission to enable the necessary zoning, subdivision and development approvals required for the Coral Coast Marina development to proceed. The document repeats much of the information presented within the PER document in relation to the environmental context of the proposal, and includes planning details in relation to the tourist and residential accommodation, utilities and services, transport, and management.

Comments from key Government agencies

The DEP has advised that it has concerns regarding the form and scale of development as proposed in the PER. Concern was expressed that a permanent residential population is more concentrated and involves specific management difficulties. It believes that a precautionary principle should be adopted, and development should be allowed to proceed with a focus on tourism use, and a limited residential component. Further development would be subject to a review of acceptable environmental management of the first stage after 5 years.

The Ministry for Planning has advised it is likely to support tourism oriented development, with minimum urban development at the Mauds Landing site.

4.12.3 Public submissions

It was considered that the size of the proposed development could not be justified just because of existing poor management of services at the existing Bills Bay/ Coral Bay community. The proponent's solution to this problem seems to be to bring in thousands more tourists, which will undoubtedly increase pressure on the region. The management of this increase in tourist numbers has consequent implications on community resources.

It was suggested that information presented in the PER relating to the Gascoyne Coast Regional Strategy is considered to be misleading. The Strategy recognised that Mauds Landing was appropriate for residential development to support the tourism industry, *but also stated that it should not be a typical urban development*. Traditional 'suburban' subdivision (including canal type) was not supported. This position was taken in the knowledge that sale of lots is needed to cover the marina and service infrastructure costs. Tourism was to have pre-eminence.

The proposed development is considered to be inconsistent with the conclusions of the recent Resource Assessment Commission Coastal Zone Inquiry, for example tourism developments should not provide an indirect means of wider development, specifically subdivision and land development, unless associated development is in accordance with local and regional land use policies and guidelines' (Objectives and Guidelines for Coastal Management, RAC Report 1993).

Finally, concern was expressed that the proposal is contrary to the 'Coral Bay Draft Management Plan'. This plan recommended 'no development at Mauds Landing due to lack of development capability'. The Plan recommends that the existing zoning of 'townsite' be revoked and the site be vested as an 'A' Class Reserve for National Park.

4.12.4 Response from proponent

The proponent has responded with the following points :

- a combination of tourist and urban development is required to ensure that the development is economically viable;
- development is proposed to be staged over a 20 year period; and
- the proposal is not inconsistent with the conclusions of the Gascoyne Coast Regional Strategy, and is outside the scope of the Jones Lang Wootton Report.

4.12.5 Evaluation

The Coral Coast Resort development will, in effect, create a new town. The proposal involves a significant tourist oriented development as well as residential development which is planned to ultimately cater for a permanent population of approximately 3,000 people, and transient tourist population of approximately 2,000 people

The EPA understands that the relevant planning authorities support the principle of tourist development at Mauds Landing. This view is likely to be reflected in the final 'Gascoyne Coast Regional Strategy'.

The EPA considers that the concentration of development at a node such as Mauds Landing will be easier to manage and control environmentally than continuous development along the coast.

The EPA has concluded that the proposed development included within the Coral Coast Resort is environmentally acceptable provided that the Ministry for Planning agrees with the proposal and project viability.

4.13 Maintenance of acceptable water quality within the marina

4.13.1 Objective

The Environmental Protection Authority's objective is to maintain water quality within the artificial water body to accepted standards.

4.13.2 Evaluation framework

Existing policy framework

WA Planning Commission Policy (formerly State Planning Commission) No. DC 1.8. 'Procedures for Approval of Artificial Waterways and Canal Estates'.

This policy provides definitions of what is considered to be a canal or canal waterway, and a canal estate. Under the definition of a canal estate outlined in this policy, the western portion of the proposed urban subdivision of the Coral Coast Resort adjacent to the marina water body can be considered to be a canal estate. The policy outlines minimum provisions for canal estates, including water quality requirements. Under the terms of the policy, water quality within the canals must be such that the following beneficial uses should not be adversely affected: occasional human immersion, boating, adjacent development and passive recreation.

This is not intended to be a technical policy, which contains specific and technical guidance on water quality within canal estates. The document is intended to be a guide to the design and assessment of canal estates only.

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992).

This document identifies acceptable standards for water discharge to ensure that accepted water quality standards are maintained for a number of uses, under a series of categories. These categories include the protection of aquatic ecosystems, recreational water quality, drinking water, agricultural water use and industrial water quality. In the context of this assessment the first two categories are relevant, i.e. . the protection of ecological values of aquatic ecosystems, and recreational water quality .

These standards would apply to water quality within the marina (recreational water quality), and near-shore marine environment (protection of ecological values of aquatic ecosystems) which may have been contaminated as a result of activities associated with the resort development. Recreational water quality guidelines refer to specific limits on faecal coliform and algal levels, and pH, temperature and toxic chemical levels.

Technical information

PER Appendix G 'Mauds Landing Coastal Engineering Study'.

This appendix was prepared by M P Rogers and Associates Pty Ltd and describes the meteorology and oceanography in the vicinity of the development area, including a description of the effects of tropical cyclones and storm surge, the current regime, and wave climate; water quality and anticipated flushing mechanisms and rates within the proposed marina water body to maintain acceptable water quality standards; an assessment of proposed building levels within the Resort, which takes into consideration tides, storm surge, climatic change (including Greenhouse Effect) and wave run-up; coastal processes and shoreline stability along the adjacent coast; and an assessment of the marine structures such as breakwaters and edge walling, which would be required if the development were to proceed.

Comments from key Government agencies

CALM believes the proposed emergency contingency plan should include a commitment to rectify any problems, whether due to nutrients in the groundwater or stormwater into the marina, which monitoring may reveal, how these problems would be dealt with, and a general commitment to implement any necessary remedial action to maintain water quality within the proposed marina. It was suggested that the proponent should also include a commitment to prevent or eliminate TBT entering the marina via large boats.

The Department of Transport advises that projected flushing rates presented within the PER may be overestimated. It was considered that the buildings around the marina may reduce the effect of wind induced flushing and so reduce water exchange.

4.13.3 Public submissions

The proposed water quality monitoring programme focuses on water quality within the marina only. Concern was expressed that no monitoring is proposed to be undertaken outside the marina, to determine the impact of construction of the marina, or long term impacts on near-shore marine flora and fauna.

4.13.4 Response from proponent

The CCMD has committed to prepare and implement an 'Emergency Response Plan' which will address contingencies for fire and explosions, collision between vessels, fuel and oil pollution, and sewage and chemical spills (Commitment 25, Appendix 6).

A 'Shallow Groundwater Management Plan' (Commitment 37, Appendix 6), and a 'Water Quality and Sediment Monitoring Programme' (Commitment 26, Appendix 6) are also proposed. These will be prepared to the satisfaction of the DEP. Further, a commitment has been undertaken that there would be no direct discharge of stormwater into marina water body (Commitment 3, Appendix 6)

Other detailed commitments to manage water quality within the marina water body have also been made. These include :

- the control of TBT use (Commitment 45.1 and 45.2, Appendix 6);
- routine inspection of the marina harbour and corrective action implemented when required to maintain water quality and aesthetics (Commitment 46, Appendix 6);
- prohibition of sewage, hydrocarbon and litter within the marina (Commitment 47, Appendix 6); and
- the provision of a sewage pump-out facility on the service jetty for vessel discharge and wastewater collection (Commitment 48, Appendix 6).

4.13.5 Evaluation

The EPA considers that it is essential that acceptable water quality is maintained within the marina water body.

The EPA notes the proponent's commitments to prepare and implement a 'Water Quality and Sediment Monitoring Programme'. This Programme is proposed to include the monitoring of water quality parameters and sediments within the marina and near-shore marine environment on a regular basis, for a period of 5 years to the satisfaction of the DEP. It is anticipated that the Programme will include details such as where monitoring sites are proposed to be established, i.e. within and outside the marina waterbody, an investigation of flushing rates on a regular basis to ensure that water quality is maintained to accepted standards identified in the 'National Water Quality Management Strategy' (1992), and details of remedial action proposed to be undertaken in the event that monitoring indicates unacceptable water quality within the marina water body.

The EPA considers that this issue has been adequately addressed by the proponent's commitments.

4.14 Solid waste management

4.14.1 Objective

The Environmental Protection Authority's objective is to ensure solid waste is collected and properly disposed of in a landfill site to agreed standards.

4.14.2 Evaluation framework

Existing policy framework

Requirements of the Health Act

Landfill sites under the control of local government in WA must be approved for that purpose under Section 119 of the Health Act. This section allows the local authority to set aside any portion of its reserve or other lands as a site for the deposit and disposal of rubbish or refuse, provided that the operator meets any requirements or conditions imposed by the Executive Director Public Health (EDPH). The Act does not explicitly restrict the scope of requirements which may be imposed by the EDPH. This for the allows consideration of town planning and environmental issues in setting requirements before approval of a gazetted waste disposal site. The powers of the EDPH with respect to waste management have now been delegated to the Waste Management Division of the DEP

Geological and Hydrogeological Guidelines for Landfill Site Selection

These guidelines provide the basic information to determine if a site is suitable on geological criteria, and should be used when establishing any new landfill site.

Guidelines for the establishment and management of a landfill site

This guide provides the framework for preparing the information required by the approving agencies for landfill sites. The larger the site, the more detailed and complete information that is required.

Code of Practise for Country Landfill Management (DEP, 1995).

This sets the minimum criteria by which small country landfill sites should meet.

(Draft) Waste Acceptance Criteria for Landfills (DEP, 1995).

This document provides advice on the suitability of material for acceptance into landfill sites. It also proposes a classification structure for landfill and the types of materials they can accept.

(Draft) Policy on licensing waste management facilities in Western Australia

This paper describes the approach proposed by the DEP for transferring the legal basis for regulating waste management facilities from the Health Act to the Environmental Protection Act. It is envisaged that the procedures adopted for approving and licensing facilities will parallel those adopted for other scheduled premises.

US Federal Aviation Administration Guidelines

These guidelines specify suggested buffer distances between runways and landfill sites, to reduce the incidence of birdstrike.

Comments from key Government agencies

The DEP considers the intention to provide a site to service both communities, i.e. Coral Coast Marina and Coral Bay townsite, has advantages over the existing landfill site. Exact location and management issues would be more closely examined during the formal approval process of the site, as required under the Health Act. It was noted that if the proposed site were established, the possibility of bird strikes may impinge on the proposed future development of the airstrip close to the service area. US Federal Aviation Administration Guidelines require a buffer distance of 1500 metres and 3000 metres between landfill sites and runways, for propeller and turbo propeller craft respectively.

The WAWA does not endorse the use of saline waste water from the water supply treatment plant to aid in compaction of waste. It was stated that adding water will maintain moisture content and increase the possibility of leachate reaching groundwater during rain events.

4.14.3 Public submissions

It was considered that details such as the projected life of the landfill site need to be quantified and substantiated in a regional context. Further, as the presence of the proposed resort generates the need for the landfill site, the proponent should be required to make a financial contribution towards it. It was suggested that a commitment also be undertaken by the proponent to ensure that there will be no sea dumping of any kind of effluent. It is unclear what recycling facilities are planned. It is also unclear whether the land fill site would be lined to prevent leaching. One submission suggested plastic lined cells should be installed to stop leaching.

4.14.4 Response from proponent

The proponent has undertaken a commitment that no noxious wastes will be discharged to the environment. Further, disposal options for such wastes will be reviewed in the detailed design phase and a proposal developed to manage such disposal so as to mitigate any environmental impacts, to the satisfaction of the Division of Waste Management (Commitment 5, Appendix 6).

The proponent also commits to no direct sea dumping of effluent or wastes of any type (Commitment 4, Appendix 6).

4.14.5 Evaluation

The EPA considers that a development proposal of this scale will require the establishment of a landfill site, to allow for the managed disposal of solid waste to established and accepted standards. This is considered to be especially important in view of the sensitive nature of the adjacent marine and terrestrial environment. A land fill site is proposed to be established by the proponent as part of the Resort development.

The EPA notes that the proponent has committed to determine the final location of the proposed landfill site following consultation with the Waste Management Division of the Department of Environmental Protection. The final location of the site will take into consideration the issue of reducing the risk of bird strikes. The EPA also considers that issues such as depth to groundwater, and distance of the landfill site from proposed residential areas and the coast should also be taken into consideration before the final site is determined.

The EPA considers that this issue is adequately addressed via the proponent's commitment and existing statutory mechanisms.

4.15 Construction impacts

4.15.1 Objective

The Environmental Protection Authority's objectives are to ensure that:

- there is no significant impact on water quality within the near-shore marine environment during construction of the marina and resort; and
- there is no significant impact on the environment as a result of limestone extraction.

4.15.2 Evaluation framework

Existing policy framework

'National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters' Australia and New Zealand Environment and Conservation Council (1992)

This document identifies acceptable standards for water discharge to ensure that the ecological values of aquatic ecosystems are protected. In the context of this assessment, these standards would apply to groundwater discharging into the marina and near-shore marine environment which may have been contaminated as a result of land use activities associated with the resort.

Draft EPA Dust Control Guidelines

The EPA published "Guidelines for Assessment and Control of Dust and Windborne Material from Land Development Sites" in 1990. In recent times these guidelines have been reviewed to ensure their continued effectiveness, and to establish guidelines for other environmental matters relating to land development sites.

New draft guidelines have been prepared by the DEP which address dust management as well as disposal of cleared vegetation and control of drainage (DEP 1995).

Environmental Management of Quarries : development, operation and rehabilitation guidelines (Department of Mines, 1991)

These guidelines are intended to be a practical guide for all quarry or pit operators on how environmentally acceptable practices may be incorporated into their operations. Particular emphasis is given to the successful rehabilitation of all excavation sites.

Comments from key Government agencies

The Ministry for Planning points out that activities associated with marina construction may have an adverse impact on near-shore water quality.

CALM states that the source and method of extraction of limestone and other building materials must be evaluated so that its environmental impact can be determined, unless materials are sourced from existing quarries.

The WAWA advises that the use of saline waste water from the potable water supply treatment plant for dust suppression must be managed to ensure that the evaporative concentrated salts accumulated in the soil are not flushed out by heavy rains and lead to the surrounding environment being affected.

4.15.3 Public submissions

Concern was expressed regarding a number of environmental impacts likely to be generated during the construction phase. These include :

- 'blow outs' being created in the dune areas;
- creation of turbidity plumes during excavation of the marina. It was considered that the silt curtain proposed to be used during the excavation of the marina is totally inadequate in containing silt, especially in wave conditions generated by more than 10 knot winds;
- the need for dust management;
- the potential impact of a transient construction population which would be required to build such a large resort. This is likely to put existing resources (wastewater treatment, sewage disposal, power supply, existing local accommodation facilities) under unacceptable pressure;
- during the construction phase there may be large areas of standing water for considerable periods of time which may cause mosquito and midge problems. Management of this issue has not been addressed;
- proposed construction methods such as de-watering are described in limited detail in the PER. De-watering may have significant and major localised impacts which should be identified and investigated within the PER. This information should be available prior to the drafting of the construction management plan;
- it is unclear what methods are proposed to be used during the monitoring of the proposed dredging operations, and who will fund it. Also the amount of dredged material, and exact location of the settlement pond / disposal site is not indicated in the PER. The ultimate fate of the settlement pond should also be described. A commitment should be made by the proponent that no water originating from marina de-watering operations is discharged directly into the marine environment; and
- the choice of quarry site to supply rock to be used for the breakwaters needs to be resolved. The environmental impact of this choice needs to be determined, including the impact on the local population from *'6 to 8 trucks completing a total of approximately 35 trips per day'* for 6 months.

4.15.4 Response from proponent

Proponent has undertaken the following commitments with respect to the control of construction impacts :

- the preparation and implementation of a 'Construction Management Plan' (see Commitment 6, Appendix 6), which will address issues such as stockpiling and materials handling areas, noise and dust suppression, temporary effluent treatment and disposal, protection of wildlife and conservation areas, and fire management ;
- the preparation and implementation of a 'De-watering Management Plan' (see Commitment 7, Appendix 6) to manage potential sediment plumes generated through marina construction;
- induction courses for all construction personnel (see Commitment 10, Appendix 6), which will inform all employees of the environmental attributes of the area and their sensitivities;

- management of construction traffic (see Commitment 11, Appendix 6) to minimise impact on existing land uses;
- optimise soil stabilisation and revegetation rates on site by recovery, stockpiling and re-application of top soil during site preparation (see Commitment 17, Appendix 6);
- construct the marina under land locked conditions (see Commitment 22.1, Appendix 6);
- connect the marina to the ocean under conditions which minimise the potential for turbid water to escape (see Commitment 22.3, Appendix 6);
- install a silt curtain to protect coral or seagrass communities in the event that turbidity plumes are generated which could impact on these sensitive communities (see Commitment 23, Appendix 6);
- survey possible dugong movements in the near shore marine environment prior to any blasting which may be necessary (see Commitment 27, Appendix 6);
- manage works in the near-coastal area to avoid alteration of existing landforms, and re-stabilise the landform where necessary (see Commitment 28, Appendix 6);
- protect environmentally sensitive areas which are not proposed to be developed, for example some dune areas, salt lakes (see Commitment 29, Appendix 6);
- acquire all construction materials (such as limestone) in accordance with Government approvals (see Commitment 32, Appendix 6); and
- control mosquitos breeding in de-watering ponds (see Commitment 34, Appendix 6)

4.15.5 Evaluation

The EPA considers that construction of the marina has the potential to have an adverse impact on water quality within the near-shore marine environment. The EPA also notes that the proponent has not yet determined the source of limestone proposed to be used for construction of the marina breakwaters, and that the proponent has undertaken a commitment to acquire all construction materials, including limestone, in accordance with Government approvals. It is anticipated that the DEP would be involved in the choice of location and management of the limestone quarry site to ensure that any potential environmental impacts as a result of these operations are minimised.

The EPA notes the proponent's commitments in relation to monitoring of the potential environmental impacts associated with construction of the marina and resort development. This includes the preparation and implementation of a 'Construction Management Plan' to set out appropriate procedures for the management of construction activities to minimise any potential environmental impacts, and a 'De-watering Management Plan', specifically for the construction of the marina, to the satisfaction of the DEP and the Shire of Carnarvon.

The EPA is particularly concerned about the effects of sediment plumes caused by the marina excavation on sensitive adjacent marine communities, particularly coral reef areas. It is noted that the proponent has undertaken a specific commitment to 'install a silt curtain to protect coral or seagrass communities in the event that turbidity plumes are generated which could impact on these sensitive communities'. However, it is considered that the implementation of this commitment may be too late if the sediment plumes have in fact already been generated. Accordingly, the EPA considers that this issue should be specifically addressed as part of the proposed Construction Management Plan, prior to construction commencing.

Following consideration of the proponent's commitments, the EPA has concluded that this issue can be adequately addressed, subject to proposed management plans providing effective solutions to potential environmental impacts.

4.16 Impact on existing communities

4.16.1 Objective

The Environmental Protection Authority's objectives are to ensure that:

- the impact on the social surroundings, including the Coral Bay community is managed; and
- any adverse impact on the social surroundings of the established town centres of Carnarvon and Exmouth is managed.

4.16.2 Evaluation framework

Existing policy framework

'North West Cape Tourism Development Study' by Jones Lang Wootton (1993)

This document was prepared by Jones Lang Wootton for an interdepartmental steering committee chaired by the Department of Resources and Development in 1993. It identified a number of sites with the potential for development as a tourism destination. Key outcomes of the Study were the identification of the need to protect important development sites, and to facilitate appropriate development sites.

The report concluded that 'the proposals for a marina / townsite at Mauds Landing needs to be evaluated in terms of the development of a town with associated servicing and resource management issues. A management plan was also identified as being needed for the coastline between Coral Bay and Ningaloo.

Draft Gascoyne Coast Regional Strategy (1994)

The draft 'Gascoyne Coast Regional Strategy' was released for public comment in November 1994, and is due to be finalised in late 1995. The Strategy reviewed the suitability of development along the Gascoyne coast, i.e. between Carnarvon and Exmouth, and took into particular consideration the Coral Coast Resort proposal. The Strategy concluded that there is a preference for tourism only development at Mauds Landing. However if urban development is proposed, the draft Strategy acknowledges that Mauds Landing is the most appropriate location. It also concluded that residential development should only be permitted if there is no potential for long term harm to the reef system. The Draft Strategy also suggests that traditional urban subdivision should be avoided, and development should adopt water sensitive design principles.

Comments from key Government agencies

The GDC have expressed concern regarding the creation of what is effectively a new town with a predicted population of over 5,000 persons (the size of Margaret River). A town of this size may have a detrimental impact on the existing community of Coral Bay.

Shire of Carnarvon and the Commission advise that the proposed development may have adverse impact on established town centres, such as Exmouth and Carnarvon and detract from economic activity in these areas.

The Exmouth and districts Chamber of Commerce is supportive of the proposed development at Mauds Landing.

4.16.3 Public submissions

Concern was expressed that a major development at Mauds Landing has the potential to undermine the viability of the Town of Exmouth, and detract from businesses currently operating successfully in Coral Bay. It was considered that the high cost of providing and maintaining services to a remote community would become untenable for the local authority and a liability for the State Government if growth is diverted away from an established centre.

Further, conclusion of the Gascoyne Coast Regional Strategy was that a town at Mauds Landing would compete with Exmouth.

The view was expressed that the proposed resort may be better located at Exmouth as there is existing infrastructure, the adjacent marine community is already exposed to human disturbance and development may therefore have less impact, the waters of Exmouth Gulf are more sheltered for boating, an airport already exists, dive and charter boats already provide services, and service facilities (eg. power, water sewage treatment) exist and can be upgraded rather than created as new facilities, increasing potential environmental impacts.

4.16.4 Response from proponent

The proponent does not consider that the proposed development will have an unacceptable impact on the existing community at Coral Bay.

The proponent has responded that the proposed development at Mauds Landing is likely to actually enhance the growth and economic potential of existing communities at Carnarvon and Exmouth.

4.16.5 Evaluation

The EPA is aware that the Ningaloo Reef is becoming an increasingly popular tourist destination, and that significant numbers of tourists visit the Coral Bay townsite, particularly during school holiday periods, despite overcrowding and inadequate facilities. Informal camping sites and associated informal 4WD tracks are increasingly common along the coastal strip north of Coral Bay to Yardie Creek. The coastal area located within Cape Range National Park to the north of Yardie Creek is managed by CALM. Camping areas and coastal access tracks in the National Park have been clearly designated and are maintained by CALM.

The EPA acknowledges this increasing tourist pressure along the coastal area, which has the potential to contribute to localised environmental management problems such as dune degradation.

This increasing tourist pressure was also acknowledged in the 'Draft Gascoyne Coast Regional Strategy'. The Strategy reviewed the suitability of development along the Gascoyne coast, i.e. between Carnarvon and Exmouth, and took into particular consideration the Coral Coast Resort proposal. The Draft Strategy concluded that there is a preference for tourism only development at Mauds Landing. However if urban development is proposed, it was acknowledged that Mauds Landing is the most appropriate location. It also concluded that residential development should only be permitted if there is no potential for long term harm to the reef system.

The proposed resort and townsite is planned to grow to accommodate some three thousand permanent residents and up to two thousand tourists over a twenty year period.

In view of the increasing tourist pressure along this section of coast, and in the context of this assessment report, the EPA considers that it would be preferable to have concentrated nodal rather than dispersed tourist visitation along the coast. The EPA is of the view that the development at Mauds Landing will provide an alternative tourist destination site for the Gascoyne coast, and a potential site for permanent residences.

The possible impact of the Mauds Landing development on Exmouth and Carnarvon is not considered to be a significant environmental issue which warrants detailed assessment by the EPA.

During this assessment, the EPA identified the need for an integrated regional strategy combining environmental and planning objectives for land based tourism development proposals along the Gascoyne Coast, which identifies adjacent marine and terrestrial conservation areas. The EPA considers it important that such a strategy be prepared, which would aim to be consistent with the following global environmental objectives :

- promote sustainable development;

- sustain marine and terrestrial biological diversity;
- integrate marine and terrestrial environmental management; and
- conserve areas of significance through the creation of reserves as required.

The strategy would also :

- integrate all existing studies for the area;
- set environmental objectives for all 'nodes' or potential development sites, and indicate how they would be managed;
- identify performance criteria; and
- identify an audit and review process.

The EPA proposes that the development of this strategy should involve appropriate government departments in consultation with the Gascoyne Development Commission, and with support from the EPA.

4.17 Long term maintenance of infrastructure

4.17.1 Objective

The Environmental Protection Authority's objective is to ensure that the construction and on-going maintenance of any service facilities associated with the proposed development should be demonstrated to be maintained in the short (and long) term .

4.17.2 Evaluation framework

Existing policy framework

WA Planning Commission Policy (formerly State Planning Commission) No. DC 1.8. 'Procedures for Approval of Artificial Waterways and Canal Estates'.

This policy provides definitions of what is considered to be a canal or canal waterway, and a canal estate. Under the definition of a canal estate outlined in this policy, the western portion of the proposed urban subdivision of the Coral Coast Resort adjacent to the marina water body can be considered to be a canal estate. The policy outlines guidelines for the design of canal estates, town planning scheme and subdivision requirements, and water quality requirements. It also highlights the need for a 'Deed of Agreement' to be prepared between the proponent, local government authority and Department of Marine and Harbours (now Department of Transport) to ensure that a reasonable period of maintenance is undertaken by the proponent before the waterways become a public responsibility.

The document is intended to be a guide to the design and assessment of canal estates only.

Resource Assessment Commission - Coastal Zone Inquiry (1993)

This is a report prepared by the Resource Assessment Commission for the Commonwealth Government, pursuant to section 16 of the Resource Assessment Commission Act 1989. The report details the findings of the Commission's inquiry into the management and use of resources of Australia's coastal zone. The report includes detailed conclusions and recommendations on the future use and management of the coastal zone throughout Australia. A number of principles are proposed to assist decision making for natural resource use and management, two of which specifically relate to the costs of provision of infrastructure in the short and long term (Principles 11 and 24).

Comments from key Government agencies

The GDC, Ministry for Planning and CALM advise the importance of ensuring that there is no long term cost to government (State or Local) as a result of long term management of

infrastructure. Particular reference was made to the marina beaches, and maintenance of marina water quality.

The Shire of Carnarvon states that it is unclear what role the Council has in terms of monitoring and management after the initial 5 year period following construction has expired, and who will be responsible for the long term maintenance of the marina' i.e. the 'Waterways Manager'.

4.17.3 Public submissions

Concern was expressed that there would be long term costs to the State Government or members of the public as a result of development proceeding as proposed, particularly in relation to the maintenance of infrastructure associated with the resort and marina.

4.17.4 Response from proponent

The proponent has responded with the following information:

- the CCMD will maintain breakwaters and harbour revetments during the period in which CCMD is responsible for townsite management (Commitment 56, Appendix 6);
- all infrastructure established as part of the Coral Coast Resort development will be operated and maintained for a minimum period of five years from construction, or until the relevant authorities wish to take over responsibility (see Commitment 59.1, Appendix 6); and
- a 'Management Corporation' will be established and be responsible for the normal day to day services and maintenance of functions such as roads, parks, waste collection and marina maintenance (see Commitment 59.2, Appendix 6).

4.17.5 Evaluation

The EPA notes that the proposed Management Corporation is nominated to be responsible for a variety of maintenance functions including the maintenance of roads, pathways, parks and public landscape areas, waste collection and disposal, street and public place cleaning and street lighting, and maintenance of the marina.

The EPA considers that specific details including the timing and extent of responsibilities of the proponent and relevant local and State government agencies in relation to the long term management of infrastructure should be made clear.

The EPA considers that this issue should be specifically addressed within the context of a formal Agreement between the proponent, State Government and Shire of Carnarvon.

The EPA recommends that the issue of long term maintenance of infrastructure associated with the resort development be incorporated within the proposed Agreement between the proponent, State Government and the Shire of Carnarvon.

5. Conclusions

The Environmental Protection Authority concludes that the proposal to construct a marina and resort development at Mauds Landing is environmentally acceptable subject to the proponent's commitments and the Environmental Protection Authority's recommendations. A summary of the Environmental Protection Authority's views are set out in Table 2.

Table 2. Summary of Environmental Protection Authority advice

Issues	Environmental Objective	EPA advice	Proponent's response	EPA Recommendation
Development will increase the number of people using the Ningaloo Reef.	Retain recreational value of Ningaloo Marine Park.	EPA acknowledges that development may increase the number of people using the reef. The proponent's commitments regarding proposed management are noted. The EPA views the development and associated management commitments as an aid in the long term management of Ningaloo Reef.	Development would be staged over a 20 year period and management adapt to the increasing development pressure. Commitments also undertaken to liaise with CALM and Fisheries Dept. on management of the Marine Park, provide an education programme for visitor and resident boat owners, and design and implement a coral community monitoring programme.	An 'Agreement' should be prepared between the State Government, proponent and Shire of Carnarvon to ensure potential impacts on Ningaloo Reef as a result of increased recreational pressure are managed.
Disturbance during construction and post construction as a result of increased recreational activity. This has implications on management of the Reef by CALM.	Protect the ecological quality and characteristics of the Ningaloo Reef (including coral communities) over the long term.	The EPA acknowledges that there is potential for damage to coral reefs as a result of increased recreational pressure on the reef. However, it considers that an alternative, safe and better managed mooring facility such as the one proposed may help to reduce damage to the Reef as a result of increased recreational activity.	Development would be staged over a 20 year period and management adapt to the increasing development pressure. Commitments also undertaken to prepare a construction management plan to minimise impacts during the construction phase, liaise with CALM and Fisheries Dept. on management of the Marine Park (including helping to fund management from income derived from the proposed Visitors Centre), provide an education programme for visitor and resident boat owners, and design and implement a coral community monitoring programme.	Proponent's commitments noted and are considered to be adequate provided that they are implemented effectively.

