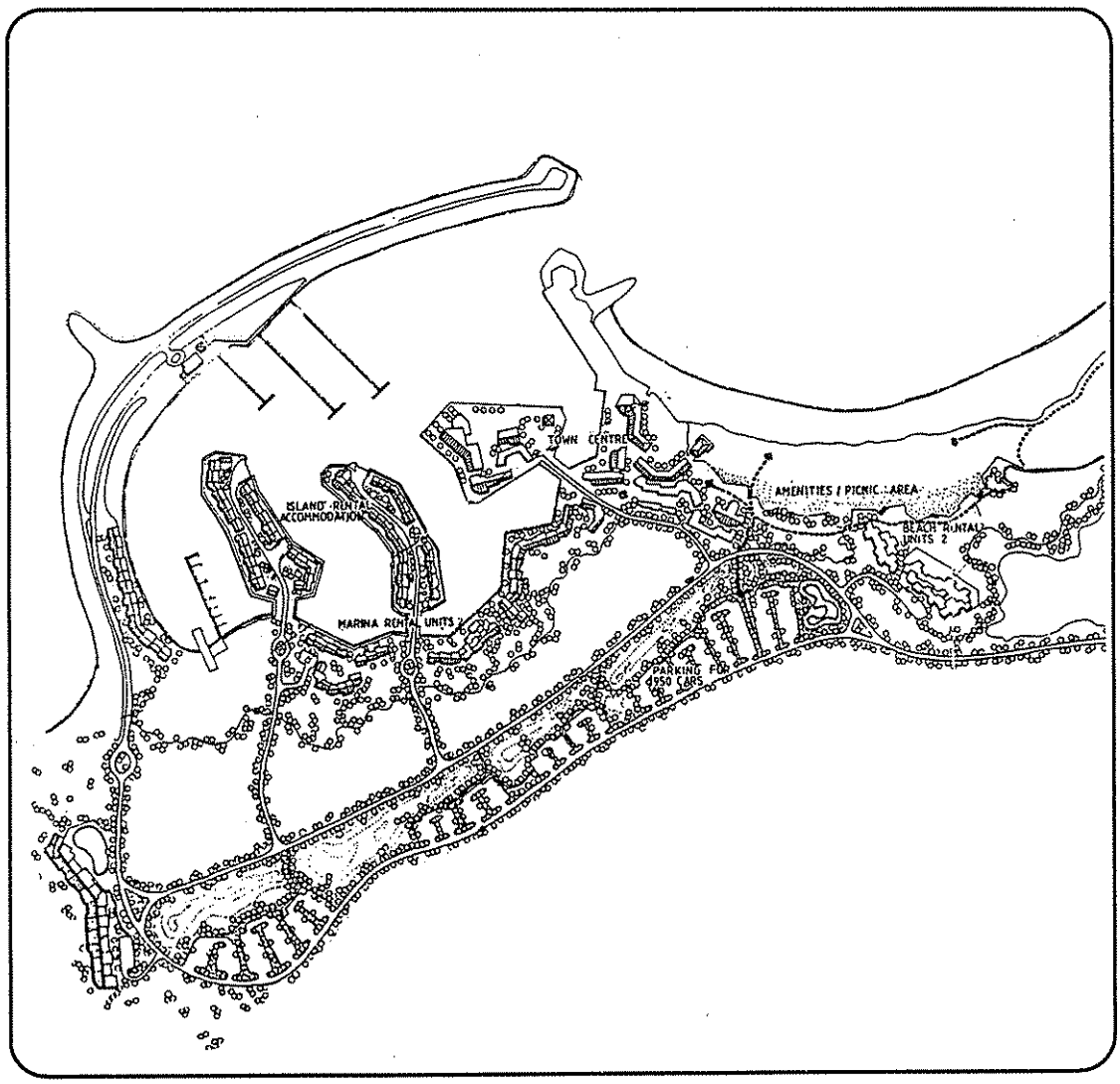
PORT KENNEDY REGIONAL RECREATION CENTRE

PORT KENNEDY JOINT VENTURE

Report and Recommendations
of the
Environmental Protection Authority



Environmental Protection Authority
Perth Western Australia
Bulletin 398 September 1989

PORT KENNEDY REGIONAL RECREATION CENTRE

PORT KENNEDY JOINT VENTURE

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
Perth Western Australia
Bulletin 398 September 1989

ISSN 0 7309 1983 0
ISBN 1030 0120

CONTENTS

CONTENTS (Cont'd)

FIGURES

APPENDICES

SUMMARY AND RECOMMENDATIONS

The Port Kennedy proposal involves the creation of a major public recreation and conservation park venue for the community of Western Australia at a key coastal site in the Perth Metropolitan Region. The proposal involves a number of specific elements that additionally contribute to the concept of a regional recreation facility, including a resort complex comprising hotel and 18 hole gold course, and beachfront resort comprising marina, town centre, holiday accommodation and a public 18 hole gold course. The site is at Becher Point on the southern side of Warnbro Sound some 9 kilometres south of the Rockingham town centre. The site terrain consists of low lying sand plain with low dunal vegetation and continuous linear and parallel dunal ridges. Excellent beaches and a highly attractive and varied marine environment are additional assests of this site.

The proposal is divided into two stages. Stage I occupies an area of 320ha, all of which is on vacant Crown land. The proponents are the Port Kennedy Joint Venture, being a partnership between Fleuris Pty Ltd and the Western Australian Development Corporation.

The Environmental Protection Authority has required the Port Kennedy Regional Recreation Centre proposal to be assessed by way of an Environmental Review and Management Programme. This document was released for public review from 21 December 1988 to 6 March 1989.

The Port Kennedy site has been the subject of numerous development announcements by Government since the 1950s, although the predominant and more recent intent has been for regional recreation uses.

The current proposal has arisen in response to an invitation by the Government of Western Australia in 1986 for applicants to register their interest in being appointed to carry out development of the Port Kennedy site. The current proposal was therefore selected against the criteria of a Development Brief prepared by the State Planning Commission. The proposal is also largely consistent with a 1978 Concept Plan prepared by the then Metropolitan Region Planning Authority.

The Port Kennedy location involves a number of environmental aspects of significance. The System 6 Report 1983, confirmed the regional recreation potential of the site, and drew attention to the various important conservation aspects, particularly the vegetation complexes and beachridge dune system.

The System 6 Report also identified the conservation value and regional significance of the nearby Murray Reefs system at the western edge of Warnbro Sound. This reef system and the Warnbro Sound marine environment will be exposed to significantly increased use pressures should the Port Kennedy development proceed. The reef system is currently substantially unmodified and close to pristine condition.

Further, it has recently become apparent that the site has national and international scientific significance. This is due to the nature of the Holocene dune assemblage, the detailed radiometric dating and stratigraphic interpretation that has been conducted. There is then the relevance of this information with respect to understanding the response of coastal processes likely to occur as a result of predicted climatic change.

The Environmental Protection Authority is of the view that these matters are of outstanding significance, and concludes that all should be adequately safeguarded as a pre-requisite to the Port Kennedy development proposal being allowed to proceed. These aspects are dealt with in greater detail in section 5 of this assessment report.

A critical initiative recommended by the Authority is the establishment of the proposed marine park as recommended in the System 6 study.

The proposed development will, in the view of the Authority , not only encourage significantly greater recreational use of the adjacent marine environment, but will also contribute to the nutrient load and input of contaminants to Warnbro Sound. This impact of the proposal will be in conjunction with that of other coastal and land use development in the Rockingham area. The Authority considers that the offer from the proponent to assist in the establishment of effective management of the immediate marine environment is an important aspect of the overall package of commitments.

In respect of the terrestrial environment, the Authority has recommended that all conservation zones and natural vegetation areas in both Stages I and II should be clearly identified and secured at the outset. All public access areas for Stage I should similarly be confirmed.

The international scientific significance of the site's geomorphology is now well established. The Authority requires the proponent to consult with experts in the field of coastal geomorphology to assess the most useful options in developing a programme to safeguard the site's scientific value.

The Environmental Protection Authority considers that by taking immediate action on these major aspects as pre-requisites is the most effective way of ensuring that the essential long-term values of the overall environmental resource are protected. In addition it will provide a clearer indication of the planning and design constraints presented by the site.

Aside from these major concerns the proposal raises a number of additional environmental issues which are considered in detail in section 5 of this report.

The need to achieve a suitable balance between conservation and recreation opportunities on the site has to a large extent been achieved by virtue of the Stage I development being concentrated on the most suitable northerly portions of the site, by planning for adequate set backs from unstable and eroding ocean foreshore zones, and by setting aside a third of the 320ha Stage I site for purely conservation purposes. This still allows for a further significant conservation contribution to be achieved from the larger 397 ha Stage II portion of the site.