<p>Maintain a ready supply of potable water to acceptable water quality standards, and ensure that effluent generated as a result of reverse osmosis treatment is disposed of in an acceptable manner.</p>	<p>Ensure that the supply of potable water to residents of proposed development does not have an adverse impact on the environment.</p>	<p>EPA notes that water is proposed to be extracted from the Birdrong Aquifer for use by the community. This is considered to be environmentally acceptable provided the appropriate licenses are obtained from the WAWA, drinking water is treated to acceptable standards, and residual 'bleed water' from reverse osmosis treatment is discharged in an acceptable manner.</p>	<p>The proponent has undertaken a commitment to obtain appropriate abstraction licenses from the WAWA for artesian water. Untreated groundwater would be used for irrigation and other non-potable uses. Potable water would be provided by treating artesian water by 'reverse osmosis' processes.</p>	<p>Potable water should be treated to acceptable standards, and effluent from the potable water treatment plant should be disposed of to the requirements of the EPA.</p>
<p>Inadequate detail is presented regarding the feasibility and details of establishing and maintaining a coral garden in the proposed marina.</p>	<p>Ensure that water quality within the marina is sufficient to maintain the proposed coral garden in a healthy condition.</p>	<p>EPA notes that the coral garden idea is a concept only at this stage. It is expected that CALM and the DEP and would be given the opportunity to provide detailed comments on the proposed coral garden at a later date when details are known. These discussions should include where coral are proposed to be taken from, to colonise the garden.</p>	<p>The proponent has stated that specific commitments regarding the construction, maintenance and on-going operation responsibilities for the coral garden would be subject to a detailed feasibility and design study which would be undertaken at a later date in consultation with CALM. No specific commitment to undertake this study is given by the proponent.</p>	<p>The proponent should provide to CALM and EPA specific design and management details of the proposed coral garden within the marina which indicate that the environmental effects are acceptable, when details are known. This information should include where coral are proposed to be taken from, to colonise the garden.</p>
<p>A positive benefit of implementation of the Coral Coast Resort proposal is to facilitate connection of the existing Coral Bay townsite to a properly constructed wastewater treatment facility at Mauds Landing. However there is no firm commitment to ensure this occurs. Connection therefore relies on action and expenditure by other parties particularly State Government and the Local Authority.</p>	<p>Improve existing sewerage management at Coral Bay town site.</p>	<p>EPA acknowledges existing nutrient problem originating from Coral Bay townsite. The EPA considers that this problem needs to be resolved as a matter of urgency, and has advised the Minister for the Environment of this concern. This issue will be addressed outside the context of this assessment report.</p>	<p>The proponent acknowledges the problem currently experienced at Coral Bay, and advises that the proposed wastewater treatment facility will be capable of accepting and treating waste from Coral Bay, in addition to waste generated by the Coral Coast Resort</p>	<p>The issue of long term management of sewage disposal at Coral Bay is currently being addressed outside the context of this assessment report.</p>

<p>Development is close to the coast (urban, golfcourse, wastewater treatment facilities) - and may contribute to nutrient run-off into near-shore marine environment.</p>	<p>Protect the marine and terrestrial environments from elevated nutrient levels which exceed sustainable limits.</p>	<p>EPA considers that the proposed development has the potential to significantly increase nutrient levels in the adjacent marine and terrestrial environments. The EPA notes that a wastewater treatment plant is proposed to be constructed. This would require a 'Works Approval' and Licence' under Part V of the Environmental Protection Act. The EPA also notes that a Nutrient and Irrigation Management Plan is proposed. It is considered essential that potential nutrient input is well managed so there is no adverse impact on the adjacent environment, and complies with accepted water quality standards.</p>	<p>The proponent has undertaken a commitment to construct a wastewater treatment plant; to design stormwater handling and disposal facilities so as to direct stormwater away from the marine environment; and to prepare a Nutrient and Irrigation Management Plan to minimise nutrient input into the adjacent marine and terrestrial environments.</p>	<p>Proponent's commitments regarding the Wastewater Treatment Plant and the Nutrient and Irrigation management Plan are noted. The Wastewater Treatment Plant would need to be constructed in accordance with requirements of Part V of the Environmental Protection Act.</p>
<p>Potential for leachate from proposed wastewater treatment facility and landfill site to pollute groundwater. Details of appropriate remedial action is required if monitoring indicates adverse impacts.</p>	<p>Protect and maintain acceptable groundwater quality.</p>	<p>EPA notes that the proposed development has the potential to contaminate groundwater, and that a Shallow Groundwater Monitoring and Management Programme is proposed to be implemented to monitor groundwater. This should incorporate adequate baseline monitoring and details of remedial action proposed to be undertaken if required.</p>	<p>Proponent has undertaken a commitment to prepare a Shallow Groundwater Monitoring Programme.</p>	<p>The proponent should undertake groundwater monitoring prior to development occurring, and specify what remedial action would be undertaken in the event that monitoring indicates unacceptable levels of contamination, to the satisfaction of the EPA on advice from the WAWA and the Department of Minerals and Energy.</p>
<p>Intensive urban development and artificial waterway (marina) may impact on protected marine species feeding and nesting in the area.</p>	<p>Protect marine mammals from direct and indirect environmental impacts.</p>	<p>The EPA notes the proponent's commitments, and has concluded that these concerns have been adequately addressed.</p>	<p>Proponent will prepare a Turtle Management and Turtle Nesting Surveillance Programme, which includes the management of lighting.</p>	<p>Proponent's commitment noted.</p>
<p>Impact of fish species, particularly recreational fish species, as a result of increased use of the Reef.</p>	<p>Protect and preserve fish species (including recreational and commercial fish species)</p>	<p>The EPA notes the proponent's commitments, and has concluded that these concerns have been adequately addressed.</p>	<p>Proponent has undertaken a commitment to liaise with the Fisheries Department on the management of the Marine Park from income generated by the proposed Visitors Centre.</p>	<p>Proponent's commitment noted.</p>

Potential impact on subterranean (stygofaunal) and troglobitic fauna.	Protect subterranean fauna from adverse environmental impacts.	Additional advice from the WAM following receipt of the proponent's response (received on 6/7/95) indicates that this issue has still not been adequately addressed, as there has been inadequate research in the development area for presence of stygofauna.	Proponent considers it unlikely that stygofauna are present on the development site, due to local geological features and salinity of groundwater in the shallow unconfined aquifers.	The proponent should liaise further with officers of the Western Australian Museum prior to the construction phase of the development, identify methods which would be adopted to determine whether subterranean stygofauna are present at the site. If fauna is located at the site through these mechanisms or through development, measures should be undertaken to the satisfaction of the EPA on advice from the WA Museum, to minimise any adverse impacts.
Inadequate terrestrial flora and fauna study.	Protect terrestrial fauna from adverse environmental impacts.	The EPA has concluded that this issue has been adequately addressed.	The terrestrial fauna survey undertaken by the proponent and documented in the PER are considered to be adequate.	This issue has been adequately addressed.
	Protect terrestrial vegetation and flora from adverse environmental impacts.	The EPA notes the concerns expressed by CEPA and the GDC regarding the uncertainty of distribution of the priority 2 flora species and 5 other rare flora species in the proposed development area and considers that this issue needs to be investigated further.	The vegetation and flora surveys undertaken by the proponent and documented in the PER are considered to be adequate.	The proponent should confirm whether 'Priority 2' flora species and other significant flora species identified on site are represented in the vicinity of the development, to the satisfaction of the EPA on advice from CALM prior to construction of the Resort.

<p>Potential impact of breakwaters on off shore sediment movement and coastal stability, and adequacy of monitoring approach.</p>	<p>Ensure that the development, including the proposed breakwaters, do not have a significant local impact on existing coastal processes.</p>	<p>EPA notes the proponents commitment to prepare and implement a 'Shoreline Movement Monitoring Plan'. It is considered that this monitoring programme should continue for a period of five years following development, on an annual basis, with a review of monitoring results after the 5 year period to determine whether further monitoring is warranted. If a significant sand build up occurs, the proponent should undertake remedial works to the satisfaction of the DOT, CALM and DEP.</p>	<p>Proponent has undertaken a commitment to prepare a Shoreline Movement and Monitoring Plan.</p>	<p>The proponent should continue to implement the proposed 'Shoreline Movement Monitoring Plan' for a period of five years following development, with a review of monitoring results by the EPA and DOT after a 5 year period, to determine whether further monitoring and subsequent remedial action is warranted. If, as a result of monitoring, a significant sand build up occurs, or erosion is occurring as a result of the breakwater construction the proponent shall implement remedial works to the satisfaction of the EPA on advice from DOT, CALM and DEP.</p>
<p>On-going management of the coastal dunes and location of part of the golf course on the primary dunes.</p>	<p>Retain the integrity of the foredune area.</p>	<p>EPA notes the proponent's commitments to undertake a Construction Management Plan and Foreshore Management Plan to minimise and control impacts on dunes during construction phase and following completion of development. The EPA considers it important that there be no long term impact to structure of the dunes as a result of construction or use of the proposed golf course links.</p>	<p>Proponent has undertaken a commitment to prepare a Foreshore Management Plan, and dune protection works during construction of the marina. A commitment is also undertaken to design the golf links so as to minimise disturbance to the existing dune form.</p>	<p>Proponent should be required to remove links from dune area if on-going monitoring indicates an unacceptable impact on dunes.</p>

<p>Long term management commitments need to be enforceable. Agreement is needed to ensure adequate and effective management beyond 5 years.</p>	<p>Ensure protection and adequate management of the environmental values of the terrestrial and marine environment in the long term.</p>	<p>The proposed development and associated commitments made by the proponent are seen as an aid to the long term management of Ningaloo Marine Park and Cape Range National Park for CALM. However, it is essential that funds are available to ensure effective management is undertaken. The EPA understands that the Ministry for Planning will ensure that technical planning and financial viability of the development, and in particular the financial commitments made to protect the environment, are guaranteed. An agreed amount would be given to CALM for environmental protection. There is also a need to acknowledge the responsibility of local government to look after aspects of the environment outside the conservation estate. (cont'd on next page)</p>	<p>Proponent has undertaken commitments to implement drainage management, waste management, foreshore management, a coral community monitoring programme, a water quality and sediment monitoring programme, a nutrient and irrigation management plan, a shallow groundwater monitoring programme, and a shoreline movement monitoring programme.</p>	<p>An Agreement should be prepared between the proponent, State Government and Shire of Carnarvon regarding long term commitments This Agreement should address the following issues :</p> <ul style="list-style-type: none"> • details associated with the marine management component including baseline studies, management infrastructure and on-going management costs. These should be agreed with the Minister for the Environment, on advice from CALM and the Fisheries Department prior to commencement of construction; (cont'd on next page)
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<p>Long term management (cont'd from previous page)</p>		<p>(cont'd from previous page) The EPA concludes that the whole of the development proposal as described within the PER is environmentally acceptable, however the proponent must be able to demonstrate acceptable environmental impacts through each stage of development.</p> <p>In order to achieve this, the EPA requires a review of all monitoring and management plans and programmes proposed after Stage 1 (i.e. first 5 years) has been completed. The ability to proceed with subsequent stages should be dependent upon annual audits and detailed review after the initial 5 year period.</p>		<p>(cont'd from previous page)</p> <ul style="list-style-type: none"> • monitoring and management plans to be prepared by the proponent to include but not be restricted to the environmental objectives identified by the EPA in its assessment report; • audit performance of all monitoring and management programmes on an annual basis, with a major review of these results after the first five years following construction, and each stage following Stage 1; • a requirement for the EPA to undertake a detailed review of the development and results of the monitoring and management programmes after the first 5 years and each stage thereafter; • details of the long term maintenance of infrastructure associated with the resort development; and • further development beyond 5 years proposed as part of the Coral Coast Resort development be in accordance with the EPA's advice to the Minister following review of the audit performance after the first five year period.
<p>Coast is prone to cyclonic activity and building floor levels need to take into account high tides, storm surges, cyclonic activity and Greenhouse effect. Appropriateness of building floor levels.</p>	<p>Protect infrastructure and members of the public from flood and storm surge risk.</p>	<p>Advice received from the WAWA indicates that the approach used by the proponent to determine minimum floor levels will provide adequate flood protection to future development from extreme tidal events. In view of this advice, the EPA concludes that this issue has been adequately addressed.</p>	<p>Proponent considers that the proposed building set back distance is adequate.</p>	<p>This issue has been adequately addressed.</p>

<p>The form and scale of development has an influence on the nature and extent of potential environmental impacts.</p>	<p>Ensure environmental impacts associated with proposed development are acceptable and minimised.</p>	<p>The EPA understands that the relevant planning authorities support the principle of tourism development only at the Mauds Land townsite. This position is likely to be reflected in the final "Gascoyne Coast Regional Strategy". The concentration of development at a node such as Mauds Landing will be easier to manage and control environmentally than continuous development along the coast.</p> <p>The EPA has concluded that the proposed development of Coral Coat Resort is environmentally acceptable provided that the Ministry for Planning agrees with the proposal and project viability.</p>	<p>It is considered that the commitments undertaken will ensure that the environmental impacts associated with a Resort development at Mauds Landing development are minimised and acceptable</p>	<p>Proponent's commitments noted.</p>
<p>Maintenance of acceptable water quality within the marina, and consequent impact on water quality in near-shore marine environment.</p>	<p>Maintain water quality within the artificial water body to accepted standards.</p>	<p>The EPA considers that this issue has been adequately addressed, provided that on-going monitoring of water quality within the marina is maintained to standards specified within the 'Australian Water Quality Guidelines for Fresh and Marine Waters'.</p>	<p>The proponent has undertaken commitments to control the use of TBT, prepare an Emergency Response Plan in the event of spills of pollutants, a Shallow Groundwater Management Plan, and a Water Quality and Sediment Monitoring programme</p>	<p>Proponent's commitments noted.</p>

Location of landfill site to avoid conflict with airstrip and to protect groundwater and the marine environment.	Ensure solid waste is collected and properly disposed of in a landfill site to agreed standards.	The EPA notes that the final location of the landfill site will be determined following consultation with the Division of Waste Management to minimise risk of bird strikes. The preparation of a 'Management Plan' is required to be prepared before formal approval for the site is granted under the Health Act. This plan will be required to address details such as depth to groundwater, and distance from coast and residential areas. The EPA considers that this issue is adequately addressed via these existing statutory mechanisms.	The proponent has undertaken commitments to ensure that no noxious wastes will be discharged into the environment, and that no direct sea dumping of any wastes of any type will be undertaken.	Proponent's commitments and existing statutory mechanisms noted.
Potential impact on water quality in the near-shore marine environment during construction of the marina and breakwaters.	Ensure there is no significant impact on water quality within the near-shore marine environment during construction of the marina and resort.	The EPA notes the proponent's commitments in relation to this issue and has concluded that this issue is adequately addressed.	The proponent has undertaken commitments to prepare a Construction Management Plan, and a De-watering Management Plan	Proponent's commitments noted.
Environmental issues associated with limestone extraction (for use in breakwaters).	Ensure there is no significant impact on the environment as a result of limestone extraction.	The EPA notes that these details will be resolved at a later date in consultation with the DEP, and Department of Geological Survey. Accordingly, this issue is considered to have been adequately addressed.	The proponent has undertaken a commitments that all construction materials (including limestone) will be acquired in accordance with Government approvals.	Proponent's commitments noted.
Impact on existing community within Coral Bay Townsite.	Ensure that there is no adverse social impact on the Coral Bay community.	The EPA is of the view that the development at Mauds Landing will provide an alternative tourist destination site and a potential site for permanent residences.	It is considered that the Resort will enhance the growth and economic potential of the Coral bay townsite.	This is not considered to be a significant environmental issue which warrants detailed assessment by the EPA.

<p>Long term maintenance of infrastructure.</p>	<p>Ensure that the construction and on-going maintenance of any service facilities associated with the proposed development should be demonstrated to be maintained in the short (and long term) at no cost to government.</p>	<p>The EPA considers that this issue should be specifically addressed within the context of a formal Agreement between the proponent, State Government and Shire of Carnarvon.</p>	<p>The proponent has undertaken commitments to maintain breakwaters and harbour revetments during the period for which CCMD is responsible for townsite management; to maintain all infrastructure established as part of the Resort development for a minimum period of five years from construction or until the relevant authorities wish to take responsibility; and to establish a Management Corporation to be responsible for normal services and maintenance of functions such as roads, parks, waste collection, and marina maintenance.</p>	<p>The issue of long term maintenance of infrastructure associated with the resort development should be incorporated within the proposed Agreement between the proponent, State Government and the Shire of Carnarvon.</p>
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In reaching this conclusion the Environmental Protection Authority identified the main environmental issues requiring consideration as:

- protection of Ningaloo Reef;
- potable water supply;
- proposed coral garden within the marina;
- nutrient management;
- groundwater quality;
- terrestrial and marine flora and fauna;
- littoral drift;
- coastal dunes;
- long term management issues;
- flood and storm surge risk;
- size and nature of development;
- water quality within the marina;
- solid waste management;
- construction impacts;
- impact on existing communities; and
- long term maintenance of infrastructure.

The Environmental Protection Authority believes that these issues are adequately addressed by the commitments made by the proponent, the proponent's response to the issues raised in public submissions, and the Environmental Protection Authority's recommendations in this report.

The proponent has made a number of environmental management commitments to ameliorate the impacts arising from this proposal. These commitments are included in Appendix 6.

In reviewing the adequacy of these commitments, the EPA believes that it is essential that auditing of compliance of the commitments is reviewed at critical points during the projected life of the proposed development. These critical times have been identified as immediately pre-construction, pre-operation, and at the end of Stage 1 i.e. after the first five years of operation. The EPA considers that the ability to proceed with subsequent stages will be dependent upon annual audits of performance, and an overall review after the five year period. A formal review after the initial five year period, and each stage following Stage 1, and should be achieved through direct agreement with the proponent.

The Environmental Protection Authority is satisfied that, using information currently available, the following recommendations may be made to the Minister for the Environment.

Recommendation 1

The EPA recommends that the impact of Coral Coast Resort on the Ningaloo Reef is environmentally acceptable subject to the proponent's commitments and recommendations contained within this report. In reaching this conclusion, the EPA has identified the following issues as being worthy of detailed consideration :

- **protection of Ningaloo Reef;**
- **potable water supply;**

- **proposed coral garden within the marina;**
- **nutrient management;**
- **groundwater quality;**
- **terrestrial and marine flora and fauna;**
- **littoral drift;**
- **coastal dunes;**
- **long term management issues;**
- **flood and storm surge risk;**
- **size and nature of development;**
- **water quality within the marina;**
- **solid waste management;**
- **construction impacts;**
- **impact on existing communities; and**
- **long term maintenance of infrastructure.**

See Recommended Environmental Condition 1 (Section 6).

Recommendation 2

The Environmental Protection Authority recommends that the proposed method of providing potable water is environmentally acceptable, provided that :

- **the treatment of drinking water complies with standards specified in the 'Australian Water Quality Guidelines for Fresh and Marine Waters'; and**
- **residual 'bleed water' resulting from reverse osmosis treatment is discharged in a way which is acceptable to the Environmental Protection Authority.**

See Recommended Environmental Condition 3 (Section 6).

Recommendation 3

The EPA recommends that the proponent provide to the Department of Conservation and Land Management and the Environmental Protection Authority specific design and management details of the proposed coral garden which indicate that the environmental effects are acceptable, when details are known. This information should include where coral are proposed to be taken from, to colonise the garden.

See Recommended Environmental Condition 4 (Section 6).

Recommendation 4

The Environmental Protection Authority recommends that the Shallow Groundwater Monitoring Programme is environmentally acceptable provided that :

- **the Plan is prepared and undertaken to the satisfaction of the Environmental Protection Authority on advice from the Water Authority of Western Australia, and Geological Survey Division of the Department of Minerals and Energy;**
- **he proponent undertake groundwater monitoring prior to development occurring; and**

- **the proponent specify remedial action which would be undertaken in the event that groundwater monitoring indicates unacceptable levels of contamination, to the satisfaction of the Environmental Protection Authority and the Water Authority of Western Australia.**

See Recommended Environmental Condition 5 (Section 6).

Recommendation 5

The EPA recommends that the proponent liaise further with officers of the Western Australian Museum prior to the construction phase of the development, to identify methods which would be adopted to determine whether subterranean stygofauna are present at the site.

If fauna is located at the site, measures should be undertaken to minimise impacts to the satisfaction of the Environmental Protection Authority, on advice from the Western Australian Museum.

See Recommended Environmental Condition 6-1 and 6-2 (Section 6).

Recommendation 6

The Environmental Protection Authority recommends that the proponent confirm whether 'Priority 2' flora species and other significant flora species identified on site are represented in the vicinity of the proposed development site to the satisfaction of the Environmental Protection Authority with advice from the Department of Conservation and Land Management prior to construction commencing.

See Recommended Environmental Condition 6-3 (Section 6).

Recommendation 7

The Environmental Protection Authority recommends that the Shoreline Movement Monitoring Plan be continued for a period of five years following development, with a review of monitoring results by the Department of Environmental Protection, on advice from the Department of Transport and the Department of Conservation and Land Management, after the first 5 year period to determine whether further monitoring is warranted.

The EPA also recommends that if, as a result of monitoring undertaken as part of the Shoreline Movement Monitoring Plan, a significant build up of sand occurs at one side of the breakwaters, or alternatively beach erosion is occurring as a result of the breakwater construction, the proponent should be required to implement remedial works. These details and extent of works should be undertaken to minimise damage to the dune forms, to the satisfaction of the Environmental Protection Authority on advice from the Department of Conservation and Land Management, the Department of Transport and the Department of Environmental Protection.

See Recommended Environmental Condition 7 (Section 6).

Recommendation 8

The Environmental Protection Authority recommends that the proponent should be required to remove the proposed golf course links from dune area if on-going monitoring as part of the Foreshore Management Plan indicates an unacceptable impact on dunes.

See Recommended Environmental Condition 8 (Section 6).

Recommendation 9

The Environmental Protection Authority recommends that an 'Agreement' be prepared between the proponent, State Government and the Shire of Carnarvon. This Agreement should address the following issues :

- details associated with the marine management component, including baseline studies, management infrastructure and on-going monitoring costs. These should be agreed with the Minister for the Environment, on advice from Conservation and Land Management and the Fisheries Department, prior to commencement of construction. Technical details should be discussed in detail with the Department of Conservation and Land Management and the Fisheries Department.
- monitoring and management plans to be prepared by the proponent, to include but not be restricted to the environmental objectives identified by the Environmental Protection Authority in this assessment report;
- audit performance of all monitoring and management programmes on an annual basis, with a major review of these results after the first five years following construction and each stage following Stage 1;
- a requirement for the Environmental Protection Authority to undertake a detailed review of the development and results of the monitoring and management programmes after the first five years and each stage thereafter;
- details of long term maintenance of infrastructure associated with the resort development; and
- further development beyond five years proposed as part of the Coral Coast Resort development to be in accordance with the Environmental Protection Authority's advice (to the Minister) following review of the audit performance after the first five year period.

See Recommended Environmental Condition 9 (Section 6).

6. Recommended Environmental Conditions

Based on the assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate.

PROPOSAL: CORAL COAST RESORT, MAUDS LANDING (SHIRE OF CARNARVON) (335)
PROPONENT: CORAL COAST MARINA DEVELOPMENT PTY LTD

This proposal to construct and operate a marina and resort development at Mauds Landing may be implemented subject to the following conditions:

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

- 1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Public Environmental Review and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

A schedule of those Environmental Management Commitments (September 1995) which will be audited by the Department of Environmental Protection was published in Environmental Protection Authority Bulletin 796 (Appendix 6) and a copy is attached.

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

- 2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.
- 2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Potable water supply Recommendation 2

The proponent intends to supply treated artesian water as a potable water source.

- 3-1 Disposal of effluent from the potable water treatment plant shall be disposed of to the requirements of the Environmental Protection Authority.

4 Coral Garden Recommendation 3

The proponent intends to create a "coral garden" within the marina.

- 4-1 During the design stage for the coral garden, the proponent shall liaise closely with the Department of Environmental Protection and the Department of Conservation and Land Management.

5 Groundwater Recommendation 4

- 5-1 Prior to commencement of construction, the proponent shall have prepared a Shallow Groundwater Monitoring Programme and have installed the monitoring bores to the requirements of the Environmental Protection Authority on advice of the Water Authority of Western Australia and the Geological Survey Division of the Department of Minerals and Energy.
- 5-2 Prior to development occurring which may impact on groundwater quality, the proponent shall undertake monitoring of groundwater to the requirements of the Environmental Protection Authority on advice of the Water Authority of Western Australia.
- 5-3 In the event that groundwater monitoring required by conditions 5-1 and 5-2 indicates unacceptable levels of contamination, the proponent shall take remedial action to the

requirements of the Environmental Protection Authority on advice of the Water Authority of Western Australia.

6 Flora and Fauna Recommendation 5

6-1 Prior to construction, the proponent shall liaise with the Western Australian Museum to determine whether subterranean fauna (stygo fauna) are present at the site.

6-2 If subterranean fauna (stygo fauna) are located at the site, the proponent shall undertake measures to minimise any adverse impacts, to the requirements of the Environmental Protection Authority on advice of the Western Australian Museum.

Recommendation 6

6-3 Prior to construction commencing, the proponent shall confirm whether 'Priority 2' flora species and other significant flora species identified on site are represented elsewhere in the vicinity of the site, to the requirements of the Environmental Protection Authority on advice of the Department of Conservation and Land Management.

7 Shoreline Movement Monitoring Recommendation 7

7-1 The proponent shall continue the Shoreline Movement Monitoring Plan for a period of five years following completion of construction of the breakwaters, with a review of monitoring results after the first five-year period following construction to determine whether further monitoring is warranted.

7-2 If, as a result of monitoring undertaken as part of the Shoreline Movement Monitoring Plan referred to in condition 6-1, a significant build-up of sand occurs, the proponent shall implement remedial works to the requirements of the Environmental Protection Authority on advice of the Department of Conservation and Land Management and the Department of Transport.

8 Protection of Coastal Dunes Recommendation 8

8-1 If monitoring forming part of the Foreshore Management Plan referred to in the proponent's commitment 8-1 indicates an unacceptable impact on dunes in the opinion of the Minister for the Environment, the proponent shall remove the parts of the golf course which are located on the dune area.

9 Long-term Management Recommendation 9

This condition to be subject to further discussion

9-1 Prior to the commencement of construction, the proponent shall prepare a Legal Agreement between the proponent, the State Government and the Shire of Carnarvon, to the requirements of the Minister for the Environment. This Agreement shall include but not be restricted to the following issues:

- the marine management component, including baseline studies, management infrastructure and on-going monitoring costs. These should be agreed to CALM's and the Fisheries Department's satisfaction. Technical details should be discussed in detail with CALM.
- monitoring and management plans to be prepared by the proponent, i.e.
 - drainage and nutrient management;
 - waste management;
 - foreshore management;
 - Coral Community Monitoring Programme;
 - Water Quality and Sediment Monitoring Programme;
 - Nutrient and Irrigation Management Plan;
 - Shoreline Movement Monitoring Programme;

These should include but is not restricted to the environmental objectives identified by the EPA in its assessment report (Bulletin 796);

- include audit performance of all monitoring and management programmes on an annual basis, with provision for a major review of these results each five years following commencement of construction, or on commencement of each stage whichever is the sooner;
- a requirement for the EPA to undertake a detailed review of the resort development and results of the monitoring and management programmes after the first five years;
- details of long term maintenance of infrastructure associated with the resort development; and
- further development beyond five years proposed as part of the Coral Coast Resort development to be in accordance with the EPA's views following review of the audit performance after the first five year period.

10 Proponent

These conditions legally apply to the nominated proponent.

10-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

11 Time Limit on Approval

The environmental approval for the proposal is limited.

- 11-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period to the Minister for the Environment.

Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Department of Environmental Protection that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years.

12 Compliance Auditing

To help determine environmental performance, periodic reports on progress in implementation of the proposal are required.

- 12-1 The proponent shall submit periodic Progress and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

- 1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.
- 2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

The proponent is required to apply for a Works Approval and License for the proposed Wastewater Treatment Plant under the provisions of Part V of the Environmental Protection Act.

7. References

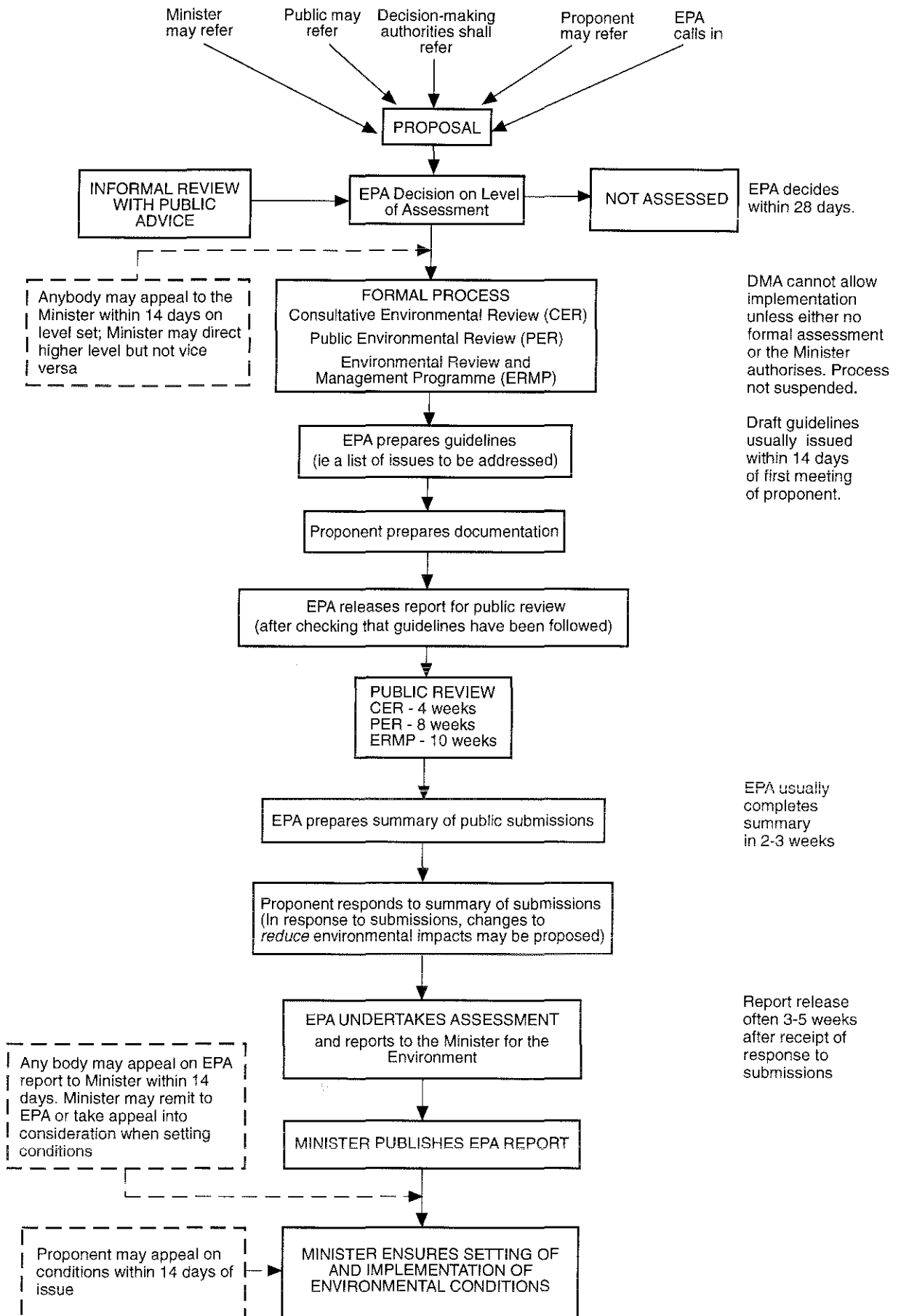
- Australia and New Zealand Environment and Conservation Council (1992) National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters.
- Bradley, A and Latto, A. (1995) Review of Sewage Disposal at Coral Bay. Department of Environmental Protection Report to the Environmental Protection Authority (unpublished).
- Bowman Bishaw Gorham (1995) Coral Coast Resort - Mauds Landing Public Environmental Review. Report prepared for Coral Coast Marina Pty Ltd.
- Department of Conservation and Environment (1984) Coral Bay Draft Coastal Management Plan. Bulletin 174.
- Department of Conservation and Land Management (1989) Ningaloo Marine Park (State Waters) Management Plan 1989 - 1999 (2) .
- Department of Conservation and Land Management (1994) A representative marine reserve system for Western Australia - Report of the Marine Parks and Reserves Selection Working Group.
- Department of Environmental Protection (1995) Land Development Sites - A Guideline for the Prevention of Pollution from Land Development Sites in Western Australia. Department of Environmental Protection (WA) .
- Department of Environmental Protection (1995) Survey of Water Quality, groundwater, sediments and benthic habitats at Coral Bay, Ningaloo Reef, Western Australia. Report to the Department of Conservation and Land Management. Technical Series No. 80
- Department of Environmental Protection (1995) Southern Metropolitan Coastal Waters Study (1991 - 1994): Perth, Western Australia. (unpublished draft).
- Department of Mines (1991) 'Environmental Management of quarries :Development, Operation and Rehabilitation Guidelines'.
- Department of Planning and Urban Development (1992) Coral Bay Planning Strategy - A Strategy to guide the future use, development and conservation of land at Coral Bay.
- Environmental Protection Authority (1975) Conservation Reserves for Western Australia as recommended by the Environmental Protection Authority. System 9 Recommendation 9.2.
- Environmental Protection Authority (1991) Proposed offshore petroleum exploration drilling in EP 325, North West Shelf. Bulletin 546.
- Environmental Protection Authority (1993) Western Australian Water Quality Guidelines for Fresh and Marine Waters'. Bulletin 711.
- ERM Mitchell McCotter (1994) Draft Gascoyne Coast Regional Strategy. Report prepared for State Planning Commission.
- Government of Western Australia (1994) New Horizons in Marine Management - a Government position statement on conserving the marine environment.
- Great Barrier Reef Marine Park Authority (1994) Environmental Guidelines for Marinas in the Great Barrier Reef Marine Park.
- Jones Lang Wootton (1993) 'North West Cape Tourism Development Study'.
- Koltasz Smith and Partners (1995) Coral Coast Resort Master Plan - 'Mauds Landing.
- Main Roads Department (1994) Roads 2020 - Regional Road Development Strategy. Report No. 185P.
- Mines Department of WA (1991) Environmental Management of Quarries : development, operation and rehabilitation guidelines.