Although water requirements for the development will be high, the Authority is satisfied that in combination with appropriate management there is sufficient groundwater for Stage I, but concludes that careful consideration be given to the landscape character of future Stage II proposals, together with a contingency plan to adapt Stage I to reduced water availability should water become limiting.

The proponent has shown considerable willingness to address the environmental aspects of this challenging site, and has made alterations to the initial proposal layout to accommodate various conservation requirements. The ERMP is extensive and offers a comprehensive set of substantial and worthwhile commitments. The proponent has also gone to considerable lengths to provide an extensive and full response to the list of issues raised in public submissions.

Subject to compliance with the recommended pre-requisites as discussed, the Authority considers that the environmental issues associated with the project are manageable, and together with the commitments provided by the proponent and the recommendations contained in this assessment report therefore finds the proposal environmentally acceptable.

The following recommendations are made:

RECOMMENDATION 1

The Environmental Protection Authority recommends that as a pre-requisite to the final approval to commence development for the Port Kennedy Regional Recreation Centre being granted, the following actions should be taken:

(i) mechanisms to implement the System 6 recommendations for the establishment of a proposed Marine Park (M101, Cape Peron, Shoalwater Bay and Warnbro Sound) and to the preparation of a marine park management plan, be set in place by Government;

(ii) in respect of the System 6 recommendations (M106) for Port Kennedy, the proponent should provide plans confirming the location and extent of all conservation zones and natural vegetation areas for both Stages I and II, and that Government set in place the mechanisms necessary to secure all conservation zones under appropriate Crown Reserve vestings;

(iii) the proponent should provide plans confirming the location and extent of all public access areas, to be secured under appropriate Crown Reserve vestings; and

(iv) the proponent should provide undertakings to safeguard the international scientific value of the site with respect to discussions in section 5.1 and 5.10.

to the satisfaction of the Minister for Environment, following advice from the Minister for Conservation and Land Management, and the Environmental Protection Authority.

RECOMMENDATION 2

The Environmental Protection Authority concludes that the Port Kennedy Regional Recreation Centre proposal Stage I as described in the ERMP is, subject to compliance with Recommendation 1, environmentally acceptable and recommends the proposal may proceed subject to the undertakings and commitments provided by the proponent (Appendix 1) and subject to the recommendations of this assessment report.

RECOMMENDATION 3

The Environmental Protection Authority recommends that the construction of the groynes and marina basin should not commence before provision of:

(i) final design details with adequate supporting data;

(ii) a plan detailing the extent of the entrance channel and bathymetry of the entrance; and

(iii) details of the volume of sand to be by-passed for depth of entrance channel determined;

to the satisfaction of the Environmental Protection Authority, following advice from the Department of Marine and Harbours.

RECOMMENDATION 4

The Environmental Protection Authority recommends that the proponent should prepare and undertake field investigation of the flushing characteristics of the proposed marina in order to support predicted flushing times, to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 5

The Environmental Protection Authority recommends that the proposed Marina water quality monitoring programme to be undertaken be expanded to include an appropriate check on the concentration of pollutants in the marina waterbody during critical environmental conditions and should make provision for a contingency plan to enhance flushing and improve water quality if required, to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 6

The Environmental Protection Authority recommends that within 5 years of the project commencing, the proponent should prepare a landscape contingency plan which provides for a reduction of water usage for irrigation purposes should this be required in the future, to the satisfaction of the Environmental Protection Authority, following advice from the Water Authority of Western Australia and the Department of Agriculture.

RECOMMENDATION 7

The Environmental Protection Authority recommends that the proponent should prepare a management plan for the proposed conservation zones, to be implemented by the Port Kennedy Management Board, to the satisfaction of the Environmental Protection Authority following advice from the Department of Conservation and Land Management.

RECOMMENDATION 8

The Environmental Protection Authority recommends that the composition of the Management Board be expanded to include a representative from a Government agency with natural resource management skills.

RECOMMENDATION 9.

The Environmental Protection Authority recommends that construction of the Port Kennedy Regional Recreation Centre proposal should not commence prior to the finalisation of a suitable project agreement between the proponent and State Government, to the satisfaction of the Minister for Environment.

1. INTRODUCTION

On the 2 March 1988, the Environmental Protection Authority received a letter of referral from the Port Kennedy Joint Venture for a proposal to develop a Regional Recreation Centre at Port Kennedy, near Rockingham on the coast of Western Australia. The proponents comprising the Port Kennedy Joint Venture are Fleuris Pty Ltd and the Western Australian Development Corporation.

The Authority required that the proposal should be assessed formally under the Environmental Protection Act (1986), and that an Environmental Review and Management Programme (ERMP) be prepared.

The proposal as submitted is for Stage I of a major conservation and recreation park on the northerly portion of the site. The concept includes some major built components including resort hotel with golf course, a marina with town centre, holiday accommodation, and an 18-hole public golf course.

The ERMP was released for public review from the 21 December 1988 to 9 March 1989. Public submissions were analysed and a summary of issues was forwarded to the proponent (Appendix 1). A formal response to these issues was received on 26 May 1989 (Appendix 2).

In addition to the response to submissions, the proponent made an informal interim submission (Appendix 3) during the ERMP preparation to clarify aspects of the terrestrial conservation value of the site , with particular reference to the System 6 status of the site. As a result of this procedure certain adjustments were made to the proposal. This has been taken into account by the Authority.

2. DESCRIPTION OF THE PROPOSAL

The Port Kennedy proposal is for the development of a 330 hectare coastal site on the southern side of Warnbro Sound, 9 kilometres south of Rockingham town centre. (See Figure 1). This is Stage 1 of a possible two stage development of a total potential site of 717 hectares of vacant Crown land.

The proposed Stage 1 has three main components (See Figure 2). Firstly, a marina development including harbour, accommodation, town centre and associated facilities.

Secondly, a golfing recreation area with an 18-hole public golf course and club house, and a hotel resort complex including 225 room international standard hotel with a further 18-hole golf course and associated facilities.

Thirdly, a 120 hectares reserved for conservation and passive recreation, additional to areas of natural vegetation that will also be retained within the golf courses.

Approximately 25 hectares of the site will be transferred to the proponent as freehold. The resort hotel and associated facilities will be located on 10 hectares. The golf courses will be established on Crown land leased from the Government for 25 years, with a 25 year option. A further 40 hectares will also be leased for various town centre functions. Remaining land will be Crown land.

The marina, town centre and accommodation precinct is proposed as being located at Bridport Point on the northern shoreline of Port Kennedy, in approximately the location of the existing squatter settlement.

The resort complex is to be 400 metres to the east of the marina and is to be behind the primary dune. The associated gold course is to be available to anyone staying at the resort, as well as nominated visitors. It extends northward and adjacent to the coast, but is to be separated from the beach by a conservation area extending over the foredune zone.