- Peters, A. and Koen, J. F. Verhoeven (1994) 'Impact of Artificial Lighting on the Seaward Orientation of Hatchling Loggerhead Turtles' in *Journal of Herpetology* (1994) 28 (1) : 112 - 114.
- Resource Assessment Commission (1993) *Coastal Zone Inquiry - Final Report into the management and use of Australia's Coastal Resources*.
- Simpson, C., Carey, J. L. and Masini, R. J. (1993) 'Destruction of corals and other reef animals by coral spawn slicks on Ningaloo Reef Western Australia' in *Coral Reefs* (1993) 12 ; 185 - 191.
- Simpson, C and Field, S (in prep.) *Coral Bay Pollution Study*. Unpublished report to the Department of Conservation and Land management.
- Stejskal, I V. (1995) 'Exploration in Sensitive areas : convincing the community' in *APEA Journal* 1985 : 822 - 829.
- Taylor, G (1994) *Whale Sharks - the Giants of Ningaloo Reef*. Angus and Robertson.
- Turner, S J (1994) 'Spatial variability in the abundance of the corallivorous gastropod *Drupella cornus*' in *Coral Reefs* (1994) 13 : 41 - 48.
- Turner, S J (Ed.) (1994) *Drupella Cornus : A Synopsis*. Proceedings of a Workshop held at the Department of Conservation and Land Management, Como, Western Australia 21 - 22 November 1991. CALM Occasional Paper No. 3/92 February 1992.
- WA Planning Commission Policy (formerly State Planning Commission) No. DC 1.8. 'Procedures for Approval of Artificial Waterways and Canal Estates'.
- WA Planning Commission Policy (formerly State Planning Commission) Policy No. DC 6.1 'Country Coastal Planning Policy'.

Appendix 1

Environmental impact assessment flow chart

EIA PROCESS FLOW CHART



Appendix 2

Summary of public submissions and the proponent's response

8

PROPOSERS' RESPONSE

PROPOSED CORAL COAST MARINA RESORT, MAUDS LANDING - PUBLIC ENVIRONMENTAL REVIEW -

RESPONSE TO ISSUES RAISED IN PUBLIC SUBMISSIONS

This document forms the proponent's (Coral Coast Marina Development Pty Ltd) principal responses to submissions regarding the Public Environmental Review (PER) for the proposed Coral Coast Resort, Mauds' Landing.

The responses are to the issues and comments within public submissions to the PER, summarised in Department of Environmental Protection (DEP) correspondence to the proponent dated 9 May, 1995. For ease of reference, the following comments and responses are numbered in accordance with the DEP correspondence.

1. JUSTIFICATION FOR THE PROJECT

1.1. The 'Project Justification' section of the PER rationalises the need for a project as one of lack of services to the present tourist and resident population of the region. Proposal should not be justified just because of existing poor management of services at the existing Bills Bay/ Coral Bay community. The proponent's solution to this problem seems to be to bring in thousands more tourists, which will undoubtedly increase pressure on the region. The view was expressed in some submissions that a lower key solution would be a preferable option.

Response:

The project is not justified on the basis of lack of services to existing tourists and residents nor on the poor management of services at the existing Bill's Bay/Coral Bay community. The project is justified on the basis of projected increases in tourism to the Gascoyne Region and the need to adequately provide for the inevitable and substantial increases in tourism to the area. Previous studies in respect of the Gascoyne Region, notably the North-West Cape Tourism Development Study (JLW 1993), the Ningaloo Marine Park Management Plan (CALM 1989), the Coral Bay Planning Strategy (DPUD 1992) and most recently the Gascoyne Coast Regional

Strategy all clearly indicate that the natural resources of the area are, in some places, already under severe stress under current levels of visitation.

Regional tourism profiles for the Gascoyne Region already indicate that the present visitation levels are increasing annually by up to 6% to commercial accommodation which, if symptomatic of the broader visitor spectrum, would represent a present annual increase of some 135,000 visitor nights per annum.

The North-West Cape Tourism Development Study (JLW Study) concluded that there was an immediate need for positive action to bring tourist demand and resource management into sustainable balance and, most importantly, that there was no viable "do nothing" option as the growing tourism market would not be satisfied and the resource would be in danger of degradation.

The project justification therefore is clearly driven by the need to provide for the inevitable increases in tourism to Ningaloo Marine Park, particularly Coral Bay and, more importantly, to provide for that increase in tourism in an environmentally sustainable manner. Furthermore, as discussed in the PER, development of a major tourist resort at Bill's Bay is not a viable option for a number of reasons, including the fact that the existing development and landform mitigate against achievement of key concepts of the Coral Coast Resort, including the removal of boat harbourage within Bill's Bay to inland marina facilities, the provision of adequate public swimming areas and the reduction of both physical and environmental pressures on the marine environment of Bill's Bay.

Coral Coast Resort seeks to accommodate and manage the inevitable increase in pressures on the Region in a sustainable manner and by virtue of the scale of the project, is able to offer the opportunity for resolution of a number of existing environmental management problems at Bill's Bay, including the ability for the existing settlement to link into the services provided by Coral Coast Resort and particularly, sewerage.

Whilst it is acknowledged that some sectors of the community may prefer to see a lower key solution, it must be accepted that Coral Coast Resort is providing substantial public and community infrastructure at no cost to Government and is therefore driven by the need for consideration of economies of scale. As recognized in the Gascoyne Coast Regional Strategy, a lower key or tourist only option is unlikely to be a viable proposition, at least not without significant Government expenditure. A tourist only development catering for comparable

visitation is estimated at approximately \$25million. Similarly, the Strategy recognized that the residential component of Coral Coast Resort is essential to the viability of the project as it provides the financial return for the significant private investment in public infrastructure that CCMD will be undertaking on behalf of, and at no cost to, State or Local Government. Moreover, the Ministry for Planning, in its submission on the PER has also recognised the importance of the residential component, stating:

"In relation to the freehold residential part of the proposal, it is now considered that this will probably stabilise the development, adding more functions, and a greater reason for it to continue successfully."

1.2. It was claimed that the extrapolation of visitor trends (PER p. 13 to 16) is deliberately misleading and is not based on existing models or studies, and that the analysis of tourism growth in the region needs to be justified. Recent research indicates that lower key small scale ecotourism is more in keeping with recent consumer trends, rather than mega resorts like the one proposed and described in the PER.

Response:

The tourism projections contained at Section 2.3.1 of the PER are consistent with the expectations of the Western Australian Tourism Commission and indicate the potential for doubling of total visitation to the Gascoyne from present levels of approximately 2,200,000 visitor nights per annum to in the order of 4,000,000 visitor nights per annum within the foreseeable future. While lower key, small scale eco-tourism resorts may be a preferable alternative to sections of the community, it is considered that Coral Coast Resort provides the best and most sustainable option for catering for this projected growth in tourism in a location that is already disturbed and under increasing visitor pressure. Apart from the question of viability of dispersed small scale eco-tourism resorts, particularly in respect of the provision of adequate services infrastructure, it is considered that this approach would result in a much higher level of disturbance in areas adjacent to the Ningaloo Marine Park by virtue of the need to open up a series of smaller but more numerous pristine areas in order to cater for the inevitable level of visitation projected for the area.

It is considered far preferable that increased visitation be concentrated at one location adjacent to the Ningaloo Marine Park, particularly one that is already disturbed and under pressure, so as to

maximise both the available physical and financial management resources available as well as limiting possible impacts to a single rather than several dispersed locations.

1.3. It was claimed that the proponent has not undertaken an economic study to justify statements made within the PER regarding fees generated by the proposed visitor centre (pages 11 and 45). Operating a marine programme to manage the potential impact of the significant increase in number of visitors as a result of the resort development will far exceed the willingness of visitors to pay for entry into the proposed interpretation centre.

Response:

The proposed Visitor/Research Centre to be constructed by the proponent and operated by CALM is projected to generate revenue to CALM in the order of \$250,000 p.a. in the initial stages, increasing to some \$500,000 p.a. at full development. The projections at full development are based on a net income of \$2.50 per head and 200,000 visitations p.a. to the Centre from a projected total visitation to the Resort of some 750,000 visitor nights p.a. The projected income is considered achievable and in conjunction with the proponents own management commitments under the PER represents a significant contribution towards overall management requirements.

The above considerations aside, it is necessary to balance the concern expressed against the alternative. Visitation levels to the area and to the Marine Park are increasing annually and expectations are that total visitation to the Region could double over the foreseeable future. The inevitable increases in visitation will in any case result in increased impacts on the Park which will require management by CALM. At the very least, Coral Coast Resort and particularly the Visitor Centre provides the opportunity to CALM to generate significant levels of income to offset its increased costs. The "do nothing" option would merely result in increased costs with little opportunity for income generation other than by a general public levy as has been proposed for other major National Parks within the State.

1.4. PER does not include a 'cost benefit' analysis. Any proposal that encourages thousands of tourists to an area must consider 'off site' impacts. This will have implications on adjacent community costs, for example roads, extra personnel for airports, welfare services, police, council maintenance etc.

These costs would not be met by the proponent and will have significant financial implications on community resources.

Response:

The PER clearly identifies both the on-site and off-site physical and environmental impacts of Coral Coast Resort. The community costs and implications are discussed in the Coral Coast Resort Master Plan Report which was also lodged with the respective authorities during the course of advertising of the PER. More importantly, it should be recognised that the community costs associated with Coral Coast Resort are inevitable as those community facilities and resources will have to be provided in any case to cater for the projected increases in visitation to the Region, albeit over a potentially longer time frame. What is most significant to note is that the establishment cost in providing a substantial portion of that infrastructure will be met by the proponent contrary to the concerns raised in the submission. More specifically, the proponent will be providing, at no cost to Government or Local Government all power, water and sewerage headwork infrastructure to service the town as well as providing, within the townsite, both building and land for a school, community and emergency services, administration and community recreation. These buildings and land, while they will need to be staffed and operated by the appropriate Authority, will be built by the proponent, thus in fact saving both State and Local Government considerable capital expenditure.

1.5. There is no evidence to support the statement made by the proponent that the development will result in the reduction of transport costs with regard to building materials and services. Further, it was claimed that the location of supplies could have a negative impact on the towns of Carnarvon and Exmouth, as lack of planning could result in the new town becoming a regional focus, with the status of the existing towns being downgraded.

Response:

Construction expenditure for the resort is estimated at \$200 million over a 15-20 year period with a further \$225 million in domestic construction over a similar period. The injection of in excess of \$400 million dollars into the Regional economy, particularly over a sustained period of time, provides the opportunity for the establishment of major supply industries within the Region itself. For example, expressions of interest have already been received for the establishment of a concrete block manufacturing plant in Exmouth utilising local stones and

aggregates. Throughout its construction life, the Resort will require significant quantities of a wide range of construction materials, many of which could be manufactured or fabricated "locally". The construction requirements of the Resort provides local business with the surety of demand to construct manufacturing plants in the Region and ultimately to supply the broader North-West.

Transport costs are widely acknowledged as being a significant contributor to increased building costs in the North-West as a significant portion of materials and supplies are sourced ex-Perth. Local manufacture, combined with economies of scale, could only lead to a reduction of the impact of transport costs on total building costs.

The opportunity for such industries to locate at Coral Coast Resort is non-existent. Coral Coast Resort is first and foremost a Resort townsite. The Services/Light Industrial Area is not intended to provide locational opportunities for manufacturing or service industries. Its purpose is to accommodate utility services and to service only the immediate "maintenance" requirements of the Resort. Industry therefore can only locate in Carnarvon or Exmouth and as a consequence thereof, ensuring the continuing viability of those townsites.

1.6. Information presented in the PER relating to the Gascoyne Coast Regional Strategy is considered to be misleading. The Strategy recognised that Mauds Landing was appropriate for residential development to support the tourism industry, *but also stated that it should not be a typical urban development.* Traditional 'suburban' subdivision (including canal type) was not supported. This position was taken in the knowledge that sale of lots is needed to cover the marina and service infrastructure costs. Tourism was to have pre-eminence.

Response:

The suggestion that the information presented in the PER in relation to the Gascoyne Coast Regional Strategy is considered "misleading" is strongly contested. Pages 9-11 inclusive of the PER para-phrase the essential components of the Strategy and comment on the viability of a "tourism only" option which the Strategy itself seriously questions.

In respect of the residential component of the Resort, the PER and the subsequent Master Plan Report adopt the recommendations of the Strategy which at page 3.32 states :

“Any residential development in the area should be designed to reflect the unique environmental qualities. Traditional suburban design should be avoided and an emphasis placed on design for water sensitivity, the climatic conditions and the visual character of the landscape. Small lots and medium density may be appropriate because of their ability to be serviced cost effectively and their low water use characteristics. It would be preferable for developments to be designed as a package in order to achieve a unique and consistent character which is compatible with the natural setting.”

The Coral Coast Resort Master Plan does not propose “traditional suburban design”, as it adopts the principles of “Green Street” and proposes that:

- approximately 90% of lots be of 500m² or less with 56% of lots being 350m²;
- 27% of all residential dwellings be medium density;
- specific townsite development controls be imposed to ensure a high standard of visual amenity compatible with the environment including height controls and a specified palette of colours and materials;
- the development of a specific range of house designs suited to the micro-climate and lifestyle considerations;
- specific house and land packages within areas of the Townsite of high visual importance; and
- the development of landscape guidelines which promote native flora.

The Gascoyne Coast Regional Strategy, in consideration of the development of residential land at Mauds Landing, further concludes that if there is to be residential development on the west coast of the Study Area, then *“Mauds Landing is the most appropriate location”*.

The Strategy (as quoted above) seeks to define what forms of residential development may be appropriate and, contrary to the claim in the submissions, the Conclusions and Recommendations of the Strategy do not preclude consideration of canal type development.

More importantly, CCMD extensively briefed the consultants engaged to prepare the Strategy as to the nature and general form of the proposals for Coral Coast Resort, including discussion of a preliminary Master Plan which clearly showed development abutting and/or in close proximity to the marina water body.

Accordingly, the claim made in the submissions that canal type subdivision was not supported by the Strategy is incorrect. The residential component of Coral Coast Resort is clearly consistent with the recommendations of the Gascoyne Coast Regional Strategy.

1.7. One of the major justifications of the proposal given in the PER is to allow the existing Coral Bay community connection to a proper wastewater treatment system and so improve water quality within Bills Bay. This justification is considered to be misleading and 'nebulous' as there is no guarantee that this connection will in fact occur, and the proponent explicitly states that they will not be responsible. More details such as costs to the community and time frames are required, i.e. on-going commitments to maintain the system and accommodate for future growth of the Coral Bay community.

Response:

The ability for the existing Coral Bay community to connect to sewer is not cited as a justification for the project but rather a significant benefit of the project to the community, the Marine Park and Government. The PER therefore is not misleading. It is not the province of the proponents to commit Government to connection strategies for the existing Coral Bay townsite but it is a matter which needs to be addressed by the respective Authorities so as to ensure that Coral Bay is connected at the earliest opportunity.

Coral Coast Marina Development Pty Ltd will provide a sewage treatment facility with the capacity to treat current and future effluent volumes from both the Coral Coast Resort and the Coral Bay townsite (Proponent Commitment No.2). The facility will be constructed within the first stage of development (at the commencement of the project) and will be maintained for a period of at least 5 years, following which time responsibility (and plant) will transfer to the Shire of Carnarvon or the Water Authority of Western Australia.

Similarly, CCMD will also provide power and potable water headworks facilities which could also service the Coral Bay townsite. The cost of the services headworks to be provided by CCMD is in the order of \$5 million, which would need to be borne by others if the Coral Coast Resort did not proceed. It is therefore considered reasonable, and appropriate, that the relevant authorities utilise this opportunity, and provide the connection necessary to treat effluent generated by the Coral Bay townsite.

1.8. The Gascoyne Coastal Regional Strategy states that a major development at Mauds Landing 'had the potential to undermine the viability of the Town of Exmouth'. Concern was expressed that the high cost of providing and maintaining services to a remote community would become untenable for the local authority and a liability for the State Government if growth is diverted away from an established centre. A conclusion of the Strategy is that a town at Maud's Landing would compete with Exmouth.

Response:

Coral Coast Resort will clearly provide a major catalyst for the economic development of the Gascoyne Region, both in respect of facilitating a substantial expansion in tourism and as a consequence thereof, the broader economic base of the region. The potential benefits of the project to the Region are widely acknowledged within the existing townsite of Exmouth and indeed, the project is strongly supported by the Exmouth Chamber of Commerce which views the project as providing an "immense boost" to the economic and social fabric of the town.

Projected increases in both construction and tourism expenditure as a consequence of Coral Coast Resort are substantial and will lead to the creation of a number of both direct and indirect service industries and employment opportunities in both Exmouth and Carnarvon.

The matter of provision and maintenance of community services has been addressed previously in Response 1.4 from which it is concluded that Coral Coast Resort will in fact save the community considerable expenditure on the provision of infrastructure which will ultimately be required in any case.

In respect of the provision of Local Government services, the Master Plan Report addresses the matter of townsite management, which for at least the first five years will be the sole

responsibility of the proponent. The Master plan provides detailed Income and Expenditure Budgets for the Townsite which indicate the ability for the Townsite to be provided with a broad level of Local Government services comparable to that of Exmouth within the revenue generated by the Townsite. In this respect, it is important to note the significance of the residential component of the Resort in the generation of Townsite Income. The estimates of Income have been prepared with the assistance of the State Valuer General and Expenditure estimates have been derived from the Municipal Budget of the Shire of Exmouth. Projected Rates for a typical residential property are comparable to those of the Shire.

1.9. The proposed resort would be better located at Exmouth as there is already existing infrastructure there, the adjacent marine community is already exposed to human disturbance and development may therefore have less impact, the waters of Exmouth Gulf are more sheltered for boating, an airport already exists, dive and charter boats already provide services, and service facilities (e.g. power, water sewage treatment) already exist and can be upgraded rather than created as new facilities, increasing potential environmental impacts.

Response:

Section 2.6 of the PER evaluates the alternatives to Coral Coast Resort, including the development of a comparable major resort facility within or adjacent to the existing Exmouth townsite.

The evaluation acknowledges the potential of Exmouth and its ability to expand its tourist facilities as a consequence of the project, but concludes that two principal factors mitigate against the development of a major tourist resort and namely:

- Exmouth's distance from Coral Bay, which is and will continue to be a major destination, precludes effective servicing of the tourist demand and as a consequence is unlikely to contain the pressure for substantial expansion of tourist accommodation and infrastructure at Coral Bay; and
- Exmouth experiences a more severe micro-climate, particularly during summer, making it a less attractive location. By comparison, Coral Bay / Mauds Landing experiences summer conditions more comparable to those of Perth.

It is also to be noted that location of the Resort at Exmouth would not yield the much needed environmental management benefits to Coral Bay that accrue from the project.

1.10. The proposed development is considered to be inconsistent with the conclusions of the recent Resource Assessment Commission Coastal Zone Inquiry, for example 'Tourism developments should not provide an indirect means of wider development, specifically subdivision and land development, unless associated development is in accordance with local and regional land use policies and guidelines' (Objectives and Guidelines for Coastal Management - RAC p. 27).

Response:

Coral Coast Resort is not an indirect means of achieving "wider development". Rather, Coral Coast Resort is generated by the recognised need to cater for increased tourist visitation to the Region in an environmentally sustainable manner. The proposed development is clearly "in accordance with local and regional land use policies and guidelines", the most recent and relevant being the Gascoyne Coast Regional Strategy prepared by the West Australian Planning Commission in 1994.

The Gascoyne Regional Strategy considers the proposed Coral Coast Resort in considerable detail (Section 3.3.2). Additionally as noted in Response 1.6, the consultants engaged to prepare the Strategy were extensively briefed by CCMD on the proposal, including a preliminary Master Plan which very closely resembled that contained in the PER. Accordingly, the Strategy "participants" were in possession of a significant level of detail in respect of the project at the time of preparation of the Strategy.

The Strategy evaluated the proposals for Mauds Landing together with the "do nothing" options against a wide range of economic, environmental, social and management criteria and concluded with a preference to the "tourism only" option. The Strategy also recognised that this option may not be viable, at least not without significant Government assistance, and accepted Mauds Landing as the "*most appropriate location*" for any residential development subject to sustainability and there being no significant impacts on the reef ecosystem. It is also significant in this respect to note that the Ministry for Planning, in its response to the PER, sees no objection to the development proceeding from a strategic planning viewpoint.

The proposals for Coral Coast Resort accord with the Gascoyne Coast Regional Strategy which forms the foundation for local and regional landuse management for the Gascoyne.

1.11. The proposal is contrary to the 'Coral Bay Draft Management Plan' (DCE Bulletin 174). This plan recommended 'no development at Mauds Landing due to lack of development capability'. The Plan recommends that the existing zoning of 'townsite' be revoked and the site be vested as an 'A' Class Reserve for National Park.

Response:

DCE Bulletin 174 - "Coral Bay Draft Coastal Management Plan" is of limited contemporary relevance. The Bulletin, which was published in 1984, has been superseded by subsequent studies and notably the Ningaloo Marine Park Management Plan (CALM, 1989), which acknowledges the potential for a marina based tourist resort at Maud's Landing. The "Coral Bay Planning Strategy" (DPUD, 1992) and the Gascoyne Coast Regional Strategy (SPC, 1994) further support development at Maud's Landing.

2. PROJECT DESIGN

2.1. Proposal does not make provision for rising sea levels due to the Greenhouse effect or climatic change and sea level rise. This was considered particularly important in view of the low lying nature of the site.

Response:

The proposed development does include appropriate allowances for the possible effects of a rise in sea levels due to Greenhouse Effects. The assessment of minimum building levels includes an allowance for a 0.3 metre rise in mean sea level (please refer to Technical Appendix G in the PER).

2.2. PER does not adequately address details associated with calculated floor levels. Concern was expressed that development behind the built up areas would only be protected from inundation if there is a continuous barrier above storm surge level. It was suggested that in planning for a worst case scenario, should not the highest astronomical tide or the mean high water spring tide levels be used in the floor level calculations.

Response:

The approach used in the PER to determine the required building levels is an appropriate use of joint probability to determine the 100 year return period water level caused by ocean storm surge. These calculations included a sensitivity analysis using higher and less frequent tidal levels with more frequent and lower storm surge values. The following is an example.

Buildings on the Coastal Dunes

Astronomical tidal level = Mean High Water Springs	+0.6m AHD
25 year return period storm surge	+1.5m
Climate change (Greenhouse) allowance	+0.3m
Wave run-up	+1.2m
<u>Freeboard</u>	<u>+0.4m</u>
<u>Recommended minimum finished floor level</u>	<u>+4.0m AHD</u>

This analysis gives a slightly lower floor level than that provided in the PER. Further, the recommended level in the PER is +4.2m AHD and is in line with the upper end of the range suggested in the Gascoyne Coast Regional Strategy (State Planning Commission, 1995). On page 2.18 of this document, it is suggested that coastal developments in the area should be at 3.0 to 4.2m AHD to allow for storm surges and rises in sea level. As the value in the PER is at the upper level, the proposed building level is considered appropriate.

2.3. It is unclear whether the calculations for building setbacks include the impact of the site when fully developed, i.e. after construction of the harbour entrance and the marina. Development is considered to be too close to High Water Mark (HWM).

Response:

The proposed set backs to the development have been calculated for the fully developed scenario. The buffer, which varies from typically 120m between the jetty and marina increasing to between 120 and 160m east of the entrance, includes appropriate allowances for longshore drift, cross-shore movement during severe storm events, and a factor of safety.

The proposed set back also coincides with the seaward boundary of the relict foredune plain delineated in the geomorphological investigations. The general building line adopted is marked by a prominent change in gradient and vegetation density between the foredune and the relict dune plain, which is considered to be the result of a past major erosional event prior to recorded history.

This provides confirmation of the adequacy of the proposed set backs.

2.4. Proposal should make provision for 'sanctuary areas' adjacent to the development, particularly around beach and salt lake areas, to provide a buffer for displaced fauna, for example birds. It was suggested that there should be a continuous fire ban in these buffer areas.

Response:

The dunal formations of Point Maud are proposed for retention and management for conservation, as is the majority of the foredune system within the townsite boundary. These areas will provide "sanctuary areas" around the beach.

The salt lake areas are expansive and continue well outside of the development site boundary. These areas are not proposed for development. Furthermore, the project is planned to proceed in a staged manner, therefore providing the opportunity for any displaced fauna to relocate as the project progresses. It is not proposed to burn any of these areas.

These factors are considered to provide an adequate buffer for any fauna displaced by the project.

2.5. It is unclear whether the proposed development will make provision for boat service facilities. Small boats are currently cleaned at Coral Bay, and pollutants from this activity is not managed at present. There is a perceived need for this type of facility (big boats currently go to Carnarvon). There may be an opportunity to include this type of facility in the proposed LIA.

Response:

Boat cleaning and servicing facilities are not proposed within the development area due to the potential for pollution, however this type of activity could be provided for in the Light Industrial Area.

Larger boats will continue to utilise either Carnarvon or Exmouth for such servicing, or could be transported from the marina to these destinations by road trailer.

2.6. Details of drainage proposals around the marina area are required in order to assess whether there may be a pollution problem arising from stormwater spill over during prolonged rain periods.

Response:

No routine discharge of stormwater to the marina or marine environment is proposed (Proponent Commitment No. 3). Stormwater runoff from most rainfall events will be managed so that all water will be directed away from the marina, with the majority directed inland to the low lying area to the east.

Figure 3.1 of the PER shows the generalised runoff paths. It is acknowledged that in severe rain storm events some overflows may occur into the harbour, however in these circumstances substantial dilution will take place prior to any of the waters entering the harbour. Furthermore, this minor runoff will be towards the harbour, and not directly out towards the sea. It should also be understood that in these events turbid run-off from the entire length of coast effected by prolonged rain periods will be entering the marine environment.

3. REGIONAL IMPACT

3.1. Concern was expressed that the development will target areas which are already adequately catered for by the existing Coral Bay community, and will in fact present direct competition with existing tourist facilities. Management problems associated with existing public facilities at Coral Bay are acknowledged, however it was considered that these problems could be overcome through liaison with appropriate government authorities.

Response:

The proposition that the existing settlement at Coral Bay is adequately catering with tourist demand is indeed questionable given that both the Coral Bay Planning Strategy (DPUD 1992) and the Gascoyne Coast Regional Strategy (SPC 1994) both highlight existing problems of:

"..overcrowding being a common occurrence, demand for accommodation outstripping supply, low key accommodation, poor services contributing to environmental degradation and lack of competition stifling development."

The viability of Coral Coast Resort is founded not on competition for the existing tourist market which is substantially intra-state (90%) but on the expansion and development of the international and interstate markets. It follows also that the provision of facilities and services of a good standard will further increase intra-state visitation to the area. Tourism projections presented in the PER anticipate a doubling of present visitation to the Region - an increase of some 2 million visitor nights p.a. of which the Resort is expected to account for some 750,000. It is considered that this level of visitor increase can only benefit the locality and the Region as well as reducing the impacts of the present seasonality of the market.

3.2. Concern was expressed that the proposed development will remove tourist opportunities from existing townships such as Exmouth and Carnarvon, and detract from other large developments already planned for the region, such as the Fascine Development at Carnarvon, and the proposed Exmouth Marina, both of which have already been granted environmental approval.

Response:

Contrary to the concern expressed that Coral Coast Resort will compete for tourism and residential opportunities with the existing townships of Exmouth and Carnarvon, it is considered that more likely, Coral Coast Resort will strengthen the demand for tourism and residential opportunities in those existing townsites.

Coral Coast Resort will clearly provide a major catalyst for the economic development of the Gascoyne Region, both in respect of facilitating a substantial expansion in tourism and as a consequence thereof, the broader economic base of the region. Projected increases in both construction and tourism expenditure as a consequence of Coral Coast Resort are substantial

and will lead to the creation of a number of both direct and indirect service industries in both Carnarvon and Exmouth. Total construction expenditure for Coral Coast Resort is estimated at approximately \$200,000,000 with a further \$225,000,000 over the life of the project in domestic residential construction. Projected increases in regional income and the strengthening and broadening of the economic base in the Region could only be reflected in increased demand for residential land over and above the present. Accordingly, developments such as the Fascine at Carnarvon and the Exmouth Marina Estate are most likely to benefit from Coral Coast Resort as a consequence of the strengthening and broadened employment opportunities that the proposal will generate.

In respect of tourism opportunities and the potential for competition with Exmouth and Carnarvon, as previously noted the projected increase in visitation to the area is estimated at an additional 2,000,000 visitor nights per annum, of which approximately 750,000 visitor nights per annum would be spent at Coral Coast Resort. The remaining 1,300,000 visitor nights is expected to be spent in the balance of the Region, notably Shark Bay, Carnarvon and Exmouth and it is therefore difficult to comprehend how Coral Coast Resort would have anything but a major beneficial effect on tourism activity within the existing townships. Visitor expenditure in the Region is projected to increase by an additional \$135,000,000 per annum of which it is projected that approximately \$90,000,000 per annum be expended within the balance of the Region. Clearly, the projected increases in construction and tourist expenditures will significantly underpin the economies of the existing townships of Exmouth and Carnarvon, increasing employment opportunities, increasing tourism opportunities and as a consequence thereof, increasing demand for residential land.

Additionally, Coral Coast Resort will result in significant improvements to air access with Interstate and International markets providing further indirect opportunities for expanding the economic and employment base within the broader Region and specifically the townsites of Exmouth and Carnarvon. The benefits of Coral Coast Resort to the Exmouth and Carnarvon communities are acknowledged and the proposal is strongly supported both by the Exmouth and Carnarvon Chambers of Commerce.

3.3. Tourism carrying capacity on the natural resources of the region, and where such tourism development should be concentrated, is not sufficiently justified in a regional context. Further, the need for additional accommodation identified by various tourism studies is referred to in the PER, but no reference is made to the need for specific canal estate type development as proposed. The

threshold and acceptable limits of impacts of the proposal on threatened species and the marine reserve should be further examined.

Response:

The North-West Cape Tourism Development Study (JLW, 1993) examined tourism opportunities within the North-West Cape and concluded that there was an immediate need for positive action to bring tourism demand and resource management into sustainable balance. The Study proposed a two-stage strategy providing for a shorter term increase in bedspaces of an additional 3,000 increasing in the longer term by some further 10,000 bed-spaces under a maximum carrying capacity scenario of purposeful, planned growth of tourism development whilst ensuring sustainability of the natural resource. Coral Coast Resort at maximum development proposes in the order of 2800 bed-spaces over a 10-15 year period. The level of tourist accommodation proposed by the Resort is clearly well within the carrying capacities identified under the Study as ensuring sustainability of the natural resource.

In respect of the issue of "canal development", it is indeed debatable whether the proposal can be considered as comprising canal development, at least in the truer sense of the term. While the project proposes tourist and residential development around an inland marina, the essential concept the inclusion of a marina is as much driven by the requirement to provide for boating in an environmentally acceptable manner as it is by any other consideration. The benefit of the marina in relation to the Bills Bay Sanctuary Zone is widely recognised. Additionally, the proposal provides for a very high level of public access to the marina foreshore, predominantly in the form of public beaches supported by an extensive and inter-connected dual-use path network, typically located at the immediate rear of the public beaches.

There appears to be some confusion within the submission between tourism and residential accommodation. The reference to "canal type" development in the submission should be a reference to the residential components of the project, which in turn is unrelated to the "various tourism studies". The need for the residential component of the project is driven by a number of factors, including the assurance of the financial viability of the project not only from a construction perspective, but also in the context of on-going management of the townsite.

The demand for residential land in the location is discussed in Section 2.3.2 of the PER, which identifies a demand for at least 10,000 additional dwellings within the Gascoyne over the next 15 years. It is also significant to note that the Ministry for Planning in its submission on the

PER has recognised the importance of the residential component, some one third of which is likely to be occupied by staff, to the townsite and particularly the social and economic stability it provides (see also Response 1.1).

3.4 The amount of limestone quoted within the PER as required for the development is significant. Concern was expressed that limestone extraction will have a big impact on quarries in the area, within 70 kms of the site. These environmental impacts are not addressed.

Response:

The quantities of limestone needed to be quarried for the development are modest compared to that available in the existing quarries. One quarry alone has several thousand tonnes of armour rock stored on-site. The quarries are already supplying materials for roads and other works, and the quantities proposed will not be difficult to accommodate.

It should also be noted that quarries already existing in the area must continue to operate in accordance with approvals granted by regulatory authorities (see PER Proponent's Response No. 29, now No.33).

4. IMPACT ON NINGALOO REEF

4.1. The view was strongly expressed in the majority of submissions that the proposed resort development will have a significant and unacceptable impact on the Ningaloo Reef through increased recreational pressure from locals and visitors to the area. This will have serious implications on the management of Ningaloo Marine Park. There is an urgent for a long term strategic management framework for Ningaloo Marine Park based on carrying capacity before any major development is allowed to proceed on its fringes.

Response:

The potential effects of the Coral Coast Resort are discussed in Section 6.2.3 of the PER. Section 7.2.4 discusses the management of these potential impacts. CCMD is sympathetic to concerns expressed in these submissions and agrees with the imperative for the on-going protection and management of the unique and invaluable natural resources within Ningaloo Marine Park. As a stakeholder in the area, CCMD's objectives for protection of Park resources

are parallel with those of CALM as Park Manager, and with the views expressed in the submissions.

As described in the PER, the proposal will establish the opportunity to secure adequate protection of the Park's resources against detrimental impacts from increased recreation and will provide resources to assist to realise those opportunities.

Relevant considerations in this regard are as follows:

- Development of the Coral Coast Resort is proposed to be staged over 15 to 20 years, allowing ample opportunity for management strategies that are applied in the Marine Park to be appropriately adapted in response to increasing use pressure and on the basis of results of monitoring proposed to be undertaken in association with the proposed development.
- The Ningaloo Marine Park Management Plan (CALM, 1989) was formulated based upon the carrying capacity of the Ningaloo Reef area, and is due for review and/or revision by 1999.
- The proposed timing of CALM's review of the Management Plan in 1999 is considered appropriate in light of the proposed development schedule. By 1999, the anticipated maximum population at Coral Coast Resort will be 1760 (320 residents and 1440 visitors). The development by that time will have fully secured the improvements proposed for management of sewage and waste disposal, the opportunities to alleviate the conflicting use pressures at Bills Bay and the opportunities for CALM and Department of Fisheries to fund and undertake much more active management in the region.
- Because of its commercial reliance upon protecting and preserving the environmental values of Ningaloo Marine Park, CCMD is strongly disposed towards ensuring effective environmental management and will assist CALM, where practicable, in the review and implementation of the Ningaloo Marine Park Management Plan. As stated in the PER (p142), CCMD anticipates that the review of the Management Plan will need to consider the relocation of a significant proportion of recreational activity from Coral Bay settlement to the Coral Coast Resort, with particular reconsideration of some of the beneficial use zonings to the north of Point Maud.

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- Previous studies, notably the North West Cape Tourism Development Study (JLW, 1993), the Ningaloo Marine Park Management Plan (CALM, 1989) and the Coral Bay Planning Strategy (DPUD, 1992), all conclude that natural resources are, in some places, already under severe stress under current levels of use. To maintain the status quo (ie, "do nothing") is inappropriate from an environmental protection perspective as well as for economic and social reasons, as even the maintenance of present visitation levels would cause detrimental impacts to the environment. As discussed in Section 2 of the PER, visitor numbers to the Coral Bay area will increase irrespective of whether the present proposal proceeds. The North West Cape Tourism Development Study concluded that "there is no viable "do nothing" policy as the growing tourism market will not be satisfied". This conclusion was also supported by the State Planning Commission's Gascoyne Coast Regional Strategy (SPC, 1994).
 - The Gascoyne Coast Regional Strategy concluded that development in the Coral Bay area (including Mauds Landing) was required to improve the environmental sustainability of increasing recreational pressures, as well as take advantage of the economic potential offered by tourism. A significant benefit of the economic potential is funding for environmental protection.
 - The Coral Coast Resort proposal at Mauds Landing provides the opportunity and resources to effectively manage both existing and future visitor pressures, in a location that is demonstrably preferable from an environmental viewpoint. The opportunity offered by the proposed development to facilitate and optimise the effectiveness of environmental management for Ningaloo Marine Park is a key benefit of the proposal.

4.2. Concern was raised in several submissions that there is potential for anchor damage to coral formations as a result of increased boat activity. This needs to be managed effectively via public education programmes and an on-site management presence.

Response:

This is recognised in the PER and appropriate management is proposed (Section 6.2.3). Education of boaters, including appropriate signage at the launching ramp, will encourage sensitive anchoring. The procession of permanent mooring buoys at popular diving locations, so that vessels can simply tie-off to the mooring whilst diving, is also suggested by the PER.

CCMD has no jurisdiction in this matter but wishes to pursue it and similar matters with CALM leading to early establishment of beneficial facilities.

Commitments made by CCMD in the PER in this regard include the following:

- "44. *The proponent will construct and establish a Marine Park Visitor/Research Centre within the resort, to provide for education and interpretation programs for visitors and residents in consultation with CALM.*
45. *The proponent will co-operate with CALM officers to establish and maintain appropriate awareness and appreciation of the attributes of the Ningaloo Marine Park to the satisfaction of the DEP and CALM.*
46. *The proponent will distribute literature to all resident and visiting boat owners to raise their awareness of the recreational potential of the terrestrial and marine habitats and their environmental limitations, to the satisfaction of the DEP and CALM. (revised).*
47. *The proponent will erect signs at appropriate locations within the development to notify visitors of their environmental management responsibilities, to the satisfaction of the DEP and CALM.*
48. *The proponent will otherwise assist CALM, where practicable, to implement and police the Ningaloo Marine Park Management Plan (CALM, 1989), particularly those aspects pertaining to visitor education and awareness, to the satisfaction of the DEP and CALM."*

(These Commitments are now No.s 51 - 55 inclusive).

Coral Coast Resort will provide the State Government through CALM with facilities to educate users and manage recreational boating and fishing at a single focussed location. CALM will also receive substantial revenue from the proposed Marine Park Visitor and Research Centre to fund management. Because the long term commercial success of the resort project relies on the maintenance of the marine recreational resources in optimal condition, CCMD has a strong financial interest in Park management and is committed to co-operating closely with both CALM and the Department of Fisheries in the education of recreational users of the area.

4.3. If nutrients are exported from the development, effects on the coral reefs could result well beyond the adjacent few kilometres. Recent research indicates that even small amounts of nutrients entering the coral reef marine environment are detrimental. The statement made within the PER that there will be no impact on coral reefs or other biota is only a supposition as little is known of the population dynamics of key benthic biota in this ecosystem and it is acknowledged that at the adjacent Coral Bay town site nutrient inputs appear to be creating significant problems. Research indicates prevailing currents flow in a northerly direction. Concern was expressed that polluted water originating from the proposed development (for example contaminated groundwater and boat emissions) is therefore likely to flow northwards inside the reef past Cardabia passage and pollute reef areas to the north.

Response:

There will be no routine or direct input of nutrients or other contaminants to the marine environment. The development will be deep seweraged and stormwater will be directed away from the coast and the marina and into the adjacent salt flat as far as practicable.

The proposed management of irrigation and nutrient inputs is described in Section 7.1.3. CCMD will prepare a comprehensive Nutrient and Irrigation Management Plan for the golf course and landscaped areas prior to construction. A Shallow Groundwater Monitoring Programme and a Water Quality and Sediment Monitoring Programme will also be prepared in consultation with CALM and DEP, and will be implemented to DEP's satisfaction. These plans will establish scientific criteria for assessing appropriate environmental performance, and will identify and commit to appropriate contingency responses in the event of exceedance.

If monitoring results indicate polluted groundwater, remedial action will be immediately implemented to reduce any risk to the adjacent marine environment.

The opportunity presented by the proposal for the existing Coral Bay community to be connected to the sewage treatment facility will mitigate the existing concern regarding eutrophication in Bills Bay and is considered to be a major positive impact of the proposal.

4.4. The PER does not incorporate a monitoring programme for the coral reef ecosystems during the construction and operational stages of the proposed

marina. Without such a programme, it would be impossible to obtain a quantitative baseline 'snapshot' of the adjacent reef habitat, and follow through with periodic assessment of key indicators such as live coral and algal cover, coral growth rates and skeletal density. This information is essential to determine accurately the success of the proposed management strategies, and would be useful to CALM in relation to Marine Park management.

Response:

The proposed management and monitoring strategy for protecting nearby marine resources described in the PER is directed at protecting water quality and marine habitats. If there is no significant impacts upon water quality or existing habitats then ecological requirements of communities and population are reasonably assured.

The PER did not propose monitoring of coral communities due to the remoteness of the nearest coral reefs to the proposed development, resulting in negligible risk of deleterious impact. Coral communities also show very high natural variability, so require substantial monitoring effort to distinguish anthropogenic from natural impacts.

However, on reflection, CCMD acknowledges the desirability of instituting a coral monitoring programme associated with development of the proposed marina. Prior to construction commencing, CCMD will design and implement a Coral Community Monitoring Programme (CCMP) to the satisfaction of DEP in consultation with CALM. The CCMP will measure coral community composition and condition at representative sites in the Sanctuary Zone, on the back reef in outer Bateman Bay and on the southern side of Cardabia Passage, at the coral reef on the inner edge of Stanley Pool, and at suitable control sites. An initial monitoring survey will be undertaken in consultation with CALM, prior to the commencement of marina construction and will describe the baseline coral community at each monitoring site. On-going monitoring will be undertaken at six monthly intervals thereafter to ascertain community variability and to test for possible anthropogenic impacts. The monitoring programme will be continued by CCMD for five years, by which time CALM will have been provided with the facilities and resources outlined in the PER and may continue monitoring if desired (see new Proponent's Commitment No. 9).

4.5. The claim made in the PER that the resort and associated facilities will resolve all difficulties associated with regulation of boating in the area, and that launching facilities will concentrate trailer boats in the township is

considered unrealistic. Many of the visitors to the Ningaloo Reef are likely to be campers who may prefer to have their boats adjacent to their camp sites.

Response:

The beach at Bills Bay is presently the major location for boat launching and retrieval in the area, which creates aesthetic and safety problems, conflicts with swimming and passive uses at this location, and damages shallow water coral communities. During peak periods, up to 120 boats may be moored in Bills Bay.

The proposed development will offer an alternative facility from which to base boating and tourism activities and thereby will provide an opportunity for the appropriate authorities to remove or reduce the recreational boating usage and associated impacts at Bills Bay. This could be readily accomplished by prohibiting or discouraging vehicle access and/or vessel anchoring at Bills Bay, a management opportunity which cannot presently be realised because convenient alternative facilities are not available.

The methods and extent to which the Government authorities determine to manage the existing conflicts and environmental damage due to boat launching at Bills Bay will rest with those Government authorities and will need to be achieved with appropriate community consultation. CCMD cannot solve all of the current problems at Coral Bay, but it will provide opportunities for achieving appropriate solutions.

It is acknowledged that people with small dinghies may choose to launch by hand over the beach.

4.6. One submission raised the point that the Ningaloo Reef is already under considerable environmental stress as a result of infestation by the *Drupella* snail. Further stress through the introduction of large amounts of tourists and associated effluent discharge is likely to destroy the Reef.

Response:

As stated in Section 4.3.1.1 of the PER, the back reef coral community throughout the Ningaloo Reef tract has been extensively affected by *Drupella cornus*, with up to 98% mortality to corals reported in some areas. The back reef near Mauds Landing has been significantly

affected, with high mortalities to corals in some areas, but very limited effects in others. Predation of corals by *D. cornus* is an on-going phenomenon in this area and, based on recent research, further reductions in live coral abundance on the back reef appear likely.

There will be no direct discharge of effluent from the development to the marine environment.

The potential effects of the Coral Coast Resort upon the adjacent marine environment are discussed in Section 6.2 of the PER. Section 7.2 discusses the management of these potential impacts. The reader is also referred to Responses 4.1, 4.2, 4.3 and 4.4 above.

4.7. Long term impacts of the proposal on the whole of the Ningaloo Reef community have not been addressed in enough detail.

Response:

The potential effects of the Coral Coast Resort upon the adjacent marine environment are discussed in Section 6.2 of the PER. Section 7.2 discusses the management of these potential impacts. The reader is also referred to Responses 4.1, 4.2, 4.3 and 4.4 above.

The proposal will be staged over 15 to 20 years, allowing ample opportunity for management strategies that are applied to the Marine Park to be appropriately adapted in response to increasing use pressures and based on the results of monitoring studies.

There are no reasonable grounds for anticipating anything but local effects from the proposal on the Ningaloo Reef community. Stringent management and monitoring are proposed by the PER to avoid or minimise adverse impacts. Detailed prescriptions for the proposed environmental management and monitoring strategies will be described by the individual management plans and monitoring programmes to be prepared by CCMD prior to the commencement of construction, as follows (see new Proponents Commitments respectively):

- A Construction Management Plan (including a Dewatering Management Plan) (6,7);
- A Nutrient and Irrigation Management Plan (36);
- A Shallow Groundwater Monitoring Programme (37);
- A Shoreline Movement Monitoring Plan (38);
- A Foreshore Management Plan (8);
- An Emergency Response Plan for the marina (25);
- A Water Quality and Sediment Monitoring Programme (26);
- A Coral Community Monitoring Programme (9); and
- A Turtle Nesting Surveillance Programme (44).

5. WATER QUALITY

5.1. The 'Water Quality and Sediment Monitoring Programme' (WQSMP) is proposed to last for 5 years. Concern was expressed that this is not long enough. The dynamics of coral reefs are likely to be such that a longer duration data set will be required in order to determine with reasonable confidence what are normal and abnormal changes in the local marine ecosystems.

Response:

The WQSMP is proposed for a minimum period of 5 years, corresponding to the minimum duration of townsite management by CCMD (in accordance with DPUD Policy DC 1.8). It is anticipated that monitoring responsibilities will be continued by any future townsite manager until it can be verified to the satisfaction of the EPA that the development has had little or no detrimental impact on the existing environment.

This is fully consistent with the intent and specifications for management and monitoring of artificial waterways defined by DPUD Policy No. D.C. 1.8, "Procedures for Approval of Artificial Waterways and Canal Estates".

5.2. PER does not address the implications of the use of boat antifouling other than TBT on water quality within the marina. The suggestion was made that TBT be banned from the marina area, and any metal based antifouling compounds that are to be used should be specified by the proponent.

Response:

The issue of the water quality in the marina is extensively covered in Technical Appendix G of the PER.

As described in Section 6.2.2.2, the use of antifoulants containing TBT on vessels less than 25m and on marine structures is prohibited in Western Australia. No antifoulants containing TBT will be used on marine structures associated with the marina. In addition, CCMD will advise all resident and visiting boat owners of the law in this regard and will prohibit vessels treated with TBT antifoulant from using the marina (see new Proponents Commitment No.45).

Most nutrients and pollutants will be prevented from entering the waterways through various design and management measures. The two sources of possible contamination are copper based antifoulants and accidental fuel/oil spills (see also Response 5.3).

The use of any antifoulants within the marina by the proponent will be in strict accordance with State Government regulations. Technical Appendix G of the PER provides an assessment of copper release from antifouled vessels within the marina. Based on a fully developed capacity of 200 pens, and assuming the unlikely event of 100% occupancy, the maximum copper ion concentration in the marina is estimated to be between 1 and 3 µg/L due to flushing effects. This is well within acceptable limits for this class of water body.

5.3. A detailed contingency plan for possible cyclonic action on fuel lines and bulk fuel storage areas needs to be prepared to avoid potential contamination of marina or adjacent marine environment.

Response:

Accidental fuel/oil spills, including those associated with cyclonic action, will be managed by careful design of the fuelling facilities and the development of an fuel/oil spill contingency within the Emergency Response Plan (PER Proponent Commitment No. 21, now No. 25), prior to the development and use of the marina.

This will include the waterway manager having oil booms, absorbent pads and oil skimmers on site for rapid deployment in the event of an accident. The first step would be to place an oil boom across the entrance to prevent any oil entering Bateman Bay. The spill would then be skimmed up and removed from site.

Furthermore, all fuel lines will be located on fixed jetties, and all fuels stored in accordance with Department of Minerals and Energy requirements.

5.4. Potential for heavy metal contamination in marina from sources such as air conditioning units. Heavy metal monitoring in marina water body needs to be undertaken regularly to ensure there is no contamination.

Response:

Regular monitoring for heavy metals in the marina and nearshore environment is proposed in the PER and reiterated by Proponents' Commitment No.22 (now No. 26), including:

"Sediments will be monitored for particle size, nutrients, metals of environmental concern and hydrocarbons." (revised).

The monitoring will be to the satisfaction of the Department of Environmental Protection upon advice from the Department of Transport.

5.5. The construction of all sewage and wastewater treatment facilities should be staged, and monitored at regular intervals, to ensure there is no adverse impact on the adjacent marine communities.

Response:

The PER confirms that construction of all sewage and wastewater treatment facilities will be staged in accordance with incremental volumes generated by the Coral Coast Resort, together with the requirements of the Coral Bay townsite.

In terms of regular monitoring, Section 7.1.2 of the PER states:

"As an environmental safe-guard, monitoring of the success in maintaining acceptable water quality in the underlying aquifer will be accomplished by the establishment and periodic sampling of an observation bore network to be located downgradient of the treatment plant and disposal area. This will be a component of a Shallow Groundwater Monitoring Programme (see Section 7.1.4) and will ensure that the existing problems of nutrient-enriched water entering the marine environment are not replicated. The identification of unacceptable water quality in the superficial aquifer would be appropriately rectified according to the contingencies included in the Programme, or by such engineering solutions which may be necessary. "

This is reiterated by Proponents' PER Commitment No. 32 (now No. 37):

"32. The proponent will formulate a Shallow Groundwater Monitoring Programme (SGMP) to monitor groundwater throughout the project area, including the golf

course, adjacent to and surrounding the marina, between residential areas and Bateman Bay, and at the Services/Light Industrial Area (SLIA) where the borefield will monitor groundwater below the power station, fuel storage, municipal landfill and treated effluent disposal areas.

The SGMP will include:

- the installation of shallow groundwater monitor bores at regular intervals throughout the project area and adjacent to and between the SLIA and the coast;*
- the collection of baseline data prior to the commencement of operation; and*
- quarterly measurement of groundwater quality within the bores including:*
 - nutrients (phosphorus, nitrogen, ammonia, nitrite/nitrate);*
 - salinity; and*
 - pathogenic bacteria counts.*

The SGMP will be formulated in conjunction with the Department of Environmental Protection to the satisfaction of the Water Authority of Western Australia. "

5.6. The proposed WQSMP should include regular reporting of results to the Department of Environmental Protection and the Department of Transport.

Response:

This is proposed in the PER (Proponents' Commitment No. 22, now No. 26). Furthermore, specialist marine scientists engaged by the proponent will supervise the monitoring and interpretation of results and recommend management action (if required).

5.7. The WQSMP should include baseline data for the nearshore environment before construction of the breakwater begins. Further, values for acceptable levels of water quality and sediment parameters must be set before monitoring proceeds and as a condition of development approval, the proponent should agree to effect management changes if / when these levels are exceeded.

Response:

The WQSMP will include baseline data for the nearshore environment prior to the commencement of any construction activity. Values for acceptable water quality and sediment

parameters will be set by the Department of Environmental Protection, to which the proponent must adhere.

5.8. The use of an oil absorbent boom, air curtain and other management items issued in the event of an accident must be accompanied by adequate contingency plans and trained personnel.

Response:

The proponent reiterates PER Commitment No.21 (now No. 25):

"21. Prior to dredging the marina entrance channel, the proponent will prepare an Emergency Response Plan (ERP). The ERP will address contingencies for:

- fire and explosions;*
- collision between vessels;*
- fuel and oil pollution; and*
- sewage and chemical spills.*

The ERP shall be to the satisfaction of the DEP upon advice from the Department of Transport and shall be trialled, updated and maintained in accordance with its requirements. "

Trialling of the ERP will ensure that personnel are adequately trained in the implementation of the Plan, to the satisfaction of the relevant authorities.

5.9. It was considered that the proposed metals monitoring programme (p. 120, PER) should be set out in more detail.

Response:

The proposed metals monitoring programme will be formulated in accordance with the detailed requirements of the Department of Environmental Protection upon advice from the Department of Transport (see Proponents' PER Commitment No.22, now No. 26).

6. OFFSHORE SAND MOVEMENT

6.1. Statements made within the PER in relation to coastal processes are based on a two year analysis. This is not considered sufficient, especially when aerial photographic records are known to exist for the last 45 years (i.e. since 1949). There may be long term shoreline change trends which have not been detected, and could be affected by the breakwater structures. Recent research by the University of WA in the Exmouth region has highlighted variations in currents, sediment transport and shoreline change between bays on the west coast.

Response:

The study of the coastal processes presented in the PER was not based on a two year analysis. It comprised several quite different techniques including:

- the use of geomorphological indicators;
- coastal engineering calculations of sand movement; and
- the historical record in the available aerial photographs.

The aerial photographs used were taken in 1949 and 1981, and span some 32 years. All of the evidence, including the position of the abutments of the old jetty (which was constructed in 1897) relative to the waterline, indicates that the area is quite stable or accreting slightly.

The assessment was not undertaken on a regional scale, but specifically on Bateman Bay.

6.2. Proposed breakwaters are likely to have a significant impact on sand movement along the coast. Previous experience elsewhere along the Australian coast of similar scale of breakwaters has resulted in expensive beach maintenance programmes to maintain beach renourishment programmes. This is a soft coast, and construction of three rock groynes, the longest approximately 400 metres long, is likely to lead to costly sand bypass operations being required. Implications of the breakwater construction on sand movements have not been researched properly in the PER.

Response:

It is agreed that it is important that the breakwaters do not interrupt significant flows of sand along the beaches. In the PER Technical Appendix G, the issue of sand movement along the beaches in the southern portion of Bateman Bay is examined in detail using geomorphological indicators, coastal engineering calculations of sand movement, and the historical record in the available aerial photographs. All evidence suggests that the beaches are well aligned to the persistent background swell that dominates the nearshore regime. This results in negligible movement of sand along the beaches under ambient conditions.

During cyclonic storms there would be modest movements of sand along the beaches. Some would be trapped by the breakwaters and the beach would be expected to widen. Following the storm, the background swell would again dominate the nearshore regime and return these beaches to their pre-storm positions. This is quite comparable to the breakwaters at Fremantle which also do not require sand bypassing. In summary, the proposed location of the breakwaters is considered ideal as there is little problem in accommodating the small amounts of longshore drift.

Notwithstanding the above, the proponent has stated and committed (regardless of cost) (PER pg 137) that:

"If sand by-passing is occasionally considered necessary this can be achieved using conventional earthmoving equipment. Access will be provided from the breakwater to the beach on both sides of the marina for this purpose. CCMD will liaise with appropriate government authorities as required and will carry out any necessary works in consultation with government." (see new Proponent's Commitment No. 38).

6.3. It was considered in two submissions that further information regarding the prediction of the effects of tropical cyclones is required. Statements included within the PER document are considered to be too general.

Response:

The PER predictions regarding severe tropical cyclones is based on significant amounts of work by various authors who have evaluated the conditions that would be encountered during these events. These analyses have included:

- a review and analysis of the historical records of cyclone activity in the area;
- statistical evaluation of the severity of the various cyclones; and
- computer modelling of the waves in a very rare cyclone event.

The level of work undertaken is considered to be adequate for the current stage of the project. The next stage, subject to environmental and planning approvals, will involve detailed engineering design. During this stage, the work to-date will be extended (where necessary) in order to finalise the detailed engineering design and documentation of the development.

6.4. Beach monitoring survey results presented in Section 7.2 are considered to be inadequate. Surveyed profiles at 250 metre intervals are not adequate to describe changes in beach shape which may result through the construction of breakwaters.

Response:

Because the beach near the development is in balance with the persistent background swell waves (as evidenced by the presence of beach cusps), the proposed spacing of survey lines is considered appropriate. Nevertheless, additional lines can be added each side of the breakwaters if required by the regulatory authorities (see revised Commitment No.33, now No. 38).

6.5. The proposed beach renourishment plan (PER p. 137) ignores that fact that the Ningaloo Marine Park boundary extends to 40 metres above high water mark. Sediment disturbance as a result of beach renourishment programmes are likely to have a detrimental impact on the Marine Park.

Response:

Any renourishment programme required, based on monitoring results, will be undertaken in accordance with the Shoreline Movement Monitoring Plan, which will be formulated and implemented to the satisfaction of the Department of Transport and CALM (see Proponents' revised Commitment No.33, now No. 38).

6.6. Consideration should be given to construct the breakwaters in such a way which does not impact on the littoral drift process, i.e. sand is moving south, therefore breakwater structures should curve to the south, to minimise interruption of sediment movement.

Response:

All evidence suggests that the beaches are well aligned to the persistent background swell that dominates the nearshore regime. This results in negligible movement of sand along the beaches under ambient conditions. There may be a modest southerly movement of sand in storm events, and the length of the breakwaters has been designed to accommodate the amounts of longshore drift associated with storm events. Any accumulation will be reflected in the results of the Shoreline Movement Monitoring Plan, and action will be taken where necessary (see new Proponent's Commitment No. 38).

7. IMPACT ON FORESHORE / DUNES

7.1. All residential development needs to be adequately set back from the coast to avoid localised dune erosion.

Response:

The proposed residential set-backs of 120 to 160 metres from the vegetation line is an appropriate buffer for any potential dune erosion.

Setbacks as proposed also take due consideration of requirements to protect proposed residences from extreme storm events such as cyclones, and advantage is to be taken of the existing landform and elevations for this purpose. The Resort development is proposed to blend in with the dunal system as much as possible and management controls such as fencing, pathway systems and strategically placed parking areas for beach users will ensure that the well established beach and foredune management principles can be readily implemented for this development (see also Response 7.2).

7.2. Stabilisation of the foreshore is a major consideration of the proposal. A dune stabilisation programme was considered to be required for temporary and permanent disturbance to the dunes. Also, it was considered that further details regarding a foreshore reserve and management plan need to be outlined.

Response:

The proponent reiterates its dedication to the protection of the dune environment in PER Commitments No. 6 (now No. 8) and No. 24 (now No. 28):

"6. *Prior to construction the proponent will liaise with the Shire of Carnarvon, the Commissioner for Soil Conservation and DPUD to develop a Foreshore Management Plan (FMP), to ensure the protection of Point Maud and the foreshore environment.*

The FMP will include:

- *the maintenance of public access to the beach at Mauds Landing, including the area through the proposed golf course;*
- *the formalisation of parking and picnic areas in appropriate locations;*
- *the definition of dune preservation and fencing areas;*
- *rationalisation of 4WD access to the beach area in the vicinity of the site;*
- *appropriate signage for public education;*
- *spoil and landform stabilisation and revegetation methods; and*
- *fire management procedures.*

The FMP will be formulated in conjunction with, and to the satisfaction of, the DEP and Department of Planning and Urban Development (DPUD), and the Department of Conservation and Land Management (CALM). "

and

"24. *Works which impinge on the near-coastal area such as the golf course, residential accommodation, parking areas and accesses will be constructed by the proponent in such a way as to avoid unnecessary alterations to the existing landforms commensurate with appropriate design practices, and to ensure that re-stabilisation and on-going stability of the landform is maintained, to the satisfaction of DEP, CALM and the Shire of Carnarvon. "*

7.3. It was considered that more information is required to assess the possible impacts of developing terraced townhouses on existing dunes and villas on the inter dunal swales, particularly in relation to dune stability and excavation methods.

Response:

The final location of dwellings on existing dunes and in interdunal swales will be dependant on detailed site surveys and final planning considerations. It is proposed to minimise earthworks as far as possible, thus minimising impact on existing dunes. Where necessary dunal rehabilitation and minimal retaining wall construction will be implemented in accordance with accepted engineering practices to ensure that long term stability of the dunes is maintained. Reference will be made to the Department of Agriculture's Coastal Rehabilitation Manual (Bulletin 4248, 1992). It should also be noted that in general terms the proposed sitings are on the leeward side of the prevailing winds in the area (see also Response 7.2).