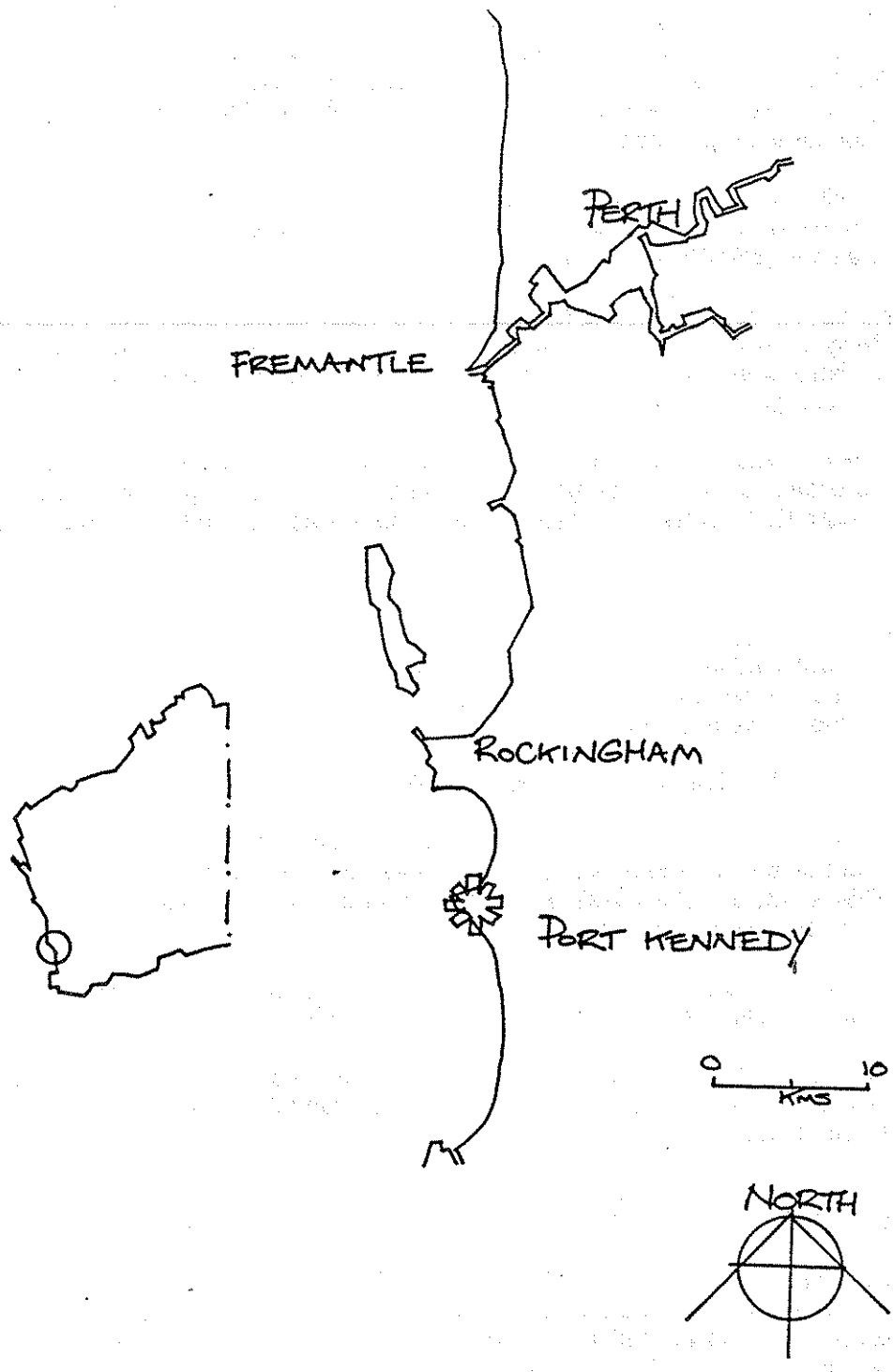


Figure 1: General Location

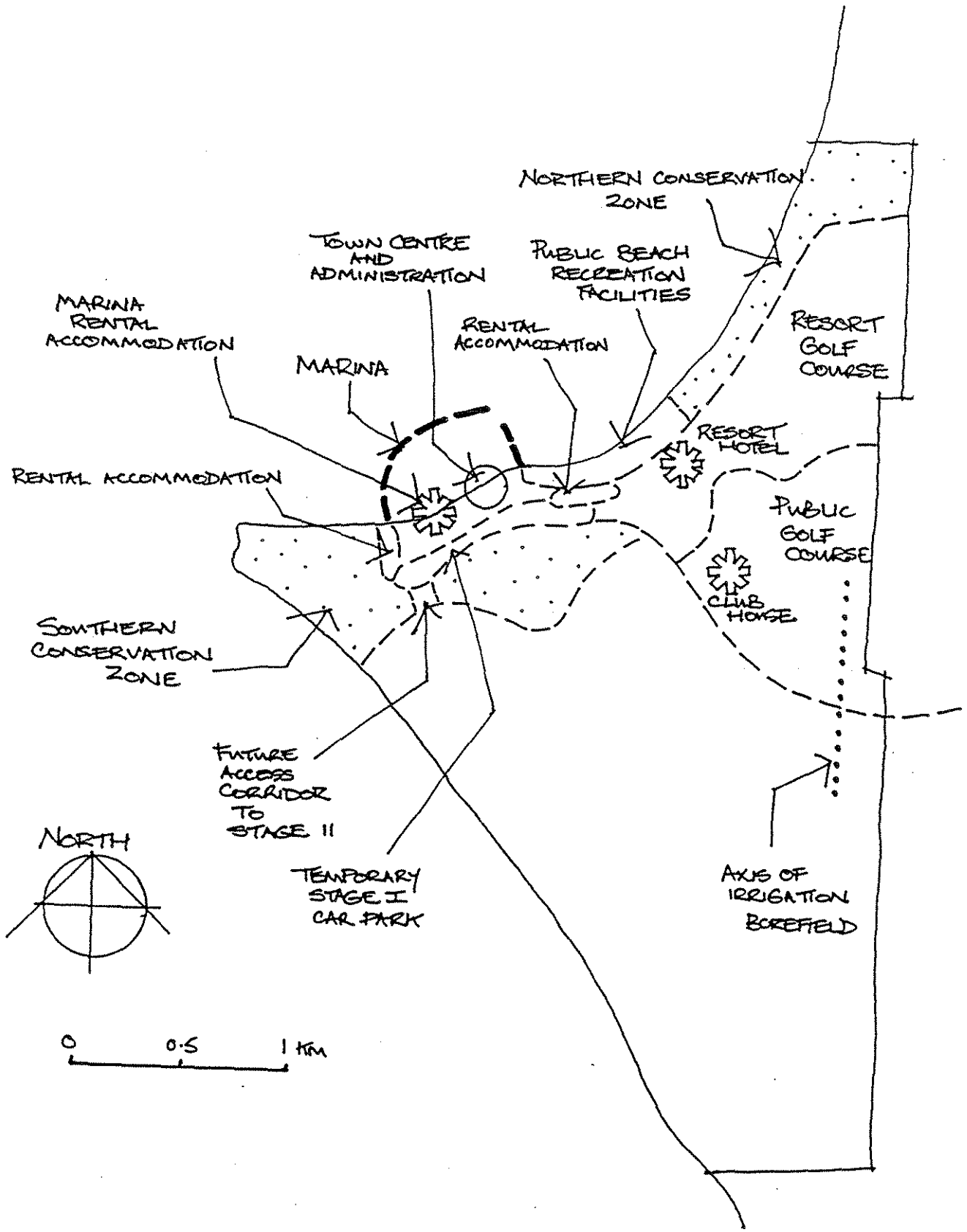


Figure 2: Stage 1 Proposal Layout

The public golf course is adjacent and inland to the resort - hotel golf course, and will be bounded to the east by adjacent urban residential development. Part of this may or may not be a canal residential development.

The principal conservation zones are the Becher Point locality west of the marina development area, the curvilinear dunes south of the marina development area, and the northern vegetation conservation area which includes the previously mentioned foredune area. All areas have been selected on the basis of their representative flora, limited degree of modification, and geomorphic significance. The conservation values of the site are also to be maintained by appropriate rehabilitation of various wetlands, or enhancement of degraded wetlands into landscape design features. A substantial total area of existing vegetation, particularly on dune ridges, are also to be retained as part of the golf course landscape design approach.

The intended visitor capacity of the Stage 1 proposal is indicated by the provision of the following facilities and facility accommodation.

MARINA AND TOWN CENTRE:

. 130 moorings in fixed pens for casual and day visitors;

. additional permanent moorings in fixed pens for essential and service craft;

. 250 peninsula moorings within the boat harbour;

. 125 holiday units;

. commercial activities (restaurants, night clubs, retail, gymnasium, tavern, offices, medical, yacht club etc);

. 140 self contained beach units; and

. restaurants for 90 people seated.

HOTEL RESORT COMPLEX

. 225 bedroom/suite Motel;

. restaurants, entertainment; and

. indoor and outdoor retail sports facilities.

PUBLIC AMENITIES AND PARKING

. 950 car parking spaces near marina;

. 400 car parking spaces at public golf club;

. 300 car parking spaces at the hotel; and

. picnic areas, barbecues, trails, shelter, grassed recreation areas, toilets and change rooms, first aid and surf lifesaving station, etc.

The development is to be fully provided with all major services, and all construction and layout to accepted standards. It is envisaged that construction of the development will take approximately two years, commencing with the main access road connecting to Ennis Avenue.

Upon completion ongoing management is intended to be the responsibility of a Port Kennedy Management Board, with powers, obligations and commitments as determined by a project agreement between the proponent and the Government of Western Australia. The principal long-term management responsibilities to be provided for include:

. management and monitoring of impacts resulting from increased use pressure on the site;

. monitoring the surficial aquifer;

. surveying beach profiles to monitor sediment transport;

. monitoring vegetation condition in both conservation zones and the southern part of the site; and

. monitoring marina water quality.

3. EXISTING ENVIRONMENT

3.1 GENERAL ENVIRONMENT

Port Kennedy is a low lying area (RL 2 metres to 5 metres) of sand plain featuring a distinctive landscape of parallel dunal ridges. It is a triangular shaped peninsular forming the southern land portion that defines Warnbro Sound, and is known as Becher Point. The formation of Becher Point began some 3,000 years ago, and in geological terms it is a dynamic and actively changing coastal landform with a steadily eroding and retreating south western shoreline, and a prograding northerly shoreline.