7.4. It was considered that the proposed golf course on the dunes to the north of the marina entrance is an inappropriate form of land use for the foredune area. It was suggested that this area should be retained within a foreshore reserve which excludes any form of development other than dual use paths to facilitate public access. Public access to this reserve should be retained and managed carefully through the implementation of a foreshore management plan, prepared in consultation with the Ministry for Planning.

Response:

The proposition that two holes of an 18 hole public golf course are an inappropriate landuse within this section of foredune is not supported. Significant public access is maintained to the coastal foreshore including two major locations between the old jetty and the marina entrance and a further location immediately north of the entrance which will include a netted bathing area.

The management of all developed coastal access locations will be incorporated within the Foreshore Management Plan. These areas are proposed to be provided with parking, picnic/BBQ facilities and toilets and will be further augmented by inter-connecting dual-use paths. Public access will be retained to the balance of the foreshore as well as through that portion of the foredune occupied by the two holes of the golf course. The determination of coastal setbacks generally embodies requirements both for protection of development from major erosional events as well as a component for recreational purposes. Both components of setback criteria are more than adequately catered for within the development generally and in particular that portion of the foredune area occupied by the subject holes which varies in width from some 120m to 160m. Additionally, it is not the intent that the land occupied by the holes

be alienated. It is proposed to be reserved with the Crown for foreshore and recreation purposes, an approach consistent with many coastal reservations within the Metropolitan and other developed locations.

The proponents' commitment to the management of the dune areas and proposed foreshore is detailed in the PER and summarised in Response 7.2 (see PER Commitments No. 6 (now No. 8) and No. 24 (now No. 28)).

8. IMPACT ON MARINE FLORA AND FAUNA

8.1. There is coral growing on the old Point Maud Jetty. Concern was expressed that removal of the jetty as proposed in the PER will mean the loss of some coral (and remove a feature which is of local historic value).

Response:

The remnants of the piles from the old jetty are presently a navigation hazard. It is proposed to cut off some of the pile stumps at the level of the sea bed to make the area safe for boat navigation. It is recognised that the jetty remains are of some historical significance, and consequently it is proposed to retain the nearshore piles and only remove those further offshore.

8.2. Results of marine faunal studies included within the PER indicate that effects on dugong and turtles, which frequent the area, are inadequately addressed and understated. Concern was expressed that increased boating activity on the area will result in increasing incidences of turtle and dugong strike.

The response for 8.2 and 8.3 are related and are best treated in a single response. Please see Response 8.3 below.

8.3. Noise associated with increased boating activity will drive away marine fauna such as turtle, dugong and manta rays.

Response:

The response for 8.2 and 8.3 are related and are best treated in a single response.

Our response to the issue of the effects of boating noise and traffic upon dugongs and marine turtles has three aspects:

1. Relatively small numbers of dugongs and turtles occur in the vicinity of the proposed development.
2. Notwithstanding the above, CCMD recognises the concerns and will co-operate fully with CALM to implement appropriate management of boating activities, aimed to minimise adverse impacts. Suggestions for appropriate management are offered.
3. The staged development of the Coral Coast Resort over 15 - 20 years will allow ample opportunity for management strategies to adapt and evolve in response to the increasing boating activities and on the basis of monitoring results.

The occurrence of dugongs and marine turtles in the vicinity of Mauds Landing is described in Sections 4.3.4 and 4.3.5 of the PER. The distribution of habitats which support food species for each of these animals is described in Section 4.3.1.2, 4.3.1.3 and 4.3.1.4. Whilst it is indicated that dugongs and Green, Hawkesbill and Loggerhead turtles would frequent the general area, the predominant marine habitat in the vicinity of Mauds Landing is bare sand. The nearest marine habitats which support food species for dugongs or marine turtles occur at Point Maud, some 2.5km distance from the marina entrance.

The beach in front of the Resort is not an important turtle nesting beach and would probably be used only by occasional green turtles, which breed on beaches throughout the region (R. Prince, CALM, pers comm, 1995). The primary turtle nesting beach in the area is at the northern side of the tip of Point Maud, well beyond the development area. Turtle nesting along the beaches of southern Ningaloo Marine Park is substantially less than in northern Ningaloo Marine Park.

Notwithstanding the foregoing, CCMD recognises and appreciates the concerns expressed in these submissions, together with the imperative for the on-going protection of dugongs and turtles which will occasionally occur in the area. As a stakeholder in the area, CCMD's objectives for protection of the Park's fauna are parallel with those of CALM.

Dugongs and turtles can hear over a wide frequency range and commonly show avoidance behaviour from approaching boats by diving, swimming to deeper waters, or swimming away.

However fast moving craft are recognised as a potential source of injury or mortality due to the reduced reaction time that is available for the animals or vessel operators to avoid collisions.

It is also recognised that turtles frequently rest in the deeper waters of dredged access channels, where they may be vulnerable to accident when they rise to breath (which occurs at approximately 1 hourly intervals).

CCMD will have no legal jurisdiction to manage vessel operators outside of the marina. However CALM as Park Manager, either in its own right or in consultation with the Department of Transport, has appropriate authority to control vessel activities so as to minimise any risk to protected fauna. CCMD is committed to assisting and co-operating with CALM in all aspects of Park management. This includes assistance in establishing and maintaining appropriate awareness of the attributes of the Park requiring protection, in notifying residents and visitors of their environmental responsibilities, and in implementing and policing the Ningaloo Marine Park Management Plan.

Specific measures that are considered appropriate to protect dugongs and turtles from annoyance or accident from vessel activities originating from Coral Coast Resort are recommended as follows:

- Vessel speeds to be specifically restricted to less than 8 knots within the marina and the dredged approach channel, with appropriate signage advising boaters.
- Vessel operators to be advised of the possible presence of protected dugong and turtles in Park waters, and requested to maintain slow speeds (less than 10 knots is most appropriate) and vigilant watch to avoid collisions.
- Vessel operators to be specifically advised of the increased likelihood of turtles during November to April in waters to the north of the tip of Point Maud (from 2km west of the marina entrance), and of the increased likelihood of dugongs occurring near the tip of Point Maud and in the area from 3km north-east of the entrance, with a request to navigate slowly and with especial diligence in these areas.
- Vessel operators to be made aware of the vulnerability of these protected animals to possible annoyance or accident from boating activity with a request that they slow to

less than 5 knots and steer well clear (more than 50m is appropriate) of any turtles or dugongs that are observed, and at no time follow, annoy or otherwise disturb them.

CCMD's specific commitments towards assisting CALM and to securing appropriate opportunities for public education and policing for the protection of Park resources, including protected fauna, are included in the following commitments:

- "44. *The proponent will construct and establish a Marine Park Visitor/Research Centre within the resort, to provide for education and interpretation programs for visitors and residents in consultation with CALM.*
45. *The proponent will co-operate with CALM officers to establish and maintain appropriate awareness and appreciation of the attributes of the Ningaloo Marine Park to the satisfaction of the DEP and CALM.*
46. *The proponent will distribute literature to all visitors, boat owners and visiting boat owners to raise their awareness of the recreational potential of the terrestrial and marine habitats and their environmental limitations, to the satisfaction of the DEP and CALM. (revised).*
47. *The proponent will erect signs at appropriate locations within the development to notify visitors of their environmental management responsibilities, to the satisfaction of the DEP and CALM.*
48. *The proponent will otherwise assist CALM, where practicable, to implement and police the Ningaloo Marine Park Management Plan (CALM, 1989), particularly those aspects pertaining to visitor education and awareness, to the satisfaction of the DEP and CALM."*

(Now Proponent's Commitments No.s 51 - 55 inclusive).

8.4. Lights originating from navigation aids, the resort development, and boats moored within 1.5 kms of the shore will disturb and disorient turtles, particularly hatchlings. This has implications on local turtle nesting behaviour. This impact has been documented at turtle nesting sites elsewhere in Australia.

Response:

The response to this submission includes two principal aspects, as follow:

1. The beach in front of the Resort is not an important turtle nesting beach and is only used by occasional Green turtles.
2. Notwithstanding the foregoing, CCMD will manage and monitor the effects of lighting so as to minimise any possible impact upon nesting turtles or hatchlings.

The beach in front of the Resort is not an important turtle nesting beach and would probably be used only by occasional Green turtles, which breed on beaches throughout the region (R. Prince, CALM, pers comm, 1995). The primary turtle nesting beach in the area is at the northern side of the tip of Point Maud, well beyond the development area. Turtle nesting along the beaches of southern Ningaloo Marine Park is substantially less than in northern Ningaloo Marine Park.

It is likely that human activity in front of the Resort will potentially mostly discourage female turtles to spawn in this specific area and they would move further west or north along the extensive beach stretching for several kilometres in either direction. Given the low densities of nesting in the area, this could not be considered to affect breeding success.

The principal recorded effects of artificial lights upon turtles are on nesting turtles and hatchlings. Bright lighting visible from the beach can occasionally attract newly spawned females or hatchlings, causing disorientation and movement away from the sea. The most notable case occurred at Delray Beach in South-east Florida in 1990, when Loggerhead turtle hatchlings were misdirected away from the ocean to wander onto the nearby, heavily lighted Highway A1A. Studies showed that the bright highway lighting, combined with the thousands of luminaries contributing to a bright sky-shine over the City of Delray Beach, had misdirected the hatchlings.

In addition to lighting cues, nesting turtles and hatchlings also orientate towards the ocean using beach slope and the elevated silhouette of the landward dune. Salmon *et. al* (1992) showed that Green turtles that are presented simultaneously with a silhouette and a light gradient oriented away from the silhouette and ignore the photic stimuli. This is significant at Mauds Landing where the high foredune provides a sharp silhouette to turtles using the beach.

Notwithstanding the foregoing, CCMD recognises the imperative to protect nesting turtles and hatchlings from adverse impact associated with lighting. Following additional consideration of this matter, CCMD now proposes to expand the strategy for the management and monitoring of the effects of lighting upon turtles to include design guidelines within the resort and a Turtle Nesting Surveillance Programme (TNSP), as follows (see new Proponents Commitment No.44):

1. The Resort will be mostly developed behind the tall foredune which extends along the shoreline. Street lighting within the Resort will be low level bollard lights which will be sheltered by the foredune and will not be directly visible from the beach.
2. Public lighting within 150m of the crest of the foredune will be low pressure sodium vapour (LPS) lights. LPS lighting emits light exclusively in the yellow range of the spectrum and is several orders of magnitude less attractive to turtle hatchlings, (and accordingly less disruptive to hatchling orientation) than other commercial light sources at comparable illuminance levels (Witherington and Bjorndal, 1991).
3. No lighting will be installed on the beach or on the beach side of the foredune ridge.
4. Public lighting within the Resort will be fitted with low illuminance lights, to the extent that is practicable with due consideration for public safety.
5. In consultation with CALM, CCMD will advise all residents and visitors of the requirement to minimise illumination during the turtle nesting season (November to April). Residents and visitors will be requested not to use lights while walking on the beach, not to use deck lights on vessels moored within 1.5km of shore after 7.30pm, and to ensure that cabin lights on vessels moored within 1.5km of shore after 7.30pm are appropriately curtained. Residents of and visitors to frontal residences that are visible from the beach will be requested to ensure that fully shading curtains are installed and always drawn prior to 7.30pm during the November to April period. They will similarly be requested to turn off any external lights at this time.
6. If acceptable to the Department of Transport as safe for marine navigation, the navigation lights to be installed at the end of the marina entrance groynes will be flashing lights with a short on-cycle and a longer off-cycle.

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7. As a component of the proposed Foreshore Management Plan (FMP), CCMD will establish a fence along the edge of the vegetation line fronting the foredune. Although the primary purpose of this fence will be to protect dune stability and direct public access, it will also be designed to prevent nesting turtles and hatchlings from wandering away from the ocean and into the dune.

 8. In consultation with CALM, CCMD will implement a Turtle Nesting Surveillance Programme to assess the effectiveness of the foregoing management measures and to rescue any disoriented turtles. It is proposed to conduct a dawn patrol of the beach and fence line each morning during November to April to map all new turtle tracks and to return any wayward turtles or hatchlings to the water. The monitoring and surveillance will continue for a minimum of three years following construction, following which the results will be assessed and management will be adapted in consultation with CALM. Following the initial three years, on-going monitoring and surveillance will become the responsibility of CALM and could appropriately be undertaken by volunteers (new commitment, No.44).

8.5. Baseline study of marine fauna described in the PER document is considered to be inadequate. Baseline data needs to be accumulated over a period of time, to ascertain appropriate indicator species of benthic fauna. Monitoring of these identified species then needs to be continued over time as the project proceeds. This method is considered to more accurately reflect the on-going quality of the water.

Response:

As described in Section 4.3.1.5, all of the marine substrates near to Mauds Landing are bare sands. The nearest hard substrates to Mauds Landing are sparse outcrops of calcarenite with macroalgae coverings, approximately 1.2km west of the site. The sand substrates are undulating and would be mobile. They show very little evidence of bioturbation and minimal attached fauna or flora. There is no evidence to support the possibility that benthic fauna have regional significance which would warrant its investigation or monitoring.

With respect to the marine monitoring programme to ascertain the effectiveness of the environmental management programme, the reader is referred to Response 4.4.

8.6. Proposed development may have an adverse impact on seagrass meadows (*Posidonia coriacea* and *Halophila ovalis*) in Bateman Bay through polluted surface runoff, nutrient enriched groundwater flows, anchor and propeller damage. Further research is needed to determine the extent of the seagrass meadows before any development which has the potential to impact on it can take place, so accurate monitoring of any impacts can take place. It should be stressed that seagrass cannot be regrown once removed from a location. Any damage to seagrass meadows could have implications for the faunal population over a much wider area.

Response:

As detailed in Section 4.3.1.2, the seagrasses in the Mauds Landing area are restricted to an area containing patches of *Posidonia coriacea* located some 4km northeast of Mauds Landing, and dispersed occurrences of sparse *Halophila ovalis* near Point Maud (3km west of Mauds Landing) and at the top of Bateman Bay (6km distance).

There will be no routine or direct discharge of nutrients or other contaminants to the marine environment. The development will be deep sewered and stormwater will be directed away from the coast and the marina and into the adjacent salt flat as far as practicable.

The proposed management of irrigation and nutrient inputs is described in Section 7.1.3. CCMD will prepare a comprehensive Nutrient and Irrigation Management Plan for the golf course and landscaped areas prior to construction. A Shallow Groundwater Monitoring Programme and a Water Quality and Sediment Monitoring Programme will also be prepared in consultation with CALM and DEP, and will be implemented to DEP's satisfaction. These plans will establish scientific criteria for assessing appropriate environmental performance, and will identify and commit to appropriate contingency responses in the event of exceedance.

There is negligible risk of any impact upon the seagrasses due to nutrient inputs, however this will be tested specifically by the Water Quality and Sediment Monitoring Programme.

The seagrasses are mostly in 5 - 10m water depth, too deep for them to suffer propeller damage. Because of their sparse nature and, compared with reef areas, their very low populations of fish species that are sought by fishers, they will not be a popular destination for

boating. Therefore, they will not be subject to regular swinging moorings which may otherwise cause significant anchor damage.

8.7. Proposed development will cause increased pressure on recreational fish species in the area, including those resident on nearby reefs outside the Maud Sanctuary Zone. There will also be the potential for a reduction in nearshore water quality which may have an adverse impact on fish species.

Response:

As stated in Section 6.2.3, the increase population that will arise from the proposed development will undoubtedly increase fishing pressure. Fishing pressure in the vicinity of Coral Bay has increased substantially during recent years and will inevitably continue to increase regardless of whether the present proposal is to proceed.

It is possible that current bag limits are too generous. Increased fisheries monitoring and research is necessary to assure management performance, irrespective of whether the proposed development proceeds.

Development of the Coral Coast Resort is proposed to be staged over 15 to 20 years, allowing ample opportunity for the Department of Fisheries and CALM to appropriately adapt management strategies that are applied to the Marine Park so as to reflect the results of monitoring and research (refer to Response 8.8). The required review of the Ningaloo Marine Park Management Plan in 1999 provides an opportunity and assurance for increased fishing pressure to be reassessed. It may be appropriate to extend the Sanctuary Zone at that time, or to alter catch restrictions.

The provision of a focal point for boat launching and retrieval adjacent to premises which are to be provided by CCMD to CALM and the Department of Fisheries will provide a substantially improved opportunity for recreational fishing catches to be monitored and policed. Education and policing is considered an essential component of future management and CCMD will assist and co-operate fully with the authorities in this regard. The reader is referred to Responses 4.1 and 4.2.

Stringent management and monitoring to protect nearshore water quality is proposed. Refer to Section 6.2.2 of the PER and Response 4.3.

8.8. The Fisheries Department has indicated that it will require extra resources and accompanying funds in addition to the office space offered in the PER document. There will also be a need to check compliance with catch regulations and to carry out research to gain an indication of the impact of the resort on fish species and fish habitats. This would allow the Department to make alterations in catch regulations and fishing practices considered necessary for the maintenance of a satisfactory level of fish stocks in the area and to detect any deleterious changes to nearby reefs.

Response:

This is acknowledged and supported. It is noted that the Visitor and Research Centre that will be established by CCMD and provided to CALM and the Department of Fisheries will generate revenue which is conservatively estimated at \$250,000 in its first year of operation alone:

8.9. PER states that the seabed adjacent to the proposed development is 'barren'. This may not in fact be the case. For example, blue green algae may be present which may have a critical role in the nutrient balance to the reef and provide a food source for some species of marine fauna. This issue needs further research.

Response:

As stated in Section 4.3.1.5 and reiterated in Response 8.5, these sediments appear to be mobile. They may seasonably support a microphytobenthos however this would be unlikely to be ecologically significant at a local scale. Moreover, the proposed development would not adversely affect microphytobenthos should such occur.

8.10 The potential impacts of the development, including future recreation usage on the following species, needs to be more thoroughly investigated :

Loggerhead Turtle (<i>Caretta caretta</i>) -		protected under the
Green Turtle (<i>Chelonia mydas</i>)		<i>Endangered Species</i>
Leathery Turtle (<i>Dermochelys coriacea</i>)		<i>Protection Act 1992</i>
Hawksbill Turtle (<i>Eretmochelys imbricata</i>)		

Humpback Whale (*Megaptera novaengliae*) - endangered species

Response:

CCMD recognises the imperative for protection of each of these endangered species. The management of increased recreational pressure on the general resources of Ningaloo Marine Park is discussed in Response 4.4. The management of increased boating activity with respect to its potential annoyance or injury to dugongs and turtles is discussed in Response 8.2 and 8.3. The management of lighting from the Resort and its implications to turtle breeding is discussed in Response 8.4. The reader is referred to each of these responses as providing a comprehensive discussion of the developments' potential impacts upon marine turtles.

As discussed in Section 4.3.4 of the PER, humpback whales regularly pass offshore from Ningaloo Reef during their northern and southern migration. CALM has developed a Code of Conduct for whale watching in Western Australia. Similar to the strategy outlined in Response 8.2 and 8.3 for the protection of dugongs and turtles, CCMD will assist CALM to educate and police boat owners to be appropriately vigilant and protecting of humpback whales, consistent with the Code of Conduct.

8.11. PER does not make reference to the Convention on the 'Conservation of Migratory Species of Wild Animals' (Bonn Convention). The Dugong (*Dugon dugon*) and four species of turtle mentioned in Point 8.10 above are listed under this convention.

Response:

This is acknowledged. The protection of these species is discussed in Responses 4.1, 8.2, 8.3, 8.4 and 8.10, to which the reader is referred.

8.12. Proposed dredging of the sea bed to create an entrance channel to the marina will create a sediment plume which may impact on seagrass and other marine flora and fauna.

Response:

As described in Section 3 of the PER, the excavation of the marina is planned to be completed in the "dry", and will be fully excavated and walling installed prior to excavating the entrance channel to ensure this work will not affect nearshore water quality.

The entrance channel to the marina will involve dredging using floating plant. The dredged material will be pumped to a contained settlement pond onshore, which will allow the sand to settle out and specially designed and operated outlets will release the excess water to soak into the development area.

As described in PER Section 5.7, the cutting action of the dredge can create a fine sediment plume under some conditions, however the marine sediments in the vicinity of the entrance channel are calcium carbonate sands, so the turbid plume from this source is expected to be minimal in extent. CCMD's coastal engineering advice is that any suspended sediment in the plume is anticipated to resettle on the seabed within close proximity of the dredging operation, and certainly well short of any sensitive habitats. This will be monitored as part of the Water Quality and Sediment Monitoring Programme, with provision for appropriate response in the event that the monitoring results indicate possible adverse impact.

CCMD's commitments in this regard are reiterated as follows:

- "18. The proponent will construct the marina basin under landlocked conditions, and all excavations and associated hard walling will be completed prior to opening of the ocean connection. The harbour entrance will be excavated by a floating dredge process when all inland marina construction is completed. The final connection to the ocean will be completed under conditions which minimise the potential for turbid water escape including a contained settlement pond ashore, to the satisfaction of the DEP, CALM and the Shire of Carnarvon.*
- 19. In the event that monitoring identifies a visible turbidity plume from dredging operations which could potentially reach sensitive coral or seagrass communities, then a silt curtain would be installed, or the marine entrance channel dredging would be otherwise altered to the satisfaction of DEP so as to reduce the on-going loss of suspended sediments. (revised).*
- 20. It is not intended for the marina to be dredged "in the wet". However, if such construction methods were necessary, the marina entrance channel would remain closed by the proponent whilst internal dredging was in progress, to prevent the loss of any suspended sediments to the ocean.*

22. *Prior to the opening of the entrance channel to the marina, the proponent will prepare a Water Quality and Sediment Monitoring Programme for the marina and nearshore environment, to the satisfaction of the Department of Environmental Protection upon advice from the Department of Transport. The objective of the monitoring program will be to allow assessment of the success of the management strategies for the project, and incorporate corrective procedures as may be indicated by the results of monitoring. Water quality parameters measured will include:*

- *suspended solids;*
- *dissolved oxygen*
- *bacteria concentrations; and*
- *nutrient concentrations.*

Sediments will be monitored for particle size, nutrients, metals and hydrocarbons. The Water Quality and Sediment Monitoring Program will run for a five year period or until such lesser time that it can be verified to the satisfaction of the EPA that the development has had little or no detrimental impact on the existing environment. Specialist marine scientists engaged by the proponent will supervise the monitoring and interpretation of the results and recommend management action."

(Now Proponent's Commitments No.s 22, 23, 24 and 26).

8.13. The proposed water quality monitoring programme focuses on water quality within the marina only. No monitoring is proposed outside the marina, to determine the impact of construction of the marina, or long term impacts on nearshore marine flora and fauna.

Response:

Proponents' Commitment No. 22 (now Commitment No. 26) states that:

"Prior to the opening of the entrance channel to the marina, the proponent will prepare a WQSMP for the marina and nearshore environment...."

Please also refer to Response 4.4, which acknowledges the need to monitor the nearshore coral communities pre - and post - marina construction.

8.14. The sea bed to the west and south west of the development area has been nominated in the Ningaloo State Waters Plan of Management as a fish sanctuary area. Special monitoring procedures should be put into place by the proponent in order to ensure the integrity of the area is not jeopardised, in consultation with the Fisheries Department.

Response:

Please see Response 4.4, which acknowledges the need to monitor proximate coral communities pre- and post- marina construction.

9. IMPACT ON TERRESTRIAL FAUNA AND FLORA

9.1. Inadequate research has been undertaken on the potential impacts of the proposed development on subterranean, stygofaunal and troglobitic fauna through, for example, groundwater drawdown as a result of marina construction and through potential nutrient and chemical contamination. It was considered that the proponents need to establish whether a significant stygofauna inhabits the area as its presence may 'dictate acceptable procedures for development', i.e. whether or not the marina should be dredged under wet or dry conditions, and will also have an influence on the proposed Shallow Groundwater Monitoring Programme (SGMP).

Response:

The subterranean (underground) troglobitic fauna of the Cape Range region can be divided into the terrestrial fauna, and the aquatic element or stygofauna.

Twenty eight species of of subterranean terrestrial fauna have been recorded from the Cape Range Peninsula and Barrow Island. None of these species are known to occur off the Peninsula (and Barrow Island), and cave systems similar to those found within Cape Range are absent from the project area (a saline flat which was previously a mangrove system).

In terms of the stygofauna of the region, in an unpublished report to the Australian Heritage Commission, Humphreys (1994) surveyed 261 sites within the Cape Range Peninsula and associated hinterland. Stygofauna were recorded from 185 of these sites, 7 of which occurred

to the south of Point Maud including Corbett well, Warroora 1 Outcamp Bore, Upper Bulbari Well, and un-named well and Warroora No.1 Bore. The nearest of these sites, Corbett Well, lies approximately 20km south-east of the project area, while the farthest, Bulbari, lies 45km to the south. The nearest record to the north is approximately 50km from Point Maud. The stygofauna of the region can therefore be considered widespread, but not recorded in close proximity to Mauds Landing.

The Museum of Western Australia (1995) states that the project overlies shallow unconfined aquifers in the Bundera Formation containing water of salinity 10,000-14,000 mg/L (Appendix C:6), and that both this formation and water in this salinity, especially if overlain by a shallow freshwater lens, are the very habitat occupied by the aquatic fauna. Immediately below lies limestone and calcarenite locally vuggy and cavernous (Appendix C:4), also potential stygofauna habitat.

In terms of the specific Mauds Landing site and its surrounds however, suitable habitat for the existence of stygofauna is considered unlikely to occur, for a number of reasons. Firstly, the stygofauna are recorded from cavernous, highly permeable limestone formations. Technical Appendix C of the PER describes the geology of the site. Extending along the coastline are coastal dunes and beach ridges of calcareous sand. These form a strip generally 1km wide, although from Point Maud they cover the peninsula for 2 km inland. Further inland the surface deposits are coastal lacustrine deposits: calcareous and gypsiferous clay, silt, and sand; and saline deposits in playas. These extend to 4.3km east of Point Maud, and are the dry saline flats and lakes that predominate through the Mauds Landing site. The surface deposits described above are underlain by the Bundera Formation, a variably cemented calcarenite forming the ground surface in a broad strip located 4 to 9 km east of Point Maud. The Bundera Formation is correlated with Tamala Limestone located further south, which is interpreted as a highly permeable aquifer. Therefore the geology of the Mauds Landing site, and up to 4km east of the site, is not conducive to the existence of stygofauna habitat.

Secondly, Technical Appendix C describes the hydrology of the site and states that bores drilled into the Bundera Formation at depths of 13 to 60 m at distances up to 10km inland from Point Maud encountered water in the salinity range described above (10,000-14,000 mg/L). However, the Appendix also states (in the same paragraph) that salinities increase from east to west, and reach 35,000 mg/L (sea water concentration) near the coast, where a wedge of sea-salinity water underlies less saline water. Given that the Mauds Landing site is at 0mAHD

elevation ie. virtually sea level, the groundwater beneath the site can reasonably be concluded to be at sea-salinity, and not suitable for stygofauna habitation.

Thirdly, it is acknowledged that a very thin freshwater lens may occur over the shallow saline aquifer in some localities, however this is located in the coastal dunes (Technical Appendix C). The coastal dunes are calcareous sands, and in the locality of the site lie between the saline flats of Mauds Landing and the ocean, where sea-water salinities are considered to predominate.

9.2. Terrestrial fauna and habitats research as document in the PER was considered to be inadequate as no field surveys of fauna were undertaken as part of the PER research required by the EPA and no reference was made to WA Museum records. Accurate research cannot be based purely on old records.

Response:

The assessment of terrestrial fauna and habitats in the PER was based on the following:

- an extensive review of current and historical literature from 1967 to 1993;
- a description of habitat types from on-site mapping of vegetation types and associations; and
- from current aerial and ground photography.

Furthermore, the following authorities and persons were consulted to access unpublished datasets and reports containing relevant fauna data for the project area:

Authorities

Conservation and Land Management	CALM
Royal Australian Ornithologists Union	RAOU

Persons

Mr Jim Lane	CALM - Woodvale
Dr Robert Prince	CALM - Woodvale

The specialist fauna consultants report (Technical Appendix I of the PER) identified only 5 habitat types over the entire site based on the results of the detailed, on-site vegetation association survey. The report concluded that the Mauds Landing project area is likely to contain fauna species which are generally widespread and abundant in similar habitats throughout the region. Furthermore, the project area is not expected to contain regional endemics or locally restricted species.

Given the above factors, the intensity of the fauna and habitat assessment is considered appropriate.

9.3. The vegetation and flora survey was considered to be inadequate as the survey was undertaken during the dry part of the year, following a dry season. Further investigation should be undertaken to determine the extent of the two 'Priority 2' species recorded (PER Section 4.2.1.2) at the site prior to any development.

Response:

As is typical of many coastal areas with relatively young sediments, the vegetation of the dune areas is relatively low in diversity, and varies mainly in the proportion of the same predominant species.

The floral species recorded are considered to represent approximately 85% of those potentially present at the site, with those species not being recorded being either present in very low numbers or being annuals not available at the time of the survey.

There are in the order of 80 Priority and Declared Rare Flora species in the CALM Gascoyne region, however systematic checking of the CALM Declared Rare and Priority Flora List (Atkins, September 1994) indicates that it is unlikely that priority species other than those recorded would occur in the study area. The reason for this is the small range of habitat that occurs in the study area (saline flats and coastal dunes) and the fact that most of the declared rare and priority flora species are not from these habitats.

The Priority 2 species listed in the PER are not Declared Rare Flora, but may be in need of regional survey, which is beyond the requirement of the study.

It should be noted that the site has been used as a port, up until recently had been grazed by stock, and is infested with rabbits and weeds (Buffel grass).

Given the above factors, the intensity of the flora and vegetation surveys is considered appropriate.

9.4. The cumulative impact on samphire flats has not been addressed. Although these are widely distributed between Carnarvon and Onslow, if none of them are included within conservation areas, incremental damage (through resort development and pastoral activities) may impact seriously on the conservation values of these areas.

Response:

It is agreed that the samphire flats are widely distributed, both regionally and in proximity to the site. Three points are relevant to the issue of conservation and incremental damage to these areas.

Firstly, the area within the Mauds Landing site is a relatively small proportion of the total samphire area surrounding the site, being approximately 170ha of 800ha or approximately 20%.

Secondly, the remaining area within the townsite boundary will be actively managed and protected during both the construction stage and operational stages, providing a degree of conservation protection.

Thirdly, Lake MacLeod, which is located approximately 60km south of the project site, is one of three such features identified as having similar vegetation types (Beard, 1975), although only large flats were noted. The Red Book Status Report (EPA, 1993) indicates that Lake MacLeod (System 9.4) is proposed as an "A" Class Reserve for Conservation of Flora and Fauna to be vested in the National Parks and Nature Conservation Authority, to be implemented following the resolution of issues with leasees.

9.5. The botanical survey presented in the PER states that the saline flats at Mauds Landing have significant conservation value for vegetation. Also the hyposaline pool is considered 'unusual' and requires further research. It was

considered that the plan for development does not adequately take into account these values, particularly the proposed golf course.