The water table is close to the surface resulting in certain of the wetlands on the site. Vegetation is generally low heath vegetation, and relatively varied according to site conditions and distance from the shoreline.

Port Kennedy benefits as a development site from its proximity to a varied marine environment, with the protected waters of Warnbro Sound to the north, a limestone reef system offshore from Becher Point and extending across the entrance to Warnbro Sound, as well as the more open ocean waters of Madora Bay to the south west.

3.2 MARINE ENVIRONMENT

The geomorphic unit within which Becher Point lies is referred to as the Warnbro-Cockburn Depression (See Figure 3). This depression is defined by the Garden Island Ridge to the west and the shoreline of the Swan Coastal Plain to the east. Becher Point is the visible portion of a sand barrier extending across the depression towards the Garden Island Ridge. Its formation and current morphology is the product of the offshore energy regime and the way in which this is influenced by offshore features, such as the limestone reefs in particular. Marine depth varies from 2 to 5 metres in association with the sand bank, up to 20 metres in Warnbro Sound to the north, while the Garden Island Ridge featuring the limestone reef system ranges from 0 to 10 metres. Further offshore depths range between 15 to 24 metres extending to another shallower ridge at 10 metres plus. Depths then deepen gently in association with the continental shelf, increasing from 20 to 300 metres.

The full force of oceanic swell and local wind induced waves are moderated by the offshore islands and reefs. Approximately 90% of the total wave energy is lost to the reef and island barrier.

Locally generated waves within the Warnbro Sound also have significance. The overall energy patterns around Becher Point and within Warnbro Sound are nevertheless complex and not well understood. The dominant wave climate in any season is resultant upon many factors including refraction, diffraction, shoaling, attenuation due to seabed friction and

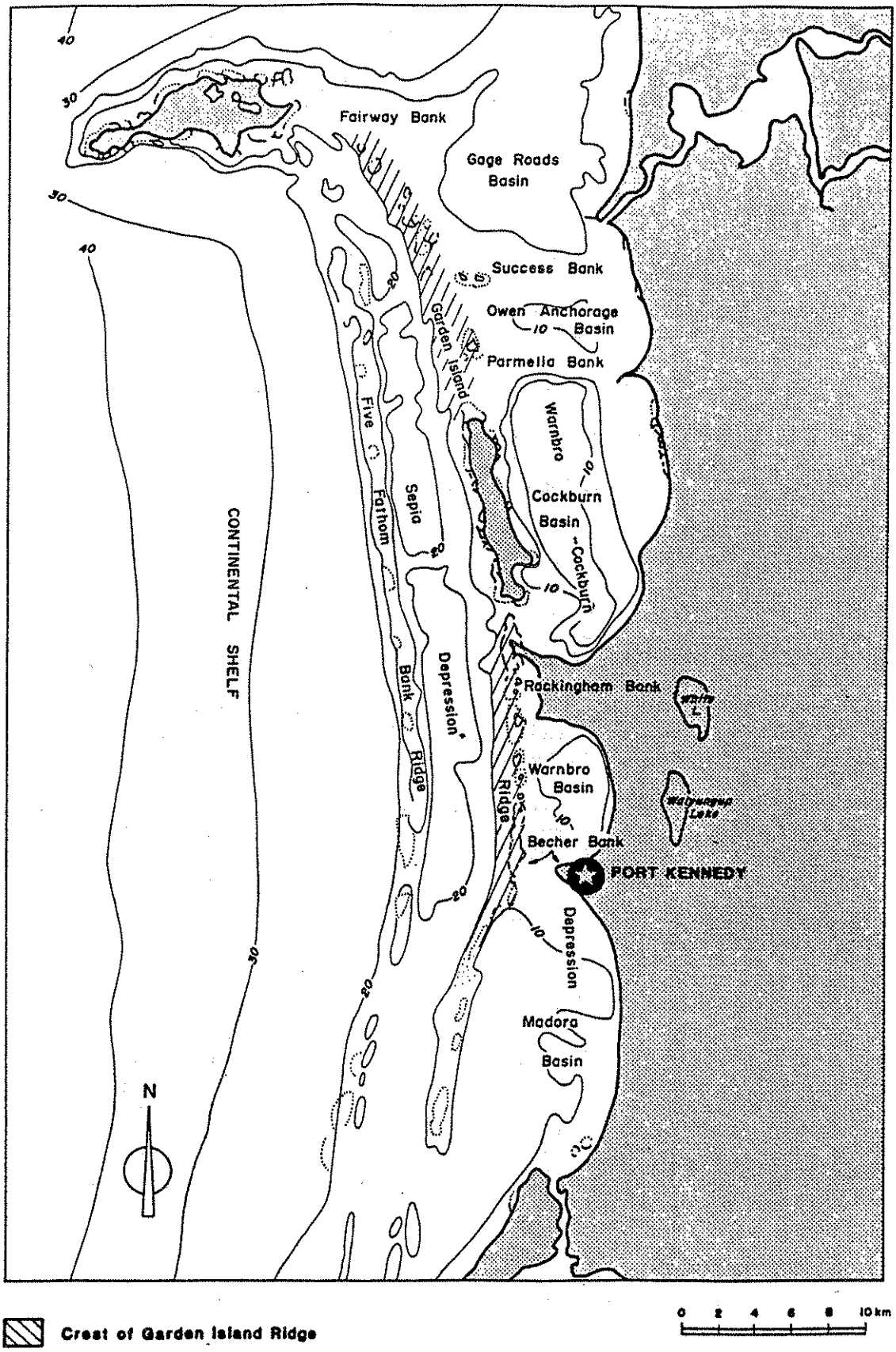


Figure 3: Marine Environment Zones

wave breaking. A dynamic equilibrium undoubtedly exists under current stable climate and sea level conditions, and this gives rise to the coastal profile currently experienced. The overall wave climate on the north side of Becher Point and at Bridport Point in particular is mild. Except for severe storm events, significant wave heights are less than about 1.2 metres.

Sediment supply over the Holocene contributing to the dominant coastal geomorphic processes is thought to have come from four main sources. Firstly, from the continental shelf mantle of quartz-felspar sands, second, from the river systems to the south discharging their sediment load via the Peel-Harvey estuary, third, the material from offshore reefs as well as the mainland coast to the north and south, and fourth, the local generation of skeletal carbonates in seagrass meadows. It is thought that the more recent sediment supply budget has experienced a reduction of supply material from offshore ridges, whilst there has been an increase in fresh carbonate associated with seagrass meadows and benthic communities. (Woods P J, 1983)

In terms of coastal process and sediment movement the south westerly and northerly shorelines of Becher Point differ markedly.

To the south west of Becher Point predominant south-westerly swells result in a net northerly movement of sediment of 50,000 - 100,000 m^3 per year. Between 30,000 to 60,000 m^3 net northerly movement of sediment has been recorded to the immediate south of the Port Kennedy site. Much of this general sediment movement is deposited on the shallow sand banks associated with Warnbro Sound. By contrast, while there is some leakage of this sediment movement around Becher Point of between 10,000 - 15,000 m^3 per year which deposits between Becher and Bridport Points, from Bridport Point westward there is markedly less net littoral drift, at about 5,000 m^3 per year. Sediment movement along the shoreline within Warnbro Sound is cyclical, being to the north in summer and to the south in winter. The overall pattern of sediment movement north east of Becher Point is the result of steady shoreline accretion northwards.

A further significant aspect of the marine environment associated with Port Kennedy are the major habitats and biological communities.

The principal marine habitats of importance are the Warnbro Sound deep basin, the shallower sandy sea floor, and the limestone Murray reefs system.

The Warnbro Sound deep basin has very little plant life but an abundant population of animals including anemones, sea-stars, holothurians and other echinoderms. The sandy sea floor supports extensive and healthy sea grass meadows which are themselves host to a variety of fish and invertebrates. Eight species of seagrass are represented. The sea grass meadows have an important influence on dissipating wave energy passing over them. Sea grass meadow cover is by no means total, and the stability of the existing meadows is an important influence on sediment movement.

The Murray Reefs and associated Garden Island Ridge of which they form a part, offer two distinct habitats of note. First the intertidal reef platforms, and second, the subtidal reefs and limestone pavement.

The intertidal reef platforms support a diverse biology similar to that of most local reefs, and are additionally important as resting and breeding sites for a variety of mammals and birds. The subtidal reefs and limestone pavement support a varied community, but tend to be dominated by brown algae such as kelp and Sargassum with a variety of red algae. A similar variety of animals are also associated with the reefs, which are nursery grounds for rock lobster and abalone. Although the distribution of fauna is patchy, the diversity of many animals, including sponges, is thought to be extremely high.