Response:

The botanical study (Technical Appendix H) states that the vegetation of the saline flat is considered to have significance, but additionally that the study area (the Mauds Landing site) includes only part of this area (20%), and the value of this area is less than that of the whole flat. The conservation significance of the saline flat in a regional context is given in Response 9.4.

The term hypersaline "pool" is considered to be a misleading description. The area is a very shallow depression in the saline flat, which only contains water for a very short period of time following significant storm events. This area can be considered a hostile environment to both plants and animals, although wading birds may utilise the habitat when it contains water. No development or disturbance is proposed for any part of this area either during or following construction. Furthermore the golf course, which skirts the perimeter of the area but does not intrude upon it, will be actively managed in terms of both nutrient and irrigation management.

Given the extremely hostile nature of the saline flats to vegetation, exotic weed species would not be expected to be able to colonise this area.

The proponent also reiterates Commitment No. 25 (now Commitment No. 29):

"25. The dune areas in the west of the site which are not affected by development will be declared "No Access" areas by the proponent and marked accordingly. Similarly, the two salt lakes are intended to be retained as existing landscape and natural drainage features, and will consequently be protected from disturbance, to the satisfaction of the Shire of Carnarvon. "

9.6. The schedules of the *Endangered Species Protection Act 1992* (ESP Act) should be checked to ensure that no species of rare or endangered flora are impacted as a result of the development.

Response:

There are in the order of 80 Priority and Declared Rare Flora (DRF) species in CALM Gascoyne Region. Systematic checking of the CALM DRF and Priority list (Atkins, 1994) indicates that no DRF are recorded from the area.

9.7 PER does not mention the Japan and Australia Migratory Bird Agreement (JAMBA) between the governments of Australia and Japan.**Response:**

The Japan and Australia Migratory Bird Agreement (JAMBA) has now been incorporated into the the *Wildlife Conservation Act, 1950* (as amended), which was addressed in the PER (Section 4.2.3).

9.8. The PER does not mention bird nesting sites in the area.**Response:**

The range and area of habitat available for nesting sites within the project area boundary are limited. However, birds would be expected to opportunistically nest in suitable habitat within the site and surrounds (see Technical Appendix I).

10. GROUNDWATER / DRAINAGE ISSUES

10.1. Proposed groundwater monitoring include no contingency plans in the event that groundwater contamination is discovered. Further no baseline studies have been undertaken or are proposed to be undertaken to compare future monitoring results. It was suggested that at least 2 years baseline data is required before borefields become operational. Several monitoring bores should be established prior to any ground disturbing activities, which should be sampled for a suite of parameters that require monitoring once the project is established. The bores should be located in areas that are not disturbed by project construction and are representative of groundwater conditions.

Response:

Baseline monitoring of groundwater is proposed in the PER, and the proponent reiterates PER Commitment No.32 (now Commitment No. 37):

"32. *The proponent will formulate a Shallow Groundwater Monitoring Programme (SGMP) to monitor groundwater throughout the project area, including the golf course, adjacent to and surrounding the marina, between residential areas and Bateman Bay, and at the Services/Light Industrial Area (SLIA) where the borefield will monitor groundwater below the power station, fuel storage, municipal landfill and treated effluent disposal areas.*

The SGMP will include:

- *the installation of shallow groundwater monitor bores at regular intervals throughout the project area and adjacent to and between the SLIA and the coast;*
- *the collection of baseline data prior to the commencement of operation; and*
- *quarterly measurement of groundwater quality within the bores including:*
 - *nutrients (phosphorus, nitrogen, ammonia, nitrite/nitrate);*
 - *salinity; and*
 - *pathogenic bacteria counts.*

The SGMP will be formulated in conjunction with the Department of Environmental Protection to the satisfaction of the Water Authority of Western Australia. "

Establishment of monitoring bores and monitoring programme will take place before commencement of construction on site, and comparative baseline or "control" data will continue to be collected from sites outside of the project area. The Programme will be formulated to the satisfaction of the authorities listed above, and will include contingency options.

10.2. Acceptable levels for the parameters to be measured in the bores in the Shallow Groundwater Monitoring Programme should be set after the baseline data have been collected. These levels should be determined by the Water Authority of WA and the Department of Environmental Protection and the proponent committed to remedial action when necessary.

Response:

Please see Response 10.1.

10.3. Implications of the use of hot mineralised groundwater in resort development on adjacent marine communities needs to be researched.**Response:**

It is proposed to cool the artesian groundwater prior to use (PER page 57).

The investigations of soil profiles undertaken by Government Chemistry Laboratories in the existing Coral Bay development confirms that nutrients from groundwater and soils can be effectively taken up by plants to ensure that no adverse change occurs in soil profile nutrients. The requirement to carefully manage the groundwater resource is well recognised. The use of mineralised groundwater in the development is not expected to have an impact on adjacent marine communities. Notwithstanding the above, the implementation of the Shallow Groundwater Monitoring Programme will provide information regarding the water quality status of the nearshore marine environment, and will also detail appropriate contingency options.

10.4. No consideration has been given to the importance of the freshwater lens (and consequent impact on flora which may be dependent upon this lens).**Response:**

The hydrogeology of the region and the Mauds Landing area is explained in detail within the PER, and further elaboration is given in Response 9.1.

Given the soil types beneath the site, proximity to the ocean, and the elevation of 0mAHD (sea level), the groundwater beneath the site is expected to be approximately 35,000 mg/L (sea water concentration).

10.5. Inadequate discussion on implications of development on drainage patterns. Contrary to claims made within the PER (p. 102), an extensive development such as is proposed is likely to have a significant impact on existing local drainage patterns.

Response:

Section 4.3 of Technical Appendix B to PER document confirms that development of Coral Coast Resort will affect only a relatively small proportion of the total saline of flat vegetation area occurring in the Point Maud area. Proposed stormwater runoff management proposals are described in Section 4 of Appendix B. All stormwater run-off generated at the resort (with the exception of cyclonic events) will be directed inland away from the marine environment.

Little if any additional stormwater will be introduced to the existing surface drainage catchment. Whilst the introduction of impermeable surfaces in the development area will reduce the proportion of direct infiltration in this area and will produce run-off, this will be mitigated by the excision of the marina from the local catchment.

The drainage pattern within the salt lake will be preserved by the incorporation of a series of culverts extending under the road. Sizing and location of the culverts will be carried out by the project engineers with the objective of maintaining the surface hydraulic connection and drainage pattern between the areas divided by the road formation (PER page 103).

10.6. The suggestion was made that depending upon the type of lithology encountered, more than one monitoring bore on each site may be required as part of the proposed monitoring programme. Final bore locations and site numbers should be determined in consultation with the Geological Survey Division of the Department of Minerals and Energy.

Response:

It is proposed to monitor groundwater throughout the project area, including the golf course, adjacent to and surrounding the marina, between residential areas and Bateman Bay, and at the Services/Light Industrial Area (SLIA) where the borefield will monitor groundwater below the power station, fuel storage, municipal landfill and treated effluent disposal areas.

The monitoring programme will be formulated in consultation with the relative authorities, and if more than one bore is required at certain sites, then these will be installed (also see Response 10.1). This will be determined when details of the monitoring programme are drafted and circulated to the relevant government agencies for comment prior to development proceeding.

10.7. It was suggested by the Department of Minerals and Energy that in addition to the parameters identified in the groundwater and water quality monitoring programmes, regular monitoring also be undertaken of water quality at the marina outflow and the hydraulic head and groundwater quality in the Birdrong Sandstone. The parameters to be monitored and monitoring frequency should be stipulated by the Water Authority of WA through licence conditions.

Response:

It is anticipated that regular monitoring of water quality, hydraulic head and groundwater quality as noted will take place and it is expected that the parameters to be monitored and monitoring in frequency will be stipulated by the Water Authority of WA in its licence conditions.

Water quality within the marina and also the nearshore environment will be undertaken as part of the WQSMP (Proponents PER Commitment No.22, now No. 26).

10.8. The consultant's report on groundwater states that nutrients and other contaminants that might be produced by urban development will tend to flow towards the coastline and marina. The impact of such a flow on the marine environment is not addressed and should be included.

Response:

A number of monitoring bores adjacent marina waters and parallel with the coast, and marina waters monitoring, will be carried out in accordance with the Shallow Groundwater Monitoring Programme to be developed prior to commencement of construction on site. This plan will address proposed responses to any detected deleterious impact of changes in groundwater regime, to the satisfaction of the Water Authority of Western Australia (Proponents PER Commitment No.32, now No. 37), and CALM if considered appropriate.

11. PROJECT SPECIFIC ISSUES

11.1. Water Supply

11.1.1. Prior to any drilling of artesian or non-artesian water supplies the proponents are required to obtain a licence to drill for water. This will require close liaison with officers of the Water Authority of WA.

Response:

Section 3.1 of Technical Appendix C to the PER notes that availability of water from Birdrong formation is subject to approval of the Water Authority of WA, and it is acknowledged that licences will be required to drill for water (Proponents PER Commitment No.28, now No. 32).

11.1.2. Capacity of the artesian formation to supply water to the proposed development has not been demonstrated in the PER.

Response:

The Department of Minerals and Energy has confirmed that information pertaining to the sources of water supply given in the PER is considered to be acceptable.

Technical Appendix C of the PER provides extensive discussion on availability of water for the proposed development and concludes that the Birdrong Sandstone is the only practical source of large supplies of groundwater in the region. This aquifer is the main source of groundwater between Kalbarri and the Fortescue River, and since the turn of the century substantial level of understanding has been obtained for the size and capabilities of this resource. It is acknowledged that aquifer coefficients need to be verified for this locality, and this will be achieved by test pumping any new production bores near Mauds Landing or Coral Bay.

11.1.3. The practicality of operating a desalinisation plant is questioned.

Response:

Very significant advances have been made in desalination plant technology in recent years, and the viability and reliability of operating such a plant is well recognised within the industry for

cost effective treatment of brackish water, such as that known to be available in the Coral Bay area.

11.1.4. It was claimed in several submissions that there is a lack of detail regarding the extent of the proposed water supply, and its distribution.

Response:

The proposals for provision of water supply for potable and irrigation purposes for the proposed resort are set out in Section 5 of Technical Appendix B to the PER. This describes various options seen as being appropriate for provision of water to the Coral Coast Resort. These options will be subject to detail review as the project progresses. In general terms the objective will be to provide fresh water for potable and some non-potable purposes, and cooled artesian water for non-potable and irrigation requirements.

11.1.5. The local water supply must meet all requirements laid down by the National Health and Medical Research Council.

Response:

The potable water supply will meet all requirements stipulated by National Health and Medical Research Council.

11.2. Power Supply

11.2.1. No consideration has been given to alternative power sources, such as solar or wind power, or heat transfer from artesian water. Given the location of the site and prevailing weather patterns, solar and wind power should be strongly encouraged from the outset. Commitment 51 should be strengthened so as to commit the proponent to investigate and utilise alternative sources of power.

Response:

Technical Appendix F of the PER document provides a report on electrical services to the proposed development and nominates a number of supply alternatives which were examined for

the development. Although not specifically referred to in the document, alternative power sources such as solar, wind power and heat transfer from artesian water were given consideration.

It was considered that at the present level of technology solar power was not viable for base load generation for the development.

Wind records confirm that generation from this source would be unreliable.

The level of energy available from heat transfer from artesian water was not considered sufficient to power a town of the proposed size.

However, the practicalities of incorporating these power sources will remain under review (Proponents PER Commitment No.51, now No. 58).

11.3. Sewage Disposal

11.3.1. One submission expressed the view that all effluent disposal and treatment should be monitored regularly by an independent authority.

Response:

The results of all monitoring, including independent laboratory analytical results, will be supplied to the relevant authorities as part of the Shallow Groundwater Monitoring Programme.

11.3.2. Proposal should only be considered if there is a firm assurance that the existing Bills Bay community will be connected to the proposed treatment plant as soon as is practically possible.

Response:

Please see Response 1.7.

11.3.3. Contingency plan needed to prevent contamination of nearshore marine waters in the event of flooding due to cyclone and storm surges.

Response:

Please see Response 5.3.

11.3.4. Unclear what facilities will be available for shore based washing and sewage facilities for people living aboard boats in the marina.**Response:**

The long-term habitation on boats within the marina will be prohibited, however with respect to short-term holiday-makers the proponent reiterates PER Commitments No. 40 and 41 (now No. 47 and 48):

"40. The discharge of sewage, hydrocarbons or litter from boats into the marina will be prohibited and all users of the marina will be informed accordingly using signage and public education. Adequate rubbish bins and sewered toilets will be provided in public areas around the marina. "

and

"41. A sewage pump-out facility will be provided at a convenient and practical location on the service jetty within the marina for vessel discharge, and wastewater collected will be directed to the main reticulation system for treatment and disposal. "

11.3.5. It was noted that the sewage is proposed to be contained in existing salt pan areas. Concern was expressed that there is the potential for marine contamination via underground upwelling of water into the salt lakes, and back into the sea (as is known to occur at Lake McLeod).

Response:

Sewage is not proposed to be delivered to or contained in existing salt pan areas at any time.

Sewage will be pumped to the Light Industrial Area within the dunal system at elevations of around 12m above sea level and approximately 3km from the coast, where it will be subject to high standard treatment before evaporation and disposal within the dune area.

Stormwater run-off will be directed to the salt flat (pan) area, however there is no evidence that upwelling of groundwater occurs into the depressions in the flats. On-site investigations indicate that the base of the salt flat depressions are very dense, and that water only remains for short periods of time following storm events until lost through evaporation. The salt flat depressions do not discharge to the ocean.

11.3.6. The suggestion was made that disposal options for noxious wastes associated with the proposal should be identified and managed in such a way as to mitigate any environmental impacts.

Response:

At no time will noxious wastes be discharged to the environment.

Disposal options for such wastes will be reviewed in the detailed design phase and a proposal developed to manage such disposal so as to mitigate any environmental impacts, to the satisfaction of the Office of Waste Management (see new Proponent's Commitment No.5).

11.3.7. The wastewater treatment plant will require a licence under Part V of the Environmental Protection Act.

Response:

This is acknowledged.

11.3.8. The proponent should undertake a commitment that all ponds be lined with an appropriate impervious material, and groundwater monitoring bores established at the site.

Response:

Disposal of the treated effluent will be carried out in accordance with opportunities and constraints imposed by the volume of effluent generated, and with the key environmental management objective that no contamination of the nearshore waters must be allowed to occur in the short or long-term, either by direct (surface run-off) or indirect (groundwater discharge) processes.

Initially, treated effluent generation rates will be small, and will be disposed in the close vicinity of the treatment plant. The proposed extended aeration activated sludge treatment process can be achieved in a number of ways. As mentioned above the waste water treatment plant will require a licence under Part V of the *Environmental Protection Act*, and if any ponds to be developed as part of the process require lining to contain treated or partially treated effluent, then they will be lined. Shallow groundwater monitor bores will be located down-gradient of all proposed disposal areas in order to monitor and actively manage treated effluent disposal in accordance with this management objective (see Response 10.1).

Management of sewage treatment and disposal can be carried out taking full advantage of the large amount of land available for an acceptable disposal solution, the extremely high evaporation rates which can be utilised, the relatively small amount of treated effluent which will ultimately be generated, and the opportunity for long-term disposal to be conducted remote from the ocean.

11.3.9. The PER does not include a commitment by the proponent to undertake tertiary treatment of wastewater. Therefore the proposal to use the treated wastewater for irrigation is considered to be unacceptable, as it is likely to contaminate groundwater and ultimately the nearshore marine environment.

Response:

The suitability of treated wastewater for irrigation will be dependant on final effluent quality and in particular the salinity of the wastewater. This would be dependent on the proportions of fresh and artesian water used within the household as determined by the supply systems finally adopted for water supply, and on approval from the Water Authority.

As volumes increase, it may become feasible to return the treated effluent to the resort or to the Coral Bay townsite for use in irrigation of landscaped areas or the proposed golf course, and this would require tertiary treatment. This option will remain under review as the development of the Resort progresses.

11.4. Landfill Site

11.4.1. Commitment should be undertaken by the proponent that there will be no sea dumping of any kind of effluent.

Response:

The proponent commits that there will be no direct sea dumping of effluent or wastes of any type (see new Proponent's Commitment No.4).

11.4.2. Proposed land fill site is located reasonably close to the proposed airstrip. This may lead to an unacceptably high degree of bird strikes. It may be useful to note that US Federal Aviation Administrative guidelines require a buffer distance of 1500 metres and 3000 metres between landfill sites and runways for prop and turbo jet aircraft respectively.

Response:

Further research into this aspect will be undertaken and if necessary an alternative land fill site further inland will need to be negotiated, in consultation with the Office of Waste Management.

11.4.3. This issue is not adequately addressed. For example, it is described in the PER as serving for 'many years'. Details such as the projected life of the site need to be quantified and substantiated in a regional context. Further, as the presence of the proposed resort generates the need for the landfill site, the proponent should be required to make a financial contribution towards it.

Response:

Final siting of the land fill site, the sizing and management proposals will be developed in conjunction with the Local Authority to ensure that it is satisfactory in a regional context, to the satisfaction of the Office of Waste Management.

The Coral Coast Resort at Mauds Landing will be subject to rating by the Local Authority and therefore the development will be making a financial contribution towards the land fill site.

11.4.4. The use of saline waste water from the potable water supply treatment plant for dust suppression must be managed such that the evaporative concentrated salts accumulated in the soil are not flushed out by heavy rains such that the surrounding environment is affected.

Response:

Final planning for disposal of treated bypass water will recognise this recommendation, however it should be recognised that the majority of the project area is located on a saline flat.

11.4.5. The use of saline waste water from the water supply treatment plant to aid in compaction of waste is not endorsed. It was claimed that adding water will maintain moisture content and increase possibility of leachate reaching groundwater during rain event.

Response:

This comment is noted and will be considered in the detailed design phase.

11.4.6. It is unclear whether the land fill site would be lined to prevent leaching. One submission suggested plastic lined cells should be installed to stop leaching.

Response:

It is not proposed to line the land-fill site at this time, however this will be given further consideration at detailed design stage, and in the course of the development of the appropriate Management Plan for the land fill site, to the satisfaction of the Office of Waste Management.

11.4.7. It is unclear what recycling facilities are planned.

Response:

The integration of recycling facilities will be considered as part of the overall refuse disposal considerations during the course of detailed design, and will be developed in conjunction with Local Authority requirements.

11.5. Golf Course

11.5.1. A golf course in this location is considered to be inappropriate in several submissions. It requires irrigation in a location where water is scarce,

and it is dangerous to be located so close to a residential area (public safety issue).

Response:

Inclusion of the proposed high standard links-style golf course is seen by the proponent as an essential component of the range of tourist facilities proposed. It is a facility that is not provided elsewhere in the Region other than on a basic scale at Carnarvon and Exmouth.

Investigations and data available to date indicate that adequate sustainable water supplies can be expected from the Birdrong Formation to satisfactorily irrigate the course, which has been confirmed as acceptable by the Department of Minerals and Energy.

Setbacks from public golf courses to residential developments are now well documented and recognised by the golf course industry. Such considerations will be included in final planning layout.

11.5.2. Proposed golf course will alter natural dune formation (see point 7. 4 above).

Response:

The course will be contoured into the existing land form as befits a links style course, and only minimal land alteration will be undertaken to allow for appropriate playing and other criteria such as maintenance of land elevations for storm surge protection.

The proponent also reiterates the intention to minimise alteration and disturbance to the dune formations (see Response 7.2, PER Commitment 24, now No. 28).

11.5.3. It is noted that dune sand from Cardabia Station was identified in the PER as potentially useful for topdressing the golf course fairways (Appendix E). The use of this sand may lead to some local impact with regard to quarrying and transport which would need to be further addressed.

Response:

This is only considered an option at present. In the event that this sand resource were to be utilised, potential impacts would be addressed and managed, in consultation with the Local Authority.

11.5.4. The proposed Nutrient Irrigation and Management Plan (NIMP) should be formulated in conjunction with the Department of Environmental Protection and the Chemistry Centre. Strategies for minimising nutrient transport must be identified in the NIMP. Provision for the monitoring of nutrient impact on a regular basis should also be included.

Response:

The above points are a component of the objectives of the NIMP proposed in the PER. The proponent reiterates PER Commitment No.31 (now No. 36):

"31. Prior to landscaping of the golf course and resort/townsite, the irrigation and fertiliser requirements of all landscaped areas within the development, including the golf course and other recreational areas, will be the subject of a comprehensive Nutrient and Irrigation Management Plan (NIMP) by the proponent. The NIMP will apply to all grassed/landscaped areas requiring water and fertiliser application, including active and passive recreation areas, and broadly incorporate the following components:

- Recommendations for low water/nutrient requirement grass/vegetation types;*
- Prescribed fertiliser applications (if necessary) on the basis of regular chemical analysis of soils and plant nutrient status;*
- Prescribed watering/reticulation regime based on historical climatic data updated on a continual basis by on-site measurement and observation;*
- Management strategies to minimise nutrient export from the site; and*
- An annual fertiliser application audit.*

Any fertilisers kept on-site will be stored above anticipated maximum flood levels, and will be provided with adequate weather protection to ensure that fertiliser discharge into the natural environment does not occur.

The NIMP will be formulated in conjunction with, and to the satisfaction of, the Department of Environmental Protection. "

11.5.5. Concern was expressed that grasses used for golf courses are shallow rooted and therefore will not be effective in stabilising the dunes, leading to long term management problems. The golf course is therefore unacceptable on the dune system.

Response:

The links style course will be developed to minimise areas to be irrigated. Other areas will be revegetated and rehabilitated with native plant species using techniques which have been shown to be successful in the area. Minimal alternation will be made to the existing dune systems, as previously described. Appropriate irrigation management techniques will be used to ensure that grass cover is achieved with minimal irrigation application and as a consequence it is expected that grass root growth will be comparatively deep. This technique is successful on golf courses located in similar situations.

Furthermore, the proponent reiterates its committed to the long-term stabilisation of the golf course (and other areas):

"24. Works which impinge on the near-coastal area such as the golf course, residential accommodation, parking areas and accesses will be constructed by the proponent in such a way as to avoid unnecessary alterations to the existing landforms commensurate with appropriate design practices, and to ensure that re-stabilisation and on-going stability of the landform is maintained, to the satisfaction of DEP, CALM and the Shire of Carnarvon. "

11.5.6. It was suggested that it would be impossible to maintain the greens and fairways without the application of water, herbicides and fertilizers. The run off from this land use will affect the nutrient levels on the nearby coral reefs.

Response:

The majority of the course is proposed to be sited on land which drains east away from the sea. Stormwater runoff from holes on the seaward side of the highest ridge will be to the back of the near-beach ridge, therefore runoff will be contained within this area.

A detailed NIMP will also be formulated for the site (see Response 11.5.4).

11.5.7. It would be difficult to manage golfers, who are likely to meander all over the dune formations, rendering them unstable.

Response:

Foreshore pathway and fencing systems proposed, together with appropriate playing restrictions will ensure that access to the dune system by golfers is limited to the appropriately managed locations.

11.5.8. Consideration should be given to an alternative location for the golf course, such as on the salt flats further inland.

Response:

The majority of the course is located on the area towards the salt flats, with only a minimal number of holes on the dunes (see Figure 1.3 of the PER).

11.6. Marina

11.6.1. It is unclear how the proposed 'beaches' within the marina site are proposed to be managed.

Response:

The beaches within the marina will be managed by CCMD in accordance with the passive recreational objectives of these areas.

11.6.2. Marina maintenance - it is unclear who will undertake the role of Waterways Manager in the short term (first 5 years) and long term (after 5 years). This includes maintenance of marina walls, dredging and maintenance of acceptable water quality within the marina.

Response:

Coral Coast Marina Development Pty Ltd, as the Management Corporation, will be responsible for the maintenance of all infrastructure and monitoring for a minimum period of 5 years (see Proponents' PER Commitment No.52, now No. 59), in accordance with DPUD Policy DC 1.8.

The proponent additionally reiterates PER Commitment No.49 (now No. 56):

"49. The proponent will maintain the breakwaters and harbour revetments to the satisfaction of the Department of Transport, including necessary repairs if any damage is sustained during a severe cyclone, during the period in which CCMD is responsible for townsite management. "

Management responsibilities will ultimately transfer to the Local Authority.

11.6.3. Orientation of marina entrance is such that in heavy weather only large craft will use it. Claims that the marina will take pressure off southern launching sites are therefore unsubstantiated. Smaller craft are more likely to opt for more sheltered water and shorter travel times to destinations, presumably reef areas, and are therefore likely to continue to use southern launch sites.

Response:

The proposed marina entrance has been planned and orientated to provide substantial protection even in heavy weather. The marina is considered to provide a safe haven for small and large vessels (25 to 30m) alike.

Continued over-crowding of Bill's Bay can and should be avoided through the use of appropriate regulations by CALM and the Shire of Carnarvon. Such regulations would be impossible to justify and enforce unless the launching facilities and marina at Maud's Landing proceeds (see also Response 4.5).

11.6.4. Concern was expressed that a depth of 3.5 metres may not be deep enough to allow for fishing charter boats, tourist vessels and large sailing craft.

Response:

The marina has been designed for the majority of vessels that will use the area, and depth is consistent with most other boat harbours in the State. However, it will not be adequate for vessels such as the STS Leeuwin. Nevertheless, the adjacent areas of Bateman Bay would provide a sheltered mooring area for large vessels.

11.6.5. Insufficient detail is given within the PER regarding total flushing of the marina to a depth of 3.5 metres in a 3 to 4 day period. Several submissions questioned whether the marina would be flushed adequately. For example it was considered that the effects of wind induced flushing are overestimated, and wind induced flushing would be further reduced by 'shielding' of urban development surrounding the marina, reducing wind speed and water exchange. It was considered important that this issue be investigated further.

Response:

There is significant sea-breeze activity from both southwesterly and southerly winds as shown on the wind roses presented in the PER. The Southwestern Waterway is aligned with the local dune drift direction and will regularly experience strong wind blowing along the waterway.

The urban development along the Southwestern Waterway will tend to funnel the southerly winds along the waterway rather than shield the waterway. Southwesterly and southerly winds will be experienced for about 60% of the winter afternoons.

In terms of the time taken for the surface layer of the water to reach 1.5% of the wind speed, it is true that due to momentum effects there may be about one-half an hour lag from the onset of the wind to the time when the water reaches its maximum speed. This is balanced by the momentum effect when the wind ceases to blow along the waterway and the water is still moving even though the wind has stopped. The figures presented in the PER are therefore considered appropriate.

11.6.6. It was considered that the location of the boat ramp and likely access channel to and from the ramp may cause some conflict with users of the proposed boat pens. The channel between the marina wall and pens appears to be at most 50 metres wide and includes a swimming / bathing area.

Response:

The swimming beach immediately to the west of the boat ramp will be protected by a shark net. The boats using the ramp will not be able to cross this barrier and move into the swimming area.

11.6.7. It is unclear who will take responsibility for maintaining and replacing the proposed shark nets within the marina.

Response:

Coral Coast Marina Development Pty Ltd, as the Management Corporation, will be responsible for the maintenance of all infrastructure, including shark nets (see Proponents' PER Commitment No.52, now No. 59).

11.6.8. It is unclear how much spoil would be generated as a result of excavation of the marina, or where it would be placed.

Response:

Section 2.2.3 of Technical Appendix B states that excavation from spoils from construction of the Marina is expected to be about 2 million cubic metres. This will be used to fill the building area and other sites.

11.6.9. There is no adequate provision for pumping of boat bilges or spill free refuelling facilities in the marina.

Response:

A sewage pump-out facility will be provided at a convenient and practical location on the service jetty within the marina for vessel discharge, and wastewater collected will be directed to the main reticulation system for treatment and disposal (Proponents PER Commitment No.41, now No. 48).

In terms of fuel management, the refuelling facilities at the marina will be constructed in accordance with the requirements of the Department of Transport and the Department of Minerals and Energy.

11.7 Coral Gardens

11.7.1. Information presented within the PER does not support the establishment and maintenance of a transplanted coral reef system. It is claimed that coral reef ecosystems are generally found in high energy systems with high flushing rates and high light attenuation, which would not be the case in the proposed marina. Water quality and temperature ranges to sustain such an ecosystem would be difficult to achieve in such a shallow low flushed system, and the issue of light regimes has not been addressed within the PER at all. Corals are likely to become abraided by sediment movements. A detailed feasibility study is required before this aspect of the development can be seriously considered.

Response:

Comments 11.7.1, 11.7.2 and 11.7.3 are interrelated and are best answered jointly as follows.

The concept of establishing a "coral garden" in the Town Beach embayment and adjoining the Ningaloo Marine Park Visitor and Research Centre, as described in Section 3.2.1, is acknowledged to require detailed feasibility and design studies. However it is considered that the anticipated water quality and flushing in the marina will be suitable for the successful maintenance and growth of diverse hard and soft coral species. Successful techniques for the transplantation and maintenance of coral communities have been developed and proven elsewhere, notably at the Great Barrier Reef Wonderland in Townsville, Queensland.

CCMD proposes to establish the coral garden and will maintain it until such time that CALM agrees to accept responsibility for its on-going maintenance as part of the operation of the Ningaloo Marine Park Visitor and Research Centre as part of the initial development.

In the event that, following the detailed feasibility and design studies, CALM elects not to participate in this aspect of the project, then CCMD would likely construct and maintain the coral garden as part of the adjoining Resort Hotel and Convention Centre.

CCMD is strongly committed to the concept of establishing the coral garden as a principal feature of the proposed marina and is advised that the concept is undoubtedly feasible from a biological perspective. Specific commitments regarding the construction, maintenance and

on-going operation responsibilities for the coral garden, including arrangements with CALM in this regard, are necessarily subject to detailed feasibility and design studies which will be undertaken in association with CALM, and under its approval.

11.7.2. The long term management of the proposed coral gardens has not been addressed within the PER after CCMD transfers responsibility. Concern was expressed that local government may not have the funding, staffing or expertise to maintain the coral gardens. Further there is no mention of the coral garden construction or maintenance in the construction and operation phase of the development, or any commitments made in relation to it.

Response:

Please see Response 11.7.1.

11.7.3. Concern was expressed regarding the collection of coral for the proposed coral gardens. This may only be achieved through the removal of coral from areas within the marine park. This would establish an undesirable precedent. Also what species would be used ? If the corals die, how many further attempts will be made to establish the gardens ? Also, how many coral heads would be required ?

Response:

Please see Response 11.7.1.

11.8 Light Industrial Area

11.8.1. The proposal to establish a light industrial area (LIA) approximately 4 kilometres south of the existing townsite of Coral Bay is different to the LIA area already designated by the Shire of Carnarvon for the area, which has been determined in accordance with the Coral Bay Planning Strategy in 1992.

Response:

The variation in the position of the LIA proposed in the PER to that in the Coral Bay Planning Strategy (DPUD, 1992) is acknowledged.

The Coral Bay Planning Strategy proposed that the Service Trades area and the utilities are required to service the existing settlement be located to the immediate east of the townsite, in the vicinity of the existing refuse disposal site. Under the Strategy, the area is proposed to contain not only service trades/industries, but also refuse disposal (existing) effluent disposal and power generation.

It is not unreasonable to conclude that the limitations imposed by the Townsite cadastral boundary was a principal determinant in choosing the location of the services/utilities area proposed in the Strategy.

The location proposed in the Strategy is considered to have many disadvantages:

- the site is visually prominent from the Coral Bay access road;
- the site is in close proximity to the townsite (the trades area being less than 200m east and the utilities/disposal area less than 300m east), resulting in noise, odour and dust nuisance; and
- the effluent /refuse disposal areas would be within 1km of the coast and the Sanctuary Zone of Bills Bay, with the inherent, continued risk of nutrient export to this area.

In view of these potential problems, a new location was considered appropriate that was well screened from view, presented little possibility of nuisance to the Coral Bay townsite, little risk of nutrient movement towards the marine environment, and was economically located for the extension of service mains to both townsites.

The SLIA proposed for the Coral Coast Resort satisfies all of the above criteria, and is therefore considered a more environmentally and socially acceptable location.

11.9 Public Access

11.9.1. Public access to the beach as described in the overall plan of the development appears to be largely through private land, with proposed facilities (kiosk) unserviced by car parking areas. This effectively privatises the beach and is considered unacceptable.

Response:

A key component of the development is to ensure that access to the beach by all users is maintained. Full public access to the beach is retained and specific provision has been made in the plan for public access to the beach including - to the west of the marina entrance - two public carparks with attenuate picnic, barbecue and toilet/change room facilities and - to the east of the marina entrance - a further carpark with attenuate picnic, barbecue and toilet change room facilities. Public access to the beaches will be further augmented by a comprehensive pedestrian / cyclist dual use path network.

This is also highlighted in Proponents' PER Commitment No. 6 (now No. 8) to develop a Foreshore Management Plan, the first point of which is:

"the maintenance of public access to the beach at Mauds Landing, including the area through the proposed golf course" (pg 151), and the second point:

"the formalisation of parking and picnic areas in appropriate locations".

11.9.2. Proposed marina should be available for use by vessels such as the STS Leeuwin as a protected anchorage during scheduled voyages.

Response:

Please see Response 11.6.4.

11.10 Roads

11.10.1. Statement made in relation to road access to the townsite are considered to be misleading. The statement is made within the PER that the site

is provided with sealed access roads and concludes that this obviates the cost of providing the necessary infrastructure to achieve access to other Park locations. However, the PER also indicates that a new access road will be established rather than using and upgrading the existing road off the existing sealed access road to Coral Bay.

Response:

Section 3.0 of Technical Appendix B clearly sets out proposals for construction of main access road to Mauds Landing and internal roads.

A new access road is proposed rather than using and upgrading the existing access to Mauds Landing off the existing sealed access to Coral Bay as this new location makes best use of the existing topography to limit fill requirements for any road embankment across the low lying areas. Substantially more fill would be required if the existing access were upgraded.

11.10.2. Approval would be required from the Main Roads Department of WA (MRDWA) on the location of the intersection of the proposed new road to Maud's Landing before roadworks can proceed. This should be reflected in Commitment 10.

Response:

It is recognised that approval will be required from Main Roads WA for the final intersection location and the final road siting and alignments will be developed in close liaison with Main Roads WA and the Local Authority.

12. AESTHETIC IMPACT

12.1. The impact of the proposed water reservoir on a highly elevated piece of land has not been adequately considered within the PER. It was considered that the visual impact of the water storage tanks on Maud Hill cannot be justified and is out of scale.

Response:

The siting of the ground level storage tank as nominated in 5.1.4 of Technical Appendix B is proposed just off the peak of Mauds Hill. The site being considered is south west of the peak and at a slightly lower elevation than the hill peak. Storage requirements will be minimised at this location and the existing access to the hill top can be upgraded to allow appropriate access for construction and operations and maintenance without further significant impact on the dune system. Dependant on final design, the storage tank would be of the order of 4m high and is therefore considered in scale with its surroundings. Areas around the tank which are disturbed during construction will be stabilised and revegetated with screening plant species.

12.2. No consideration given to the visual impact of the proposed power transmission lines carrying power to the site.**Response:**

All power lines are to be located underground, as described in Section 7.2 of Technical Appendix B (see new Proponent's Commitment No.18).

12.3. Residential / tourist development should be characterised by low profile structure harmonising with the dune and low land profiles. Height of buildings should be restricted to 2 storeys.**Response:**

The Resort has been planned to harmonise with the environment. Details of development controls including building height, design and materials are given in Section 3.2.8 of the PER. In general, all buildings will be limited to two storeys in height, with the exception of the Resort Hotel/Convention Centre which may be slightly higher, subject to detailed design and specific building approval.

The proponent also reiterates PER Commitment No.34 (now No. 39):

"34. To ensure a high level of sympathetic residential design, all building designs and material schedules will be vetted for approval by the the proponent (Resort Manager) prior to lodgement with Council for Building Approval. "

12.4. Development controls proposed by the proponent to reduce aesthetic impact are largely based on assumptions and have not been discussed or approved by the local authority, which has ultimate control over such issues.

Response:

The Town Manager for the Coral Coast Resort for the first 5 years, which includes the construction period, will be CCMD. Therefore control to reduce potential aesthetic impacts will be achievable (see also Response 12.3). As a component of the planning approvals process, discussions with the Shire of Carnarvon are proceeding.

12.5. Several submissions expressed concern that the development is out of scale and context with the Ningaloo area. The area is popular at present because of its 'natural' appeal. It was considered that a large resort is inappropriate and will detract from the natural beauty of the area.

Response:

The notion of appropriate "scale" and "appeal" are by definition subjective, and it is acknowledged that acceptability will vary with the individual. However, the proponent refers the reader to Responses 1.1 in terms of the scale of development, and Response 12.3 in terms of aesthetic impact.

13. MANAGEMENT ISSUES

13.1. PER states that dogs and cats will be excluded from the resort. This appears to be an unrealistic commitment, especially as a large proportion of the stated target market (i.e. people in their forties) take their pets with them when they holiday.

Response:

The exclusion of cats and dogs from the residential and tourist accommodation areas of the development can be prohibited under Council by-laws specifically formulated for the Coral Coast Resort. The by-laws will be enforced by the townsite Ranger, and a pound can be constructed within the LIA.

The proponent also reiterates PER Commitment No. 38 (now No. 43):

"38. *To maximise the protection of native terrestrial fauna in the area, the proponent will consult with the Shire of Carnarvon to determine appropriate procedures for the prohibition of cats and dogs in the resort and townsite areas.*"

13.2. Facilities proposed for the CALM interpretive centre do not take into account the costs of providing staff or on-going maintenance costs.

Response:

All infrastructure, including offices for CALM (and Fisheries) personnel will be provided by CCMD. Furthermore, the proponent will establish a Marine Park Visitor/Research Centre within the resort (see Proponents Commitments No. 43 and 44). The revenue generated by this facility has been estimated at between \$250,000.000 to \$500,000.00 per year. It is considered appropriate that CALM provide the staff to continue to manage the Ningaloo Marine Park (refer also to Response 1.3).

13.3. Residential landscaping - commitments to manage this issue in the PER are untenable - how will the land owner be required to implement suggested nutrient management and landscaping guidelines. This is unenforceable.

Response:

The nutrient management and landscaping guidelines are practical and enforceable in a number of ways:

- 88% of lots proposed are less than 500m² in size, therefore limiting the potential for large areas of lawn or garden beds;
- maximum lawn areas can be specified for each lot (together with other restrictions), as a condition of sale.
- nurseries and garden outlets within the townsite can stock only nominated plants and grass types;
- Penalties for excess water consumption above a reasonable predetermined limit.

13.4. ORV activity along the beaches needs to be carefully managed, particularly inter-tidal areas.

Response:

It is proposed to prohibit access by ORV to the beaches south of the entrance channel and prohibit access to the conservation area. The proponent reiterates PER Commitment 6 (now No. 8) to formulate a Foreshore Management Plan which will include:

"rationalisation of 4WD access to the beach area in the vicinity of the site".

13.5. CALM needs to enforce current and proposed restrictions on collecting, disturbing, and / or displacing marine fauna within the Marine Park. Possibly need to increase personnel numbers.

Response:

This is agreed, and it is considered that the provision of office and other facilities within the Coral Coast Resort will facilitate this aim.

13.6. Detailed 'Public awareness' campaign needed to educate public on environmentally sensitive issue. This campaign needs to address issues such as discouraging hand feeding of silver gulls. Consideration should be given to form a community association to protect the environment. This would reduce need for authoritative policing and administration.

Response:

The proponent agrees and reiterates Commitments No. 37, 44, 45, 46 and 47:

"37. The proponent will formulate an education programme to ensure that residents and visitors are fully advised of requirements in regard to nutrient control and management within the resort, together with active discouragement of fertiliser use within residential areas, to the satisfaction of the DEP. (revised)

-
44. *The proponent will construct and establish a Marine Park Visitor/Research Centre within the resort, to provide for education and interpretation programs for visitors and residents in consultation with CALM.*
45. *The proponent will co-operate with CALM officers to establish and maintain appropriate awareness and appreciation of the attributes of the Ningaloo Marine Park to the satisfaction of the DEP and CALM.*
46. *The proponent will distribute literature to visitors to raise their awareness of the recreational potential of the terrestrial and marine habitats and their environmental limitations, to the satisfaction of the DEP and CALM.*
47. *The proponent will erect signs at appropriate locations within the development to notify visitors of their environmental management responsibilities, to the satisfaction of the DEP and CALM."*

(Now Proponent's Commitments No. 42, 51, 52, 53 and 54).

The suggestion of the formation of a community association is noted and supported.

13.7. Proponent should discourage regular use of anchors, and support installation of fixed moorings within the marina.

Response:

Fixed moorings will be provided on pens and jetties within the marina. Anchoring will not be permitted in the waters of the marina, except during emergencies or when the marina is used as a storm refuge.

13.8. Proposed resort development will increase recreational pressure on the Oyster Bridge area, approximately 8 kilometres north of Point Maud. Consideration should be given by CALM to include this area within a 'Marine Sanctuary' if the proposed development proceeds.

Response:

CCMD agrees with this suggestion, as discussed in Section 7.2.4 of the PER (page 142).

13.9. Concern was expressed in several submissions that should the proponents at some stage during the term of development of the project be unable to meet their commitments and the proposal be abandoned, there needs to be a process established to complete development to ensure there are no long term adverse impacts on the environment through incomplete works.

Response:

The first stage of the project, that is within the first 5 years, is to construct all of the infrastructure associated with the project. Prior to commencement of construction, a condition of approval will be the demonstration to Government that sufficient financial resources are available for the the project to proceed as planned.

13.10. Details regarding the proposed 'Management Corporation' are unclear, i.e. which groups / bodies will be represented on the Corporation, and what powers will it hold, and what happens after the designated 5 year period. Consideration should be given to extending the 5 year period to a 10 year period.

Response:

The formation of a Management Corporation is a planning issue which is being dealt with separately in negotiation with the Shire of Carnarvon, Department of Land Administration, and the Ministry for Planning (see Koltasz Smith and Partners, 1995). Please also see Response 11.6.2.

13.11. Additional details are required regarding handover to local Government of aspects of the project such as sewerage, marina, and foreshore reserve management.

Response:

Please see Responses 11.6.2.

13.12. It is likely that the proposed development will place additional traffic demands on access tracks adjacent to Ningaloo Marine Park. These areas need

to be carefully managed via appropriate signage and tourist radio. An integrated approach needs to be made with CALM, local pastoralists and the proponent to manage coastal land via joint agreements.

Response:

The proponent agrees with this suggestion.

13.13. Coastal access will need to be maintained north of the proposed development. PER commitments 6 and 13 need to be modified to reflect the following : 'Allowance for existing coastal access between Coral Bay and Ningaloo will be maintained at the north eastern edge of the Coral Coast Resort development, in lieu of the Roads 2020 review of the need for further extension and rationalisation of coastal access in the area'.

Response:

Coastal access will be maintained to beaches east and north of the proposed development.

13.14. The suggestion was made that in relation to Commitment 26, the proponent liaise with the Department of Conservation and Land Management and Greening Australia on the proposed tree planting programme for the development site.

Response:

The proponent agrees with this suggestion.

13.15. It is unclear in the PER whether dredging of the entrance channel to the marina will be required. This possibility is raised in PER Section 7.2.1, however insufficient detail is presented. The potential future need to deepen or lengthen the channel in future years, for example to provide access for larger vessels also needs to be addressed.

Response:

Dredging of the marina entrance channel will be required during the construction phase of the project, however the entrance has been designed to minimise the need for dredging at the outer end both during construction and operation of the facilities.

In terms of the requirement for on-going dredging of the entrance, Section 7.2.2 of the PER states:

"The entrance channel bathymetry will be monitored on an annual basis. There is adequate capacity for sediment storage against the breakwaters to cater for expected accretion over the next 40 to 50 years, consequently there should be little sedimentation within the entrance channel within that time. If dredging should be required, a dredge from Carnarvon can be mobilised. "

It is not part of the present proposal to deepen the entrance for very large vessels.

13.16. Has the need for 'green areas' or vegetation belts to suppress dust during the long and windy dry season been given adequate consideration.

Response:

The need for vegetation belts has been considered and will be included as part of the extensive tree planting programme (PER Commitment No.26, now No. 30).

13.17. PER does not include fuel storage details, which is an important environmental issue.

Response:

The PER describes fuel storage details for both construction and operational phases of the project. The proponent reiterates PER Commitment No.17 (now No. 21):

"17. The proponent will design, construct and manage bulk fuel storages in accordance with specifications set by the Water Authority and Department of Transport. In terms of fuel management, the refuelling area for construction machinery and any fuel storage

vessel utilised on-site will be located within an area which is sealed with a continuous double-thickness polythene sheet covered with soil, of sufficient volume to contain any spill which may occur during re-fuelling in accordance with standard practice in hazardous materials management in accordance with Department of Minerals and Energy requirements. In the event that any spill occurs outside the compound, the contaminated soil will be immediately removed for disposal in an approved manner to be determined in consultation with the Shire of Carnarvon. " (revised).

14. CONSTRUCTION IMPACTS

14.1. Proposed silt curtain is considered to be totally inadequate in containing silt, especially in wave conditions generated by more than 10 knot winds.

Response:

If the utilisation of a silt curtain is required, it will be located within the marina entrance, which will be shielded from the prevailing winds at all times.

14.2. Construction impacts need to be carefully controlled to avoid 'blow outs' being created in the dune areas.

Response:

The design and management of the development both at construction and the implementation stages will recognise the need for correct dune management and control to ensure on-going stability (see also Response 7.2, PER Commitment No.24, now No.28).

14.3. Minimal blasting should occur during construction.

Response:

The proponent reiterates PER Commitment No.23 (now No. 27):

"23. There is currently no expectation that blasting will be required, however should blasting be necessary the proponent will obtain permission from the Shire of Carnarvon. In the event that any non-routine exceptionally loud noise was anticipated,

surveillance of possible dugong movements in the nearshore environment would be implemented. "

14.4. Transient construction population which would be required to build such a large resort will put existing resources (wastewater treatment, sewage disposal, power supply, existing local accommodation facilities) under unacceptable pressure.

Response:

The transient population associated with the construction of the project will be fully self-contained, and therefore will not place unacceptable pressure on existing local resources.

Subject to final designs and construction timing, it is possible that a camp will initially be set up near the service industries area where construction of Stage 1 facilities for wastewater, power and similar facilities can be developed. As development progresses, these facilities would be transferred to the Mauds Landing site to the caravan park area where use will be made of Stage 1 facilities.

14.5. During the construction phase there may be large areas of standing water for considerable periods of time which may cause mosquito and midge problems. Management of this issue has not been addressed within the PER document.

Response:

The only areas of standing water which may occur due to the project which do not occur at present will be due to storage of dewatering spoil (water). This water will be of seawater concentration and breeding habitat may be created for nuisance insects (predominantly the mosquito).

Coral Bay is located some 3km south of the project area, in the opposite direction to prevailing southerly and south-westerly winds. The likelihood of mosquitos impacting the townsite is therefore considered remote. However if required, mosquitos and their larvae will be controlled by a number of standard practices, such as the minimising the area of suitable habitat available, or careful selective spraying (see new Proponent Commitment No.34).

14.6. Proposed construction methods such as dewatering are described in limited detail in the PER. Dewatering may have significant and major localised impacts which should be identified and investigated within the PER. This information should be available prior to the drafting of the construction management plan.

Response:

The proponent has committed to the formulation of a detailed Dewatering Management Plan as part of the Construction Management Plan. The environmental and engineering concepts on which the plans are based will follow detailed drilling and pumping on-site investigations.

The Dewatering Management Plan will be formulated by the proponent to the satisfaction of Department of Environmental Protection and Shire of Carnarvon.

14.7. It is unclear what methods are proposed to be used during the monitoring of the proposed dredging operations, and who will fund it. Also amount of dredged material, and exact location of the settlement pond / disposal site. The ultimate fate of the settlement pond should also be described.

Response:

The Construction Management Plan will include the specific details of monitoring and dredging operations proposed, and the location of settlement pond. It is anticipated that settlement ponds will be within the development area and will be rehabilitated and incorporated within the overall works (see also Response 11.6.8).

All dredging operations will be funded by the proponent.

14.8. The choice of quarry site to supply rock to be used for the breakwaters needs to be resolved. The environmental impact of this choice needs to be determined, including the impact on the local population from '6 to 8 trucks completing a total of approximately 35 trips per day' for 6 months.

Response:

Whilst a quarry located approximately 70km from Mauds Landing has been identified as being appropriate, the precise location and quarrying proposals can only be developed as the approval and design process continues. The total number of truck trips per day nominated is similar to that expected for total vehicle trips in a normal urban residential street, and it is not therefore anticipated to create significant local impact during the construction phase.

The proponent also reiterates PER Commitment No.9 (now No. 12):

"9. *Management during the first phase of the project will seek to minimise the impact of additional traffic and heavy vehicles thereby minimising the potential for impact on existing landuses at the Coral Bay townsite, to the satisfaction of the Shire of Carnarvon.* " (revised).

14.9. A commitment should be made by the proponent that no water originating from marina dewatering operations is discharged into the marine environment.

Response:

The Dewatering Management Plan to be formulated as part of the Construction Management Plan will identify environmentally acceptable sites for disposal of dewatering which will include prevention of marina dewatering discharge direct into the marine environment.

15. OTHER ISSUES

15.1. In view of the former role of the site as a landing port and port, a detailed historic values study of the area should be undertaken prior to the execution of groundworks.

Response:

The only evidence of the sites' former use as a port are the remnant jetty piles on the beach. For an account of the historic value of the site the reader is referred to:

Whiteford, David. (1993). Light Railways No.119 - Mauds Landing: A History.

Historical photographs and records will also be resourced by CCMD for display in the proposed Visitor Centre.

REFERENCES

- Atkins, K.J. (1994). The Department of Conservation and Land Management Declared Rare Flora and priority Flora List for Western Australia. CALM.
- Beard, (1975). Vegetation Survey of Western Australia, 1:100,000 Series. Pilbara Sheet and Explanatory Notes. University of Western Australia Press.
- Department of Conservation and Environment (DCE) (1984). Coral Bay Draft Coastal Management Plan. Bulletin 174, Department of Conservation and Environment, Perth, Western Australia.
- Department of Conservation and Land Management (CALM) (1989). Ningaloo Marine Park (State Waters) Management Plan 1989-1999. Management Plan No. 12, Department of Conservation and Land Management, Perth, Western Australia.
- Department of Planning and Urban Development (DPUD) (1992). Coral Bay Planning Strategy. Department of Planning and Urban Development, Perth, Western Australia.
- Environmental Protection Authority (EPA) (1993). RED BOOK - Status Report. Report 15, February 1993.
- Humphreys, W.F. (1994). The subterranean fauna of the Cape Range coastal plain, Northwestern Australia. Report to the Australian Heritage Commission and the Western Australian Heritage Committee.
- Jones Lang Wootton (1993). North west Cape - Tourism Development Study. Report prepared for the Department of Resources Development.
- Koltasz Smith and Partners (1995). Coral Coast Resort Master Plan - Mauds Landing.
- Museum of Western Australia (1995). Coral Coast Per - Comments. Unpublished submission to the Department of Environmental Protection.

Salmon, M., Wyneken, J., Fritz, E. and Lucas, M. (1992). Seafinding by hatchling sea turtles: Role of brightness, silhouette and beach slope as orientation clues. *Behaviour*, **122**(1-2):56-77.

State Planning Commission (1994). Gascoyne Coast Regional Strategy - Draft for Public Comment. Perth, Western Australia.

Western Australian Museum (1995). Coral Coast PER - Comments. Unpublished Response to the Department of Environmental Protection.

Witherington, B.E. and Bjorndal, K.A. (1991). Influences of artificial lighting on the seaward orientation of hatchling Loggerhead turtles (*Caretta caretta*). *Biol. Conserv.*, **55**:139-149.

Appendix 3

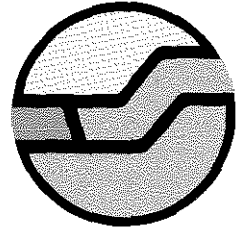
**Submission from the Department of Conservation and Land
Management (CALM)**

HEAD OFFICE

HACKETT DRIVE CRAWLEY
WESTERN AUSTRALIA
Phone (09) 442 0300
Facsimile (09) 386 1578

STATE OPERATIONS HEADQUARTERS

50 HAYMAN ROAD COMO
WESTERN AUSTRALIA
Phone (09) 334 0333
Facsimile (09) 334 0466
Teletype (09) 334 0546



Please address all correspondence to Executive Director, P.O. Box 104, COMO W.A. 6152

Your Ref:
Our Ref: AJW:SB
Enquiries: Mr J Sharp
Phone: 442 0304

Chairman
Environmental Protection Authority
Westralia Square
141 St George's Terrace
PERTH WA 6000

Attention: Ms Eve Bunbury

DEPARTMENT

18 MAY 1995

S/44/89

CORAL COAST RESORT / MAUDS LANDING - PUBLIC ENVIRONMENTAL REVIEW

This proposal has the potential to help solve several major environmental problems in the Coral Bay area and to assist with the management of the southern part of the Ningaloo Marine Park. However, the project itself has some risks associated with its potential success which could also result in further environmental problems. Some of these require further discussion with the company in order to resolve them.

The proposal has the potential to deliver some environmental benefits, but more definite ways of achieving these need to be addressed. There is little doubt that the proponent can deliver the engineering aspects such as marina construction, armouring, subdivision, facilities, water supply and sewage disposal. However, some of the other aspects which rely on residents' behaviour over long periods of time, such as nutrient input to gardens, low water gardens and agreeing not to keep cats and dogs, will be more difficult to achieve and control. Control will also depend initially on the proposed management corporation and subsequently on the local authority. It will be essential for the conditions that are to apply at Mauds Landing to be stated at the very outset to potential residents.

If sewage from Bills Bay is connected to the Mauds Landing development and if moorings in more suitable locations are provided then the existing environmental damage will be reduced. However, these are only possibilities, not certainties, and rely on action and expenditure by other parties, particularly the Government, the local authority and to a lesser extent, CALM. The proponent may be able to assist financially to ensure that the potential benefits are realised.

The resort will result in an increase in visitor numbers, both tourists and residents. The carrying capacity of the marine environment may be exceeded and management costs to Government and the local authority will increase. CALM will face substantial additional capital costs (land, housing, boat, vehicles) as well as management costs (salaries, vehicle running, office). Although some finance may be available from the visitor centre, the \$250 000 per annum income is only an estimate and there is no guarantee that it will be realised. Firm commitments by the proponent of a guaranteed minimum income to CALM and management structures agreeable to the proponent and CALM need to be established.

The principles on which CALM has considered the PER are:

- There should be no adverse effect on the environment, especially the coastal dunes and the coral reef component of the marine environment.

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442 22/15/95

- The proponent must make a commitment to manage, rectify and control both existing and potential problems associated with the project and also identify how this will be done.
- CALM must be able to manage the conservation estate as well, or better than before, the project occurs.

The three major problems that the project could help solve are:

- (i) The opportunity for the Coral Bay settlement to be included in a properly structured water and power supply and to be linked to a tertiary waste treatment facility. At present the Coral Bay settlement is constrained in its possibility for expansion and the sewage system is inadequate.
- (ii) Further damage to the coral reef in Bills Bay from moorings could be eliminated by providing alternative mooring facilities in the proposed marina.
- (iii) Reducing the large numbers of vessels in Bills Bay would also solve the safety problem caused by the interaction of these boats with swimmers and snorkelers.

Financial and visitor arrangements can have marked consequences for the environment. There is a risk that the residential blocks on which this project depends for its financial viability may not all be sold, or that the estimated number of visitors may not eventuate or that environmental or other problems may occur that jeopardise the project. If any of these things happen arrangements must be made to ensure that the environment does not suffer if the Government has to pick up the pieces. It may be prudent to have some mechanism such as a substantial development bond or bank guarantee lodged with the Government to cover these eventualities.

A complementary approach would be to develop the structures, such as the marina and breakwater, first. If problems arose later these structures could become the property of the Government and if they were constructed under the environmental conditions outlined in the PER would not be a burden on the Government.

The PER is a comprehensive one as one would expect from a major proposed development. The things that it is particularly encouraging to see include:

- Educating residents about nutrient management and control (point 37, p157).
- The emergency response plan for several contingencies. This should be extended to include a commitment to rectify any problems, whether due to nutrients in the groundwater or stormwater into the marina, which their proposed extensive monitoring might reveal. As well as the commitment to be responsible for any problem the proponent should also indicate how nutrient and stormwater problems, revealed by their monitoring, will be dealt with (point 21, p153).
- The commitment to implement any necessary remedial action to maintain water quality in the proposed marina (point 39, p157).
- The provision of adequate rubbish bins and sewerred toilets in public areas around the marina (point 40, p157).

- Induction courses about the environmental sensitivities of the area (point 7, p151).
- The commitment to landscape areas disturbed by construction but not required for resort purposes (point 36, p157).
- The commitment to a nutrient and irrigation management plan including a low water use approach to gardens (point 31, p155). This will overcome the tendency in Pilbara towns at present to have lush high water use gardens. Low water use techniques have been developed at Karratha by WAWA, CALM and DEP. The proponents should also indicate how these positive features will be implemented.

Some of the things that may require more attention include:

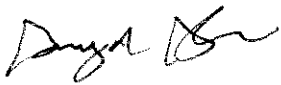
- There may be a need to review the amount of excavated material needed to prepare the site. The development is based on excavated material from the marina raising building levels above storm surge height. This appears to have been calculated on mean sea level. As cyclones may not always occur at low tide, allowance may be necessary for the fact that highest astronomical tide is 0.93 m above mean sea level.
- There is already evidence of high levels of TBT (tri butyl tin used in anti-fouling paint) near large boat moorings in Bills Bay so the PER should include a commitment to prevent or eliminate that at Mauds Landing.
- While there is a monitoring program for shoreline movement (point 33, p156) there should also be a commitment to rectify any adverse situation revealed by that monitoring. How this would be done should also be indicated.
- The proposed development will bring more people to the area and although the development is a few kilometres from a sanctuary zone in the marine park there will certainly be more pressure on it. The PER should indicate how this will be handled.
- The PER should also indicate how impacts outside the sanctuary zone will be handled.
- The coral garden is a creative idea but there is no explanation of how such a garden is to be established nor what action will be taken if monitoring shows that the marina environment is unhealthy for the coral.
- The PER recognises the potential for damage due to anchors from higher levels of boat use but should also make a commitment to contribute to the cost of managing and rectifying the increased impacts by, for example, the provision of moorings or public docking facilities in the marina.
- The high number of residential blocks (eventually over 900) means that in due course there will be a substantial population of "residents" compared to tourists and visitors. The significance of this is that tourists are much easier to guide to places of interest without damaging the environment. Residents, and visitors who are not part of tours, are much more likely to explore on their own and there is then a much greater risk of damage to the environment. The proponent should make a commitment to manage, rectify and control this problem and also indicate how this will be done.

- When there are many permanent residents in the area there will also very likely be an increase in 4WD ownership. The proponent should make a commitment, or provide CALM with the means, to manage, rectify and control this problem and also indicate how this can be done.
- The visitor centre is an attractive idea, offering CALM some educational and improved operational opportunities. However, we would need to look more closely at the costs and potential revenue before making firm commitments. An estimated \$250 000 revenue for the first year is given but there is no estimate of costs, eg is the block and building to be provided free of charge? Who is to pay for future maintenance costs?
- As visitor numbers increase so will CALM's supervision and management requirements. Will houses be provided for the extra staff needed?
- It should be a condition of the development that the proponent will ensure that the new sewage and effluent treatment plant that they put in for the Mauds Landing development will be capable of coping with, and capable of being connected efficiently to, the effluent and sewage output from the Bills Bay settlement (p143). It is essential that this is achieved as it will provide a major environmental benefit to the area.
- A similar arrangement should apply to the provision of power and water.
- Many of the statements in section 8 mention "opportunity" without specifying who pays and how much, eg visitor centre, effluent treatment at Bills Bay.
- The source and method of extraction of the limestone and other building materials must be evaluated so that its environmental impact can be determined, unless the materials are sourced from approved existing quarries.
- When visitor numbers increase, the potential for over exploitation of fish stocks will occur. The PER should give a commitment, or provide the means to manage, control and rectify this problem, as well as indicating how it can be achieved.
- CALM receives a steady stream of proposals from potential commercial operators wanting to establish a wide range of aquatic activities in Bills Bay. These are generally unable to be accommodated because of overcrowding. The proposed marina would very likely accommodate these activities.
- If the proposed development went ahead as the proponents outline in the PER and there were no adverse effects on the environment then the problems of sewage and overcrowding at Coral Bay and harm to the coral at Bills Bay could be solved. In addition, revenue would be available to CALM if the visitor numbers were realised and this would enable effective management of the southern end of Ningaloo Marine Park and any southern extension to Cape Range National Park. With Exmouth as the major centre at the northern end of the parks, CALM will be able to manage the coastal areas between these centres in a satisfactory manner.

This proposal is a very attractive one as it has the potential to solve the major environmental problems associated with the present use of the Coral Bay area. To enable that attractive potential to become a reality some environmental and financial problems will have to be dealt with. To ensure that this happens the proponent's response to comments on their PER must give a commitment in all cases to manage, rectify and control the existing and potential

problems associated with the development. As well as giving this commitment their responses should also say how the problems will be dealt with. In addition, it may be worthwhile pursuing the preparation of a memorandum of understanding in order to clarify the respective ongoing financial and management responsibilities of the proponent and CALM. Furthermore, as CALM has major responsibilities for conservation and recreation in the area, serious consideration should be given to the inclusion of CALM as a member of the management advisory committee of the proposed management corporation.

In summary, once there are suitable financial arrangements and guarantees in place and it is clear that the environmental problems can be dealt with, then CALM recommends the project should be given favourable consideration.