Of particular note in a discussion of the marine environment, is the outstanding condition of the southern portion of the Murray Reefs system in particular, due to lack of human interference and recreational pressure to this point in time. There is a further point that many aspects of the marine system, especially water circulation, biology, and assimilative capacities are not well researched, or understood.

3.3 TERRESTRIAL ENVIRONMENT

The Port Kennedy site falls within the Quindalup Dunes geomorphic unit of the Swan Coastal Plain. Locally, the site can be described as exhibiting typical characteristics of the Holocene beach ridge plain that occurs in the Rockingham locality. Although apparently uniform in character at first sight, there are in fact several identifiable elements to the landscape.

Figure 4 shows that the majority of the site falls into the category of "relict foredunes forming a plain with generally narrow ridges and poorly developed swales" (ERMP Fig 12). Further east this alters with the incidence of more obvious relic foredunes, small remnant blow outs and parabolic dunes.

A further distinctive feature through much of the site are ephemeral linear wetlands running in the swales between the beach ridges, following a generally north west to south east alignment. The wetlands feature saturated ground conditions during winter but generally have no standing water.They are obvious to the observer on site due to the distinct wetland vegetation they support.

Running parallel and adjacent to the south west ocean foreshore of the site is a further distinct but narrow zone of more prominent foredunes with some small blow outs and parabolic dune formations.

On the northern foreshore, running eastward from Becher Point, is a zone of "contemporary relic fore dune, actively accreting a low undulating fore dune backing the beach" (ERMP Fig 12). Behind this is a narrow zone of high foredunes with pronounced ridges and swales overlaying deep calcareous sand. At an area south of Bridport Point there is specific area of curvi-linear dune intersection which is unusual and of interest. Finally, there is a distinctive circular rather than linear wetland immediately inland from Becher Point.

The vegetation of the site consists of species similar to other areas of beach ridge sand plain. Due to relatively less disturbance and modification than other coastal locations within the vicinity of the Perth Metropolitan Region, the Port Kennedy development now exhibits a substantial and quite diverse remnant flora of its type. Thickets of wattle are common and there are numerous tall shrubs typical of coastal species.

As indicated in Figure.5.various vegetation complexes.have been identified It is the pattern of vegetation complexes on Port Kennedy that is of particular interest. Four dominant complexes are noted in association with the relict foredunes:

- Acacia rostellifera complex (central and south east of Becher Point);
- Olearia axillaris and Melaleuca acerosa complex (centre and north easterly portions of the site);
- Jacksonia furcellata, Acacia saligna complex (southern and eastern portions);
- Olearia axillaris, Jacksonia furcellata complex (south of Bridport Point).

A further two dominant complexes are found in association with stabilising dunes and high foredunes:

- Scaevola crassifolia, Olearia axillaris (low open heath to closed heath to open scrub);