Syd Shea
EXECUTIVE DIRECTOR

4 May 1995

Appendix 4

Proponent's response to CALM's submission

Our Ref: MA5150

8 June 1995

Chairman
Department of Environmental Protection
Westralia Square
141 St Georges' Terrace
PERTH WA 6000

Attention: Ms Eve Bunbury

Dear Eve,

**Coral Coast Resort - Mauds Landing
Proponents Response to CALM's PER Submission**

Further to your correspondence dated 9 May 1995, on behalf of the proponent (Coral Coast Marina Development Pty Ltd) I am pleased to provide a response to CALM's submission regarding the PER for the above project.

The majority of the issues raised by CALM are answered in the primary Proponent's Response document forwarded to your Department, however we wish to formally respond to CALM's submission individually to ensure that all issues are specifically addressed. To avoid lengthy repetition, the appropriate responses to issues raised by CALM are cross-referenced to the main response document, with additional information as required.

CALM has confirmed that the Coral Coast Resort could help to solve the three major problems which currently occur at the Bills Bay settlement:

- (i) an inadequate sewerage disposal system;
- (ii) damage to corals in Bills Bay by boat propellers and anchoring; and
- iii) safety hazards in Bills Bay due to conflict between swimmers and boats.

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B.Sc. (Hons), MEIA

In relation to these problems, if Coral Coast Resort did not proceed then:

- (iv) The cost of providing adequate power, water and particularly sewerage headworks would be in the order of \$5million which would need to be borne by others. The Coral Coast Resort project will provide these facilities, to which the existing settlement can be connected.
- (v) An alternative boat launching facility has previously been suggested at Monck Head, at the southern end of the Maud Sanctuary Zone. Apart from the questionable environmental acceptability of such a proposal, the cost, including the necessary breakwater shelter, would be in the order \$3million.
- (vi) In short, the Coral Coast Resort project will save the Government (or others) from capital expenditure of approximately \$8million for facilities which are desperately needed for the area.

CALM has indicated in it's submission that some issues regarding the proposal may require more attention. These issues are listed below, together with the Proponent's Response.

1. There may be a need to review the amount of excavated material needed to prepare the site. The development is based on excavated material from the marina raising building levels above storm surge height. This appears to have been calculated on mean sea level. As cyclones may not always occur at low tide, allowance may be necessary for the fact that highest astronomical tide is 0.93 m above mean sea level.

Response:

Please see Response 2.2 in the main response document.

2. There is already evidence of high levels of TBT (tri butyl tin used in anti-fouling paint) near large boat moorings in Bills Bay so the PER should include a commitment to prevent or eliminate that at Mauds Landing.

Response:

This is agreed. Please see Response 5.2 in the main response document.

3. While there is a monitoring program for shoreline movement (point 33, p156) there should also be a commitment to rectify any adverse situation revealed by that monitoring. How this would be done should also be indicated.

Response:

This is agreed. Please see Response 6.2 in the main response document.

4. The proposed development will bring more people to the area and although the development is a few kilometres from a sanctuary zone in the marine park there will certainly be more pressure on it. The PER should indicate how this will be handled.

Response:

This is agreed. Please see Section 4 of the main response document.

5. The PER should also indicate how impacts outside the sanctuary zone will be handled.

Response:

Please see Section 4 of the main response document.

6. The coral garden is a creative idea but there is no explanation of how such a garden is to be established nor what action will be taken if monitoring shows that the marina environment is unhealthy for the coral.

Response:

Please see Section 11.7 of the main response document.

7. The PER recognises the potential for damage due to anchors from higher levels of boat use but should also make a commitment to contribute to the cost of managing and rectifying the increased impacts by, for example, the provision of moorings or public docking facilities in the marina.

Response:

This is agreed. Please see Response 4.2 in the main response document.

8. The high number of residential blocks (eventually over 900) means that in due course there will be a substantial population of “residents” compared to tourists and visitors. The significance of this is that tourists are much easier to guide to places of interest without damaging the environment. Residents, a visitors who are not part of tours, are much more likely to explore on their own and there is then a much greater risk of damage to the environment. The proponent should make a commitment to manage, rectify and control this problem and also indicate how this will be done.

Response:

Please see Responses 4.1 and 4.2 in the main response document.

9. When there are many permanent residents in the area there will also very likely be an increase in 4WD ownership. The proponent should make a commitment, or provide CALM with the means, to manage, rectify and control this problem and also indicate how this can be done.

Response:

Please see Response 13.4 in the main response document.

10. The visitor centre is an attractive idea, offering CALM some educational and improved operational opportunities. However, we would need to look more closely at the costs and potential revenue before making firm commitments. An estimated \$250 000 revenue for the first year is given but

there is no estimate of costs, eg is the block and building to be provided free of charge? Who is to pay for future maintenance costs?

Response:

The estimated revenue to CALM from the Visitors Centre is dealt with in Response 1.3 of the main response document. CALM has been formally advised by the Company that the Visitor Centre will be made available to the Department at a peppercorn rental. The nett revenue estimated from the centre is returned after payment by CALM of normal rates and charges and with due allowance for building maintenance.

In addition to the above revenue, the Townsite Management Budget submitted as part of the planning approvals process (refer to Master Plan Report Table 4E, pages 102-103) makes provision for on-going environmental monitoring and National Parks contributions totalling \$130,000.00 per annum at full development.

If the revenue thereafter derived by CALM from the Coral Coast Resort Project still does not adequately cover costs, CCMD will examine with CALM the suggestion of guaranteeing any shortfall to the Department on the proviso that the shortfall is due wholly to the additional management costs attributed to the Coral Coast Resort project. The costs for proper management of the on-going Coral Bay situation if Coral Coast Resort was not to proceed must be subtracted from the equation.

The financial risk of the project is carried wholly by CCMD in that all facilities including breakwaters, marina, reclamation and services are provided "up front" by the Company. If the project was to subsequently fall over, the Government would be left with a substantial asset. The financial viability of the project will in any case be subject to final approval by the Minister for Planning in accordance with the Heads of Agreement between the Government and the Company.

11. As visitor numbers increase so will CALM's supervision and management requirements. Will houses be provide for the extra staff needed?

Response:

Housing for CALM staff can be made available at commercial rental rates.

12. It should be a condition of the development that the proponent will ensure that the new sewage and effluent treatment plant they they put in for the Mauds Landing development will be capable of coping with, and capable of being connected efficiently to, the effluent and sewage output from the Bills Bay settlement (p143). It is essential that this is achieved as it will provide a major environmental benefit to the area.

Response:

This is agreed. Please see Response 1.7 in the main response document.

13. A similar arrangement should apply to the provision of power and water.

Response:

This is agreed. Please see Response 1.7 in the main response document.

14. Many of the statements in section 8 mention “opportunity” without specifying who pays and how much, eg visitor centre, effluent treatment at Bills Bay.

Response:

Please see Response 1.7 in the main response document, and Response 10 above.

15. The source and method of extraction of the limestone and other building materials must be evaluated so that its environmental impact can be determined, unless the materials are sourced from approved existing quarries.

Response:

Please see Response 3.4 in the main response document.

16. When visitor numbers increase, the potential for over exploitation of fish stocks will occur. The PER should give a commitment, or provide the means to manage, control and rectify this problem, as well as indicating how it can be achieved.

Response:

Please see Response 8.7 in the main response document.

17. CALM receives a steady stream of proposals from potential commercial operators wanting to establish a wide range of aquatic activities in Bills Bay. These are generally unable to be accommodated because of overcrowding. The proposed marina would very likely accommodate these activities.

Response:

The Proponent agrees with this statement.

18. If the proposed development went ahead as the proponents outline in the PER and there were no adverse effects on the environment then the problems of sewage and overcrowding at Coral Bay and harm to the coral at Bills Bay could be solved. In addition, revenue would be available to CALM if the visitor numbers were realised and this would enable effective management of the southern end of Ningaloo Marine Park and any southern extension to Cape Range National Park. With Exmouth as the major centre at the northern end of the parks, CALM will be able to manage the coastal areas between these centres in a satisfactory manner.

Response:

The Proponent agrees with this statement.

In terms of other management issues, CCMD agrees with the preparation of a Memorandum of Understanding between the Company and CALM to clarify the respective on-going financial and management responsibilities of both parties. In such manner, it is envisaged that the

revenues derived from the project can be put to best use not only in sustaining the environment, but also in carrying out much needed management improvements, research, and education on a prioritised basis.

CCMD also agrees with the inclusion of CALM as a member of the Management Advisory Committee of the proposed Management Corporation whilst CCMD is the Townsite Manager.

I trust the above information is to your satisfaction, however should you have any queries or require clarification of any point, please do not hesitate to contact the undersigned.

Yours faithfully

BOWMAN BISHAW GORHAM



STEVE ROLLS

Appendix 5

List of submitters

Commonwealth, State and local government agencies

Western Australian Museum
Shire of Carnarvon
Ministry for Planning
Fisheries Department of WA
Main Roads Department
Department of Land Administration
Department of Transport
WA Tourist Commission
Department of Minerals and Energy
Chemistry Centre
Water Authority of Western Australia
Gascoyne Development Commission
National Parks and Nature Conservation Authority
Department of Conservation and Land Management
Office of Waste Management (Department of Environmental Protection)
Environment Protection Agency (Canberra)

Organised groups and members of the public

Boating Industry Association of WA (Inc.)
Australian Marine Conservation Society Inc.
Coastal Heritage Association of WA (Inc.)
Ningaloo Preservation Association
Exmouth and Districts Chamber of Commerce
Conservation Council
Carnarvon Tourist Bureau
Australian Institute of Marine Science

Neil, G S
Matthias, M
French, E W and C
Simmons, S
Bunce, R
Pitt, D
Crocker, G
Callow, K

Sanders, C
Mack, P
Pummer, H, Harding, P and Thomas, J
Rose, D M
Hughes, K
Doubikin, C
Dorey, N
Morris, A
Mitchell, K
Kosovich, L
Yelash, V
Charleson, D
Eastman, D
Johns, C
Hamilton, M
Neretlis, J
Forbes, C
Lofts, L
Barras, S
Tomlinson, P
Evans, S
Wainwright, D
Mc Gregor, M
Heal, C
Mackie, M
Ballard, R W
de Jong, A E
Taylor, G
Vincent, M D
James, D
Thomas, C
Hay, A and Hogg, C
Gleadell, R
Wake, D
Holborn, K
Reiffer, S
Anon x 2

Appendix 6

Consolidated list of proponent's commitments

PROPONENT'S COMMITMENTS

The proponent, Coral Coast Marina Development Pty Ltd, undertakes to comply with each of the commitments made in this document to the satisfaction of the relevant statutory authority. The commitments are divided into pre-construction, construction, and post-construction and operational phases of the project.

PRE-CONSTRUCTION PHASE

General

1. The proponent will accommodate environmental management objectives listed below in the following commitments within the detailed design stage of the project, to the satisfaction of the Department of Environmental Protection, the Shire of Carnarvon, and the Department of Planning and Urban Development.

Services

2. During the detailed engineering design phase of the project the proponent will design the provision of services to the resort, including reticulated sewerage and a sewage treatment plant and treated effluent disposal facility at the Service/Light Industrial Area, and potable water and electricity supply systems, in a manner which will allow their expansion for the connection of the existing Coral Bay Townsite to the new services, to the satisfaction of the service authorities. The proponent will not, however, be responsible for the connection of the existing Coral Bay Townsite to the new services provided.

Drainage and Nutrients

3. The proponent will design stormwater handling and disposal facilities during the detailed engineering design phase of the project, to direct stormwater away from the marina and marine environment as far as practicable, in accordance with current regulatory design specifications and to the satisfaction of the Shire of Carnarvon and the Water Authority of Western Australia.

Waste Management

4. The proponent commits that there will be no direct sea dumping of effluent or wastes of any type.

5. At no time will noxious wastes be discharged to the environment. Disposal options for such wastes will be reviewed in the detailed design phase and a proposal developed to manage such disposal so as to mitigate any environmental impacts, to the satisfaction of the Office of Waste Management.

Construction Management Plan

- 6.1 Prior to the commencement of construction, the proponent will prepare a Construction Management Plan (CMP) which will set out appropriate procedures for environmental management of construction activities.
- 6.2 The CMP will include the following:
- Detailed procedures to be followed by contractors involved in the construction works;
 - Environmental responsibilities of all construction staff;
 - The identification and marking of "no access" areas, including:
 - aboriginal site areas
 - salt lake areas
 - dune conservation areas
 - heavy vehicle and machinery access and "no traffic" areas
 - Fuel storage and refuelling areas and associated management (including spill cleanup procedures);
 - Stockpiling and materials handling areas;
 - Dewatering and product disposal (including a Dewatering Management Plan);
 - Noise and dust suppression;
 - Building rubble, construction spoil, and refuse disposal sites and methods;
 - Temporary effluent treatment and disposal procedures;
 - Wildlife protection responsibilities and conservation areas; and
 - Fire management and suppression procedures.
- 6.3 The CMP will be formulated in conjunction with, and to the satisfaction of, the Department of Environmental Protection (DEP) and the Shire of Carnarvon.
- 6.4 The approved CMP will be implemented in full.

Dewatering Management Plan

7.1 As a component of the CMP, a Dewatering Management Plan (DMP) will be formulated by the proponent to:

- estimate the quantity of water which will be produced;
- determine the likely quality of dewatered product based on trials carried out on the site;
- estimate the amount of suspended and settleable solids which will be carried by the dewatering product;
- identify environmentally acceptable sites for water treatment by sedimentation ponds prior to disposal; and
- analyse disposal options - either recharge to the shallow aquifer from where the water was abstracted or evaporation, or a combination of these processes.

7.2 The DMP will be formulated in conjunction with, and to the satisfaction of, the DEP and the Shire of Carnarvon.

7.3 The approved DMP will be implemented in full.

Foreshore Management Plan

8.1 Prior to construction the proponent will liaise with the Shire of Carnarvon, the Commissioner for Soil Conservation and Ministry for Planning to develop a Foreshore Management Plan (FMP), to ensure the protection of Point Maud and the foreshore environment.

8.2 The FMP will include the following:

- the maintenance of public access to the beach at Mauds Landing, including the area through the proposed golf course;
- the formalisation of parking and picnic areas in appropriate locations;
- the definition of dune preservation and fencing areas;
- rationalisation of 4WD access to the beach area in the vicinity of the site;
- appropriate signage for public education;
- spoil and landform stabilisation and revegetation methods; and
- fire management procedures.

8.3 The FMP will be formulated in conjunction with, and to the satisfaction of, the DEP, Ministry for Planning, and the Department of Conservation and Land Management (CALM).

8.4 The approved FMP will be implemented in full.

Coral Community Monitoring Programme

9.1 Prior to construction, the proponent will design and commence implementing an approved Coral Community Monitoring Programme (CCMP) to the satisfaction of DEP in consultation with CALM.

9.2 The CCMP will measure coral community composition and condition at representative sites in:

- the Sanctuary Zone;
- on the back reef in outer Bateman Bay and on the southern side of Cardabia Passage;
- at the coral reef on the inner edge of Stanley Pool;
- and at suitable control sites.

9.3 An initial monitoring survey will be undertaken in consultation with CALM, prior to the commencement of marina construction, and will describe the baseline coral community at each monitoring site.

9.4 On-going monitoring will be undertaken at six monthly intervals thereafter to ascertain community variability and to test for possible anthropogenic impacts.

9.5 The monitoring programme will be continued by CCMD for five years, by which time CALM will have been provided with the facilities and resources outlined in the PER and may continue monitoring if desired.

9.6 The approved CCMP will be implemented in full.

CONSTRUCTION PHASE

Construction Management

10. The proponent will conduct induction courses for all construction phase employees and contract personnel, which will include information regarding the environmental attributes of the region and their sensitivities, together with information defining individual environmental responsibilities, to the satisfaction of the Shire of Carnarvon. All construction contracts will incorporate appropriate environmental management clauses, which bind both contractor and employees to protect identified environmentally sensitive areas, such as the coastal dunes.
11. All reasonable efforts will be made to minimise inconvenience to pastoral operations at Cardabia Station, and close liaison will be maintained.
12. Management during the first phase of the project will seek to minimise the impact of additional traffic and heavy vehicles thereby minimising the potential for impact on existing landuses at the Coral Bay townsite, to the satisfaction of the Shire of Carnarvon.
13. Access to the Townsite for construction purposes will be via the main entry road off Coral Bay Road. This entry will be constructed to a trafficable stage as the first construction activity.
14. Public safety will be recognised by the restriction of access to the development site during the construction phase and the erection of appropriate warning signs, in consultation with the Shire of Carnarvon.
15. The proponent will control and manage public access to the Bateman Bay beach in the close vicinity of the entrance channel and associated construction works for public safety purposes to the satisfaction of the Shire of Carnarvon.
16. The proponent will construct internal public roads in accordance with the Shire of Carnarvon's and relevant industry standards. Road reserve widths will be minimised whilst maintaining adequate area for the installation of services to reduce public land requiring stabilisation and landscaping. Common trenching practices will be employed wherever possible throughout the development.

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17. The proponent will develop road pavement construction specifications to suit the needs of the locality, and will draw on the experience of the Shire of Carnarvon and the regional Main Roads WA officers, to the satisfaction of the Shire of Carnarvon and the Main Roads WA.
 18. All permanent power lines will be located underground.
 19. The proponent will optimise soil stabilisation and revegetation success by the recovery, stockpiling and re-application of top soil and vegetation during site preparation works, to the greatest practical extent, in consultation with the Shire of Carnarvon.
 20. The proponent will achieve effective noise and dust control during the construction phase of the project in accordance with current engineering industry codes of practice, to the satisfaction of the Department of Environmental Protection and the Shire of Carnarvon.

Fuel Management

- 21.1 The proponent will design, construct and manage bulk fuel storages in accordance with specifications set by the Water Authority and Department of Transport.
- 21.2 In terms of fuel management, the refuelling area for construction machinery and any fuel storage vessel utilised on-site will be located within an area which is sealed with a continuous double-thickness polythene sheet covered with soil, of sufficient volume to contain any spill which may occur during re-fuelling in accordance with standard practice in hazardous materials management in accordance with Department of Minerals and Energy requirements.
- 21.3 In the event that any spill occurs outside the compound, the contaminated soil will be immediately removed for disposal in an approved manner to be determined in consultation with the Shire of Carnarvon.

Construction Management

- 22.1 The proponent will construct the marina basin under landlocked conditions, and all excavations and associated hard walling will be completed prior to opening of the ocean connection.

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- 22.2 The harbour entrance will be excavated by a floating dredge process when all inland marina construction is completed.
- 22.3 The final connection to the ocean will be completed under conditions which minimise the potential for turbid water escape including a contained settlement pond ashore, to the satisfaction of the DEP, CALM and the Shire of Carnarvon.
23. In the event that monitoring identifies a visible turbidity plume from dredging operations which could potentially reach sensitive coral or seagrass communities, then a silt curtain would be installed, or the marine entrance channel dredging would otherwise be altered to the satisfaction of the DEP so as to reduce the on-going loss of suspended sediments.
24. It is not intended for the marina to be dredged "in the wet". However, if such construction methods were necessary, the marina entrance channel would remain closed by the proponent whilst internal dredging was in progress, to prevent the loss of any suspended sediments to the ocean.

Emergency Response Plan

- 25.1 Prior to dredging the marina entrance channel, the proponent will prepare an Emergency Response Plan (ERP). The ERP will address contingencies for:
- fire and explosions;
 - collision between vessels;
 - fuel and oil pollution; and
 - sewage and chemical spills.
- 25.2 The ERP shall be to the satisfaction of the DEP upon advice from the Department of Transport and shall be trialled, updated and maintained in accordance with its requirements.
- 25.3 The approved ERP will be implemented in full.

Water Quality and Sediment Monitoring Programme

- 26.1 Prior to the opening of the entrance channel to the marina, the proponent will prepare a Water Quality and Sediment Monitoring Programme (WQSMP) for the marina and nearshore environment, to the satisfaction of the Department of Environmental Protection upon advice from the Department of Transport. The objective of the monitoring program will be to allow assessment of the success of the management strategies for the project, and incorporate corrective procedures as may be indicated by the results of monitoring.
- 26.2 Water quality parameters measured will include:
- suspended solids;
 - dissolved oxygen
 - bacteria concentrations; and
 - nutrient concentrations.
- 26.3 Sediments will be monitored for particle size, nutrients, metals of environmental concern and hydrocarbons.
- 26.4 The WQSMP will run for a five year period from completion of construction of the marina, to the satisfaction of the EPA.
- 26.5 Specialist marine scientists engaged by the proponent will supervise the monitoring and interpretation of the results and recommend management action.
- 26.6 The approved WQSMP will be implemented in full.

Construction Management

27. There is currently no expectation that blasting will be required, however should blasting be necessary the proponent will obtain permission from the Shire of Carnarvon. In the event that any non-routine exceptionally loud noise was anticipated, surveillance of possible dugong movements in the nearshore environment would be implemented.
28. Works which impinge on the near-coastal area such as the golf course, residential accommodation, parking areas and accesses will be constructed by the proponent in such a way as to avoid unnecessary alterations to the existing landforms commensurate

with appropriate design practices, and to ensure that re-stabilisation and on-going stability of the landform is maintained, to the satisfaction of DEP, CALM and the Shire of Carnarvon.

29. The dune areas in the west of the site which are not affected by development will be declared "No Access" areas by the proponent and marked accordingly. Similarly, the two salt lakes are intended to be retained as existing landscape and natural drainage features, and will consequently be protected from disturbance, to the satisfaction of the Shire of Carnarvon.
30. The proponent will conduct an extensive tree planting programme to the satisfaction of the Shire of Carnarvon.
31. In the event that an aboriginal site, artefacts or other material is uncovered during earthworks, the proponent will immediately cease work in that area and the procedure detailed in PER Appendix J will be implemented, to the satisfaction of the Department of Aboriginal Sites.
32. The proponent will apply for appropriate licenses and abstract and monitor groundwater in accordance with the requirements of the Water Authority of Western Australia.
33. Environmental impacts resulting from the supply of construction materials will be in accordance with Government approvals for these operations.
34. If required, mosquitos and their larvae in the dewatering pond will be controlled by standard practices, such as minimising the area of suitable habitat available, or careful selective spraying, to the satisfaction of the Shire of Carnarvon.

POST-CONSTRUCTION AND OPERATIONAL PHASE

General

35. The proponent will conduct induction courses for all operational stage employees and contract personnel, which will include information regarding the environmental attributes of the region and their sensitivities, together with information defining individual environmental responsibilities, to the satisfaction of the Shire of Carnarvon and CALM.

Nutrient and Irrigation Management Plan

- 36.1 Prior to planting and landscaping of the golf course and resort/townsite, the irrigation and fertiliser requirements of all landscaped areas within the development, including the golf course and other recreational areas, will be the subject of a comprehensive Nutrient and Irrigation Management Plan (NIMP) by the proponent.
- 36.2 The NIMP will apply to all grassed/landscaped areas requiring water and fertiliser application, including active and passive recreation areas, and broadly incorporate the following components:
- Recommendations for low water/nutrient requirement grass/vegetation types;
 - Prescribed fertiliser applications (if necessary) on the basis of regular chemical analysis of soils and plant nutrient status;
 - Prescribed watering/reticulation regime based on historical climatic data updated on a continual basis by on-site measurement and observation;
 - Management strategies to minimise nutrient export from the site; and
 - An annual fertiliser application audit.
- 36.3 Any fertilisers kept on-site will be stored above anticipated maximum flood levels, and will be provided with adequate weather protection to ensure that fertiliser discharge into the natural environment does not occur.
- 36.4 The NIMP will be formulated in conjunction with, and to the satisfaction of, the Department of Environmental Protection.
- 36.5 The approved NIMP will be implemented in full.

Shallow Groundwater Monitoring Programme

- 37.1 The proponent will formulate a Shallow Groundwater Monitoring Programme (SGMP) to monitor groundwater throughout the project area, including the golf course, adjacent to and surrounding the marina, between residential areas and Bateman Bay, and at the Services/Light Industrial Area (SLIA) where the borefield will monitor groundwater below the power station, fuel storage, municipal landfill and treated effluent disposal areas.
- 37.2 The SGMP will include:
- the installation of shallow groundwater monitor bores at regular intervals throughout the project area and adjacent to and between the SLIA and the coast;
 - the collection of baseline data prior to the commencement of operation;
 - quarterly measurement of groundwater quality within the bores including:
 - nutrients (phosphorus, nitrogen, ammonia, nitrite/nitrate);
 - salinity; and
 - pathogenic bacteria counts.
 - establishment of scientific criteria for environmental performance; and
 - contingency responses in the event of exceedance.
- 37.3 The SGMP will be formulated in conjunction with the Department of Environmental Protection to the satisfaction of the Water Authority of Western Australia.
- 37.4 The approved SGMP will be implemented in full.

Shoreline Movement Monitoring Plan

- 38.1 The proponent will formulate and implement a Shoreline Movement Monitoring Plan (SMMP) to survey the beaches for 2km each side of the breakwaters, and the bathymetry of the entrance channel, for three years following development of the marina, to the satisfaction of the Department of Transport and CALM. Survey profile intervals will be to the satisfaction of the regulatory authorities.
- 38.2 If sand by-passing is occasionally considered necessary this will be achieved using conventional earthmoving equipment.
- 38.3 Access will be provided from the breakwater to the beach on both sides of the marina for this purpose.

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- 38.4 CCMD will liaise with appropriate government authorities as required and will carry out any necessary works in consultation with government.
- 38.5 The approved SMMP will be implemented in full.

Townsite Management

39. To ensure a high level of sympathetic residential design, all building designs and material schedules will be vetted for approval by the the proponent (Resort Manager) prior to lodgement with Council for Building Approval.
40. The proponent will develop residential landscaping guidelines identifying suitable species of grasses, shrubs and trees as well as identifying principles of residential landscape design that maximise building orientation and passive climate control, whilst minimising the requirement for water and fertilisers.
41. All areas which are disturbed by construction but are not required for resort/townsite purposes, will be stabilised and revegetated using appropriate land care procedures and techniques. Rehabilitation success will be monitored, and any necessary corrective works or maintenance will be carried out in conjunction with landscape management and maintenance practices for the resort and townsite to the satisfaction of the Shire of Carnarvon. Surveillance of natural areas within the townsite but beyond the resort and residential areas will be carried out on a routine basis and corrective works implemented as necessary.
42. The proponent will formulate an education programme to ensure that residents are fully advised of requirements in regard to nutrient control and management within the resort, together with active discouragement of fertiliser use within residential areas, to the satisfaction of the DEP.
43. To maximise the protection of native terrestrial fauna in the area, the proponent will consult with the Shire of Carnarvon to determine appropriate procedures for the prohibition of cats and dogs in the resort and townsite areas.

Turtle Management

- 44.1 The proponent will manage the effects of lighting upon turtles by including design guidelines within the resort and preparing a Turtle Nesting Surveillance Programme (TNSP) which will be conducted to the satisfaction of the DEP, in consultation with CALM.
- 44.2 The design guidelines will include the following:
- Street lighting within the resort will be low-level bollard lights which will be sheltered by the foredune and will not be directly visible from the beach.
 - Public lighting within 150m of the crest of the foredune will be low pressure sodium vapour (LPS) lights.
 - No lighting will be installed on the beach or on the beach side of the foredune ridge.
 - Public lighting within the resort will be fitted with low illuminance lights, to the extent that is practicable with due consideration for public safety.
 - In consultation with CALM, CCMD will advise all residents and visitors of the requirement to minimise illumination during the turtle nesting season (November to April).
 - If acceptable to the Department of Transport as safe for marine navigation, the navigation lights to be installed at the end of the marina entrance groynes will be flashing lights with a short on-cycle and a longer off-cycle.

Turtle Nesting Surveillance Programme

- 44.3 In consultation with CALM, CCMD will implement a Turtle Nesting Surveillance Programme to assess the effectiveness of the foregoing management measures and to rescue any disoriented turtles.
- 44.4 The monitoring and surveillance will continue for a minimum of three years following construction, following which the results will be assessed and management will be adapted in consultation with CALM.
- 44.4 The approved TNSP will be implemented in full.

Marina Management

- 45.1 No antifoulants containing TBT will be used on marine structures associated with the marina.
- 45.2 The proponent will advise all resident and visiting boat owners of the law in this regard, and will prohibit vessels treated with TBT antifoulant from using the marina.
46. The marina harbour will be inspected routinely by the Marina Manager and any corrective action required to maintain water quality and aesthetics to the required standard will be implemented immediately, to the satisfaction of the Shire of Carnarvon.
47. The discharge of sewage, hydrocarbons or litter from boats into the marina will be prohibited and all users of the marina will be informed accordingly using signage and public education. Adequate rubbish bins and sewered toilets will be provided in public areas around the marina.
48. A sewage pump-out facility will be provided at a convenient and practical location on the service jetty within the marina for vessel discharge, and wastewater collected will be directed to the main reticulation system for treatment and disposal.

Townsite Management

49. Fire management in the vicinity of the resort/townsite and Service/Light Industrial Area, including the establishment and maintenance of firebreaks by the proponent in strategically appropriate locations, and fire hydrants for fire suppression, will be conducted in accordance with conventional industry standards and the requirements of the Shire of Carnarvon and Bush Fires Board of Western Australia.

Management Resources

50. Office space will be provided by the proponent within the resort development for use by CALM and Fisheries Department staff.
51. The proponent will construct and establish a Marine Park Visitor/Research Centre within the resort, to provide for education and interpretation programs for visitors and residents in consultation with CALM.

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52. The proponent will co-operate with CALM officers to establish and maintain appropriate awareness and appreciation of the attributes of the Ningaloo Marine Park to the satisfaction of the DEP and CALM.
 53. The proponent will distribute literature to all visitors, boat owners and visiting boat owners to raise their awareness of the recreational potential of the terrestrial and marine habitats and their environmental limitations, to the satisfaction of the DEP and CALM.
 54. The proponent will erect signs at appropriate locations within the development to notify visitors of their environmental management responsibilities, to the satisfaction of the DEP and CALM.
 55. The proponent will otherwise assist CALM, where practicable, to implement and police the Ningaloo Marine Park Management Plan (CALM, 1989), particularly those aspects pertaining to visitor education and awareness, to the satisfaction of the DEP and CALM.

Marina Management

56. The proponent will maintain the breakwaters and harbour revetments to the satisfaction of the Department of Transport, including necessary repairs if any damage is sustained during a severe cyclone, during the period in which CCMD is responsible for townsite management.

Services

57. The proponent will select high technology power generation (diesel turbine plant) to enable the relevant standards of stack emission to be routinely met.
58. Recognising that establishment of power generation plant will be incremental and will occur over a twenty-year period, the economics and practicality of incorporating renewable energy sources, including solar and wind power, will remain under review by the proponent.

Townsite Management

- 59.1 The proponent commits that infrastructure established as part of the Coral Coast Resort development will be operated and maintained for a minimum period of 5 years from construction or until the relevant Authorities, such as the Local Authority and Service

Authorities, wish to take over responsibility for operation and maintenance of the facilities.

- 59.2 A Management Corporation will be established and be responsible for the normal day to day services and maintenance of functions including maintenance of roads and pathways, maintenance of parks and public landscaping areas, waste collection and disposal, street and public place cleaning, and the provision of street lighting. The Management Corporation would also be responsible for maintenance of the marina.
- 59.3 Management of the site will be to the satisfaction of the Shire of Carnarvon.