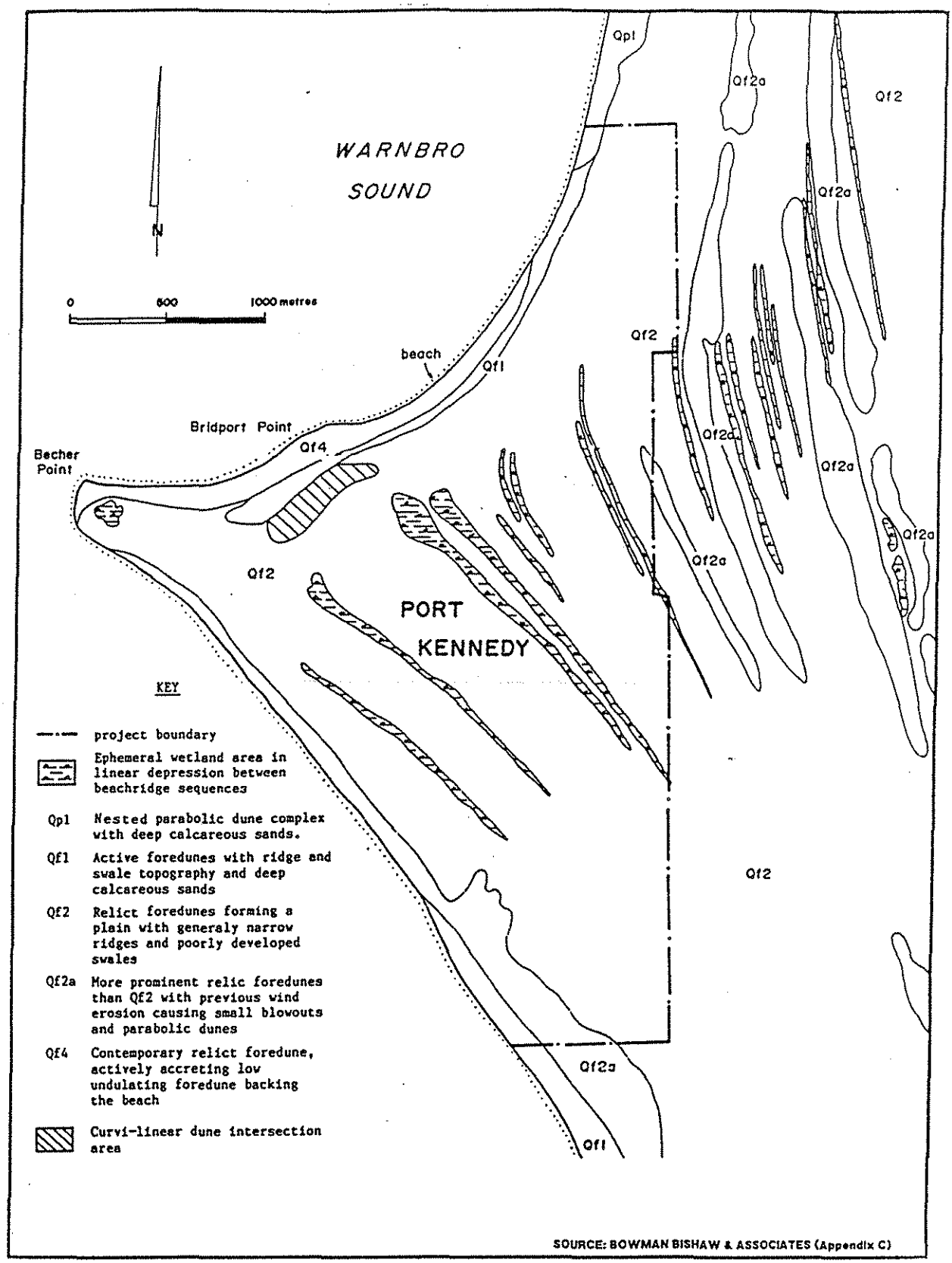


Figure 4: Geomorphic Zones

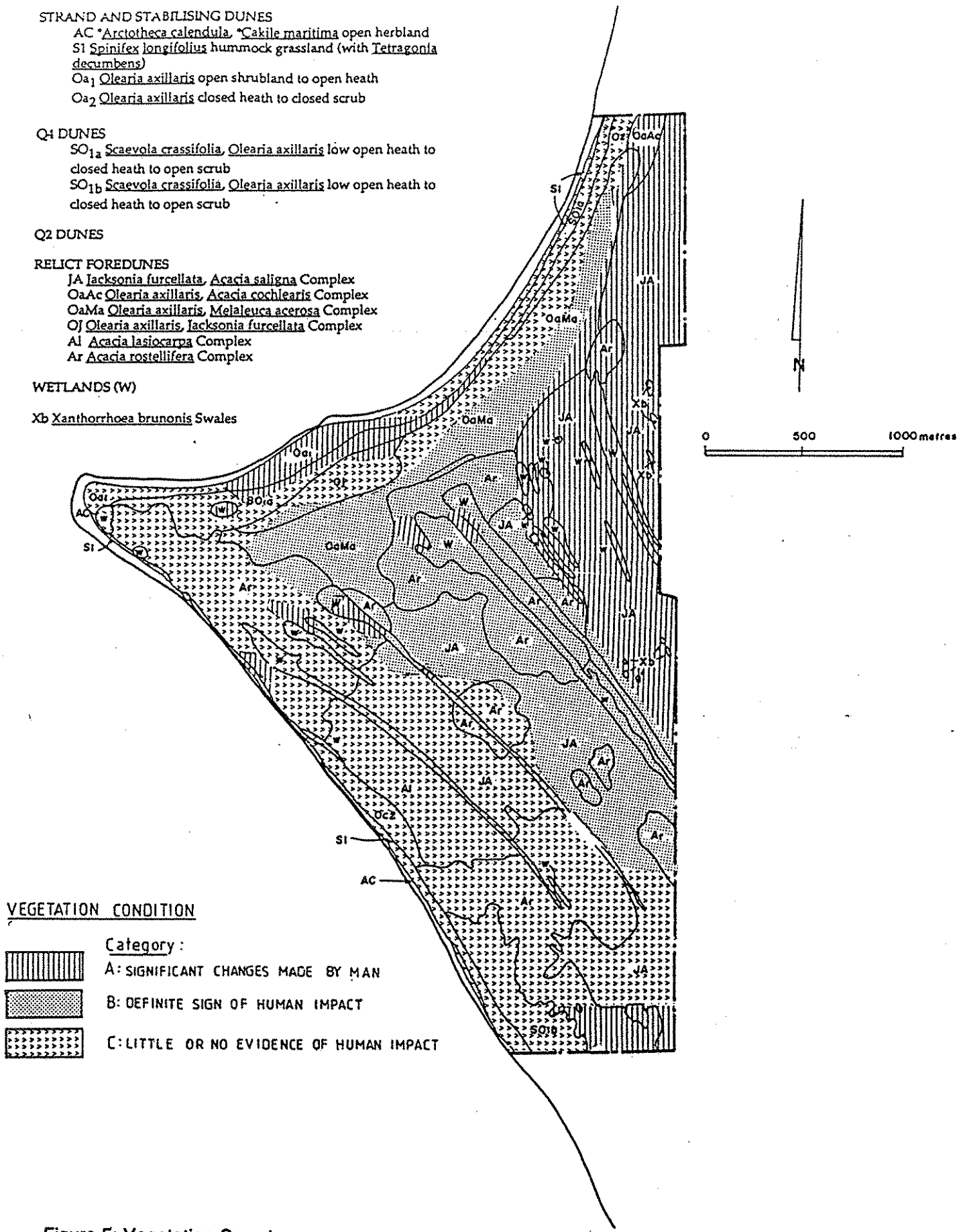


Figure 5: Vegetation Complexes

SOURCE: BOWMAN BISHAW & ASSOCIATES (Appendix C)

. Olearia axillaris (open shrubland to open heath).

The fauna of the site has not been extensively surveyed, but it is not thought to support an unusual or exceptional animal population in terms of either individual species or diversity. The view held is that introduced predatory species (feral cats, rats, mice and foxes) are a dominant influence.

There have nevertheless been sightings of a range of relatively common fauna including the Western Grey Kangaroo, Short Nosed Bandicoot, various snakes, frogs, skinks and a variety of birds. It is concluded that overall the fauna is likely to be impoverished within a regional context.

3.4 HYDROGEOLOGY

The local hydrogeology is an important aspect of the site. The two principal superficial unconfined aquifers are the surficial Safety Bay Sand aquifer, and the underlying Rockingham Sand aquifer.

The former attains a thickness of about 20 metres at the coastline, but narrowing as it extends eastward towards the Rockingham Lakes. The underlying Rockingham Sand aquifer extends to a thickness of more than 100 metres. Beneath this are the older Leederville and Yarragadee formations.

The unconfined groundwater body within the Safety Bay sands is of relatively good quality, and recharged principally from rainfall. A slight groundwater mound exists and groundwater flow over the site is towards the ocean shoreline.

4. REVIEW OF SUBMISSIONS

A total of 31 separate submissions were received, a total number of 108 proforma letters, and 4 late submissions. Of the 31 main submissions 7 were from Government agencies, and 12 were from community groups or organisations. A notable emphasis in the overall number of submissions was a concern regarding public access and the loss of existing low cost use of the site by ordinary people. A further concern of note was the System 6 status of the site.

The following is a summary of main issues raised in all submissions.

ALTERNATIVE USES AND BROADER PLANNING CONCERNS

Some submissions considered that alternative plans for the site are inadequately covered, that the proposal is generally inappropriate for the site, and that surrounding urbanisation and cumulative impacts should suggest other preferred uses for the site.

EXCLUSIVENESS

A number of submissions expressed the view that the proposal will cater for the wealthy, will provide an exclusive resort, and will be unaffordable for the ordinary person.

FLORA, FAUNA AND MARINE ASPECTS

Some submissions were concerned that the ERMP provides an insufficient explanation of the wildlife value of the site, omits a detailed fauna study and provides no indication of the proposal's impact on seagrass in the sound.

WETLANDS

Certain submissions felt that the importance and fate of wetlands on the site are insufficiently covered by the ERMP.

CONSERVATION ZONES

The issue was raised that the high boundary to area ratio of the conservation zones to be provided will make them susceptible to rapid deterioration.

CHARACTER AND HERITAGE VALUE

Several submissions were of the view that a distinct and unique environment with a potential to provide a Rottnest-like atmosphere, will be transformed and lost if the proposal proceeds.

INTERNATIONAL SCIENTIFIC SIGNIFICANCE AND CONSERVATION VALUE

A detailed submission raised the issue that the site is of recognised international significance for the study of sea level history, cuspate foreland stratigraphy/sedimentology and climate history. Stemming from this is the case for its considerable educational and conservation value, and the case for restricting development and promoting a regional or national park for conservation and landscape preservation. Several submissions felt that the System 6 recommendations will be compromised by the proposal.

MANAGEMENT

A number of submissions raised a variety of issues under the general heading of "management", including:

. impact of leached fertilisers;

. groundwater management;

. inadequate response to the potential of the Greenhouse Effect; and

. inadequate provision for general management .

PUBLIC ACCESS

Many submissions complained of the restriction that will result on current access to the Port Kennedy foreshore, and others regard the omission of a public boat launching ramp as unacceptable.

MARINA IMPACTS

A number of submissions considered details of the Marina to be either lacking or imprecise, and many submissions strongly queried the degree of foreshore movement and stability indicated in the ERMP.

OTHER FACILITIES

Many submissions suggested that a variety of additional facilities should be provided in the development (cycleways, trails, club facilities, etc).

SOCIAL AND ECONOMIC ASPECTS

A variety of social and economic concerns were raised in several submissions, relating to long-term costs of management imposed upon the community, lack demonstrated need for the proposed facility, impact on existing commercial fishing etc.

The proponent has taken considerable time to respond in full to the summary list of 95 issues that were presented under the above headings. The responses are detailed and sufficiently answer the majority of queries raised. A more detailed summary of issues is provided in Appendix 2. The proponent's detailed response to issues raised is contained in Appendix 3.

5 ENVIRONMENTAL ASSESSMENT

The following sections provide the assessment of the Port Kennedy proposal (Stage 1). The Environmental Protection Authority has taken into account all aspects of the project itself, but in addition has given careful consideration to the broader environmental concerns associated with the conservation value of the adjacent marine environment, the international scientific significance of the site, and the Greenhouse Effect.

5.1 AN OVERVIEW - PREREQUISITES

The Port Kennedy proposal involves a site and general location with various features of regional, national and international significance. These include the System 6 status of Port Kennedy (M106), the System 6 status of the adjacent marine environment (Cape Peron, Shoalwater Bay and Warnbro Sound-M101), and the international scientific significance of the Holocene dune assemblage. These aspects are discussed in detail in subsequent sections 5.3, 5.4 and 5.10.

The Environmental Protection Authority is of the view that these values are of outstanding significance and that all should be adequately safeguarded as a pre-requisite to the Port Kennedy Regional Recreation Centre development proposal being allowed to proceed. This means that prior to final Government approvals appropriate undertakings should be agreed, and that mechanisms to implement the Environmental Protection Authority's recommendations should be in place.

In order to achieve the System 6 (M106) objectives for the site, the Authority regards as essential the confirmed delineation of all conservation zones for both Stages I and II. This should confirm those areas proposed for conservation in Stage I in the ERMP, and for Stage II a target of 60% of the total area to be set aside would be appropriate. In addition the Authority sees opportunity in the balance of the land area to incorporate further natural vegetation in the landscaping of various facilities. The Authority recommends that there should be undertakings to secure all conservation areas as 'A' class reserves with suitable vesting. Additionally all other areas to remain in natural condition should be clearly identified in a plan, including those portions within the golf course areas. A clear undertaking to retain and manage these portions for their natural vegetation value should be provided.

Within the context of requirements addressing the System 6 values of the site, the Authority also recommends that the various public access areas should similarly be clearly defined with undertakings to secure all areas in Crown reserves with appropriate vesting.

In respect of the marine environment component, the Authority regards as essential that mechanisms to establish the proposed Marine Park M101 should be confirmed at the earliest opportunity. Establishment of the marine park necessarily includes the preparation of a marine park management plan, and setting in place appropriate staff and resources. Mechanisms to ensure provision of these should be in place prior to Port Kennedy being allowed to proceed.

In respect of the international scientific significance of the site, the Environmental Protection Authority believes that the values outlined in section 5.10 should be secured by means of an appropriate programme to retrieve available data from those areas to be significantly modified by construction. This may require consultation with experts in the field of coastal geomorphology to determine useful scientific questions that could be answered at the time of excavation. The Authority also concludes that the proponents should provide evidence that accessibility to the majority of the site for scientific research purposes will be maintained in perpetuity and that this requirement is directly taken into account in the planning and design of all facilities proposed for Stages I and II.

Providing all these aspects are addressed adequately as pre-requisites to the development proceeding, then on the basis of a detailed assessment of the proposal and after consideration of all major issues, the Environmental Protection Authority concludes that the proposal for Stage I is environmentally acceptable.

RECOMMENDATION 1

"The Environmental Protection Authority recommends that as a pre-requisite to the final approval to commence development for the Port Kennedy Regional Recreation Centre being granted, the following actions should be taken:

(i) mechanisms to implement the System 6 recommendations for the establishment of a proposed marine park (M101, Cape Peron, Shoalwater Bay and Warnbro Sound) and the preparation of a marine park management plan, be set in place by Government;

(i i) in respect of the System 6 recommendations (M106) for Port Kennedy, the proponent should provide plans confirming the location and extent of all conservation zones and natural vegetation areas for both Stages I and II, and that Government set in place the mechanisms necessary to secure all conservation zones under appropriate Crown Reserve vestings;

(i i i) the proponent should provide plans confirming the location and extent of all public access areas, to be secured under appropriate Crown reserve vestings; and

(i v) the proponent should provide undertakings to safeguard the international scientific value of the site with respect to discussions in section 5.1 and 5.10.

to the satisfaction of the Minister for Environment, following advice from the Minister for Conservation and Land Management, and the Environmental Protection Authority".

As a result of consideration of all major issues and the environmental assessment of the proposal itself, and providing Recommendation 1 is satisfied, the following recommendation is made.

RECOMMENDATION 2

The Environmental Protection Authority concludes that the Port Kennedy Regional Recreation Centre proposal Stage 1 as described in the ERMP is, subject to compliance with Recommendation 1, environmentally acceptable and recommends the proposal may proceed subject to the undertakings and commitments provided by the proponent (Appendix 1) and subject to the recommendations of this assessment report.

5.2 BACKGROUND

5.2.1 PLANNING ASPECTS

To many observers the Port Kennedy site may appear as a vacant land area still predominantly in its natural state, and without any apparent fixed future purpose. To some the proposal at hand may be a surprise and without any precurser.

In fact there has been an extensive debate over the last four decades as repeated suggestions for use of the area have been put forward. The history of past use proposals for the site are summarized in Appendix 4. This indicates that from the Second World War when the general area was used as a Defence Force artillery practice range, there has been a range of use suggestions including residential subdivision, sporting and recreational purposes, institutional uses, a potential nuclear power station site, and conservation.

The Authority believes it is important to consider the current proposal in the context of the most frequently endorsed use objectives for the site, namely the development of a regional recreation facility . This culminated in a 1978 report prepared by the then Metrpolitan Region Planning Authority entitled "the Port Kennedy Recreation Centre Concept" which recommended a broad range of community recreation facilities for the site. This report received Cabinet endorsement at the time, but no further action was taken. In this context at least, the Port Kennedy Recreation Centre is consistent with previous established thinking.

5.2.2 DEVELOPMENT BRIEF

The current proposal arose as a result of an invitation by the Government of Western Australia in 1986 for applicants to register their interest in being appointed to carry out development at the Port Kennedy site. Prospective candidates for selection responded to a Port Kennedy Development Brief prepared by the State Planning Commission (see Appendix 5).

The Environmental Protection Authority notes that the Development Brief is consistent with previous discussions on future use of the site. The brief identified the need for proponents to consult with the then Department of Conservation and Environment, but made no mention of the System 6 status of the site, or the site's conservation value.

5.3 SYSTEM 6 STATUS -

The System 6 study makes recommendations concerning both the Port Kennedy site (M106) and the adjacent Murray Reefs System(Cape Peron, Shoalwater Bay and Warnbro Sound M101). (See Appendix 6). The recommendations for Port Kennedy are:

(i) that the general recommendations for Regional Parks be applied in this area; and

(ii) that the Metropolitan Region Planning Authority consider "reserving" those portions not already reserved for Parks and Recreation in the MRS.

For the M101 Murray Reefs area, the recommendations are:

(i) that the general recommendation on planning and management of Regional Parks be applied to this area;

(ii) that Reserves C24204, C31893 and C31894 be amended to Class A;

(iii) that each area of vacant Crown land be made a Class C Reserve for Conservation of Fauna and be vested in the WA Wildlife Authority;

(iv) that a study of the area be commissioned by the Environmental Protection Authority with the aim of establishing a Marine Reserve to be managed for the purpose of Conservation; and

(v) that, subject to the implementation of recommendation (iv), a management plan be prepared for the Marine Reserve.

It is the Authority's view that in respect of the recommendations for Port Kennedy (M106), bearing in mind the findings and recommendations of this assessment report, the proposal is of a considerably greater intensity and scale than is envisaged by the System 6 Study. While the System 6 Study recognises the recreation resource potential of the site, it also stresses the conservation value of the locality and specifically mentions regeneration of local indigenous flora and removal of squatter's shacks. This indicates an emphasis on rehabilitation of the site.

Nevertheless, the Environmental Protection Authority wishes to point out that the proponent made an interim submission (Appendix 7) during the preparation of the ERMP in response to the Authority's advice that the System 6 status of the site was a matter that should be adequately addressed. The purpose of the submission was to clarify the relative conservation importance of various portions of the site, and make any necessary adjustments to the proposal. This procedure resulted in a greater setback of the marina development from the curvilinear dune system, and the provision of an additional conservation 'transect' zone at the northern end of the site.

The Authority believes that, given the constraints of the Development Brief to which the proponent's were required to respond and the limitations for flexibility arising from the need to promote a commercially viable proposal, due credit should be given to the proponent for attempting to ensure that the System 6 conservation value of the site was adequately incorporated into the development proposal.The inclusion of a commercial element to achieve the creation of a major conservation and recreation resource for the public of Western Australia is not without precedent. Both in the case of Herdsman Lake and Whiteman Park commercial or private organisation interests were involved in achieving a major park development for the community.

In respect of the M106 recommendations for the site, the Authority concludes that the acceptability of Stage I depends to a large degree on the adequate overall emphasis on conservation in both Stage I and II combined. This aspect is discussed further in Section 5.4.

In respect of the M 101 recommendations, the Authority concludes that with the advent of the Port Kennedy proposal, particularly in combination with the possible commencement of the Westport and the Mangles Bay Marina proposals, the resultant pressures that will be placed on the marine environment will be considerable. This aspect is discussed further in section 5.5. However, the Environmental Protection Authority is of the view that the System 6 M101 recommendations should now be implemented as a matter of priority. It is the Authority's recommendation that if the Port Kennedy proposal is to proceed, then the M101 Marine Park should be established as soon as possible.

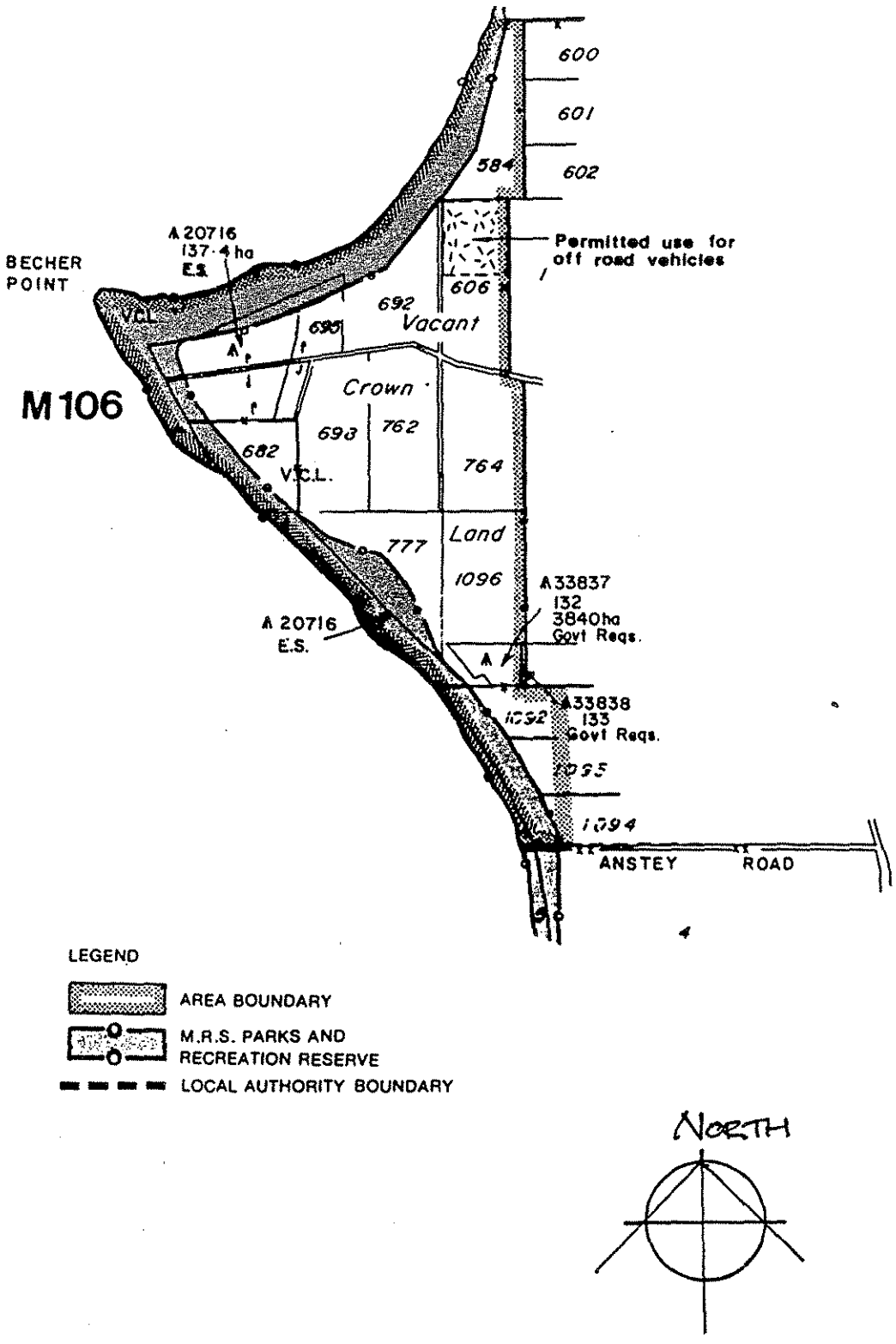


Figure 6: System 6 M106

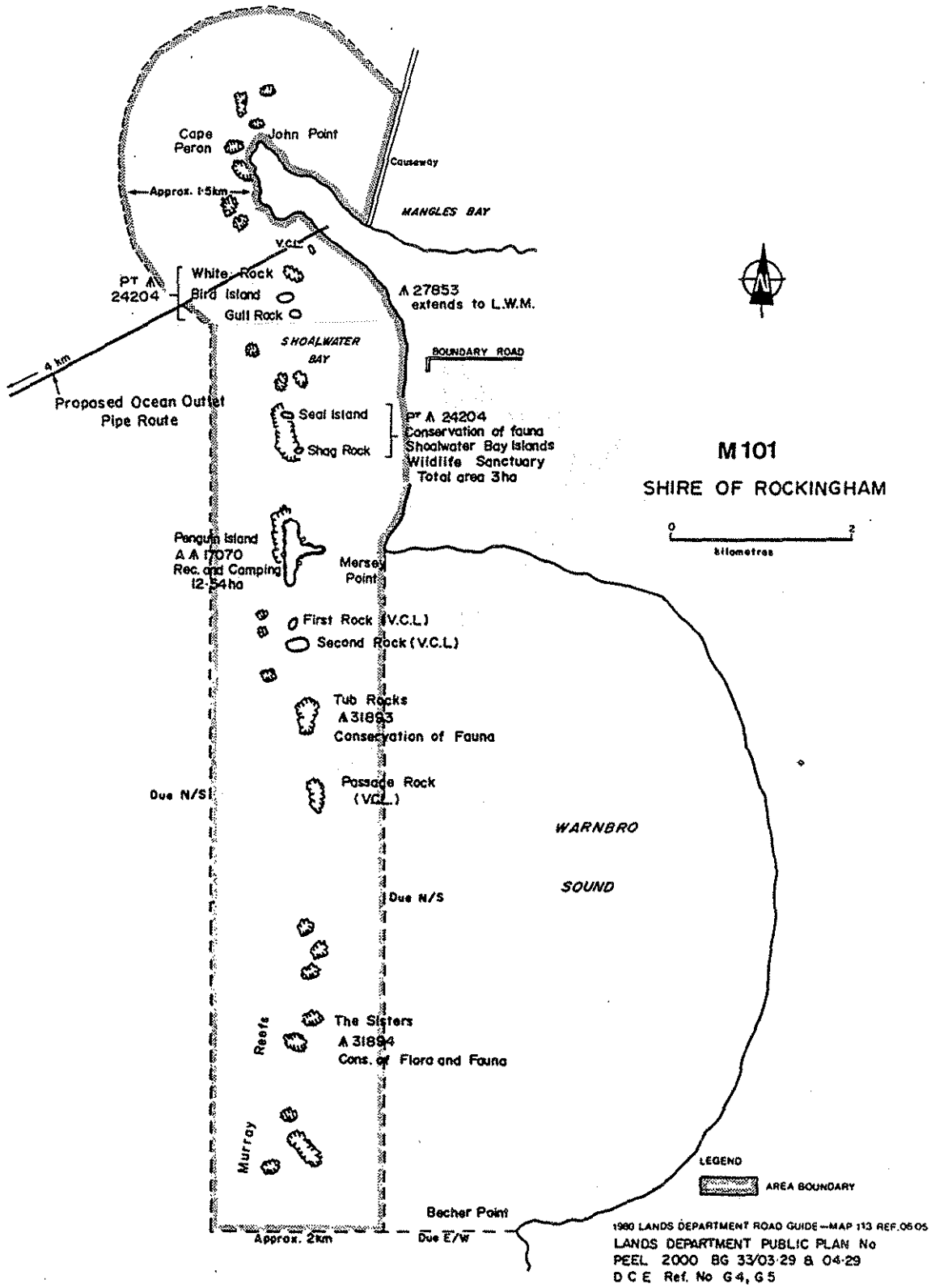


Figure 7: System 6 M101

5.4 STAGES I AND II

Figure 8. indicates the extent of stages I and II, and the area of various facilities to be provided in Stage I. It shows only an approximate positioning of various facilities in Stage II.

It is apparent from the explanation of the proposal provided in the ERMP that Stage I is of necessity to be the most intense portion of the development in creating a commercially viable proposal. It has also been apparent from the outset that Stage II will be a lower density and more subdued style of development with a greater conservation emphasis.

The ERMP does not provide any detail of Stage II, but because the Environmental Protection Authority regards knowledge of the overall balance of development versus conservation for the whole site as essential in determining the appropriateness of Stage I the Authority requested clarification on this aspect from the proponent. The proponent's response is provided in Appendix 8 to the effect that on the basis of preliminary analysis more than 50% of stage II will be incorporated into conservation zones and managed as such. The proponent also points out that identification of further constraints on development is anticipated, and a low-intensity development approach to provide suitable facilities for local demand is advocated.

The Authority concludes therefore that, given the discussion regarding the System 6 status of the site in Section 5.3, the overall intent to reduce the level of development for Stage II appears reasonable and, subject to recommendation I finds the scale of Stage I development acceptable.

5.5 MARINE ENVIRONMENT ASPECTS

The Port Kennedy Recreation Centre development will result in increased impacts on the adjacent marine environment. Such impacts will stem from the anticipated inputs of nutrients and contaminants arising from the development, the principal sources being the marina harbour and from contaminated groundwater flow in the long term. The major impacts however will be in the form of markedly increased recreation pressure on the marine environment, as a result of far greater ready access to the southern and western portions of Warnbro Sound and the associated reef system.

5.5.1 NUTRIENT LOADS INTO WARNBRO SOUND

The ERMP estimates that nutrient loadings via submarine groundwater discharge are likely to be relatively small compared to the ultimate nutrient loading capacity of Warnbro Sound. In the "Comments and Responses" (Appendix 3) the proponent provides an estimate of 10 Kg per day of nitrogen to Warnbro Sound as a consequence of the development. These calculations have been assessed by the Authority, and it has been concluded that this appears to be a reasonable estimate.

Nevertheless while a relatively low level of nutrient input is expected, heavier nutrient loads could be reached at a late stage if there were lack of concern on the issue. One potential source of nutrients could be the area of golf courses, if acceptable management practices were not adhered to. It is suggested that in addition to the undertakings provided by the proponent on golf course management, a golf course irrigation and fertiliser application and monitoring programme should be developed incorporating the monitoring and management principles of Australian Irrigation Association.

However the major issue at hand is that of the combined loading of all coastal developments along the eastern margins of Warnbro Sound. This has not yet been addressed. When Port Kennedy is considered as one of several users of Warnbro Sound, and its nutrient loading as being a component of all other loadings, it is clear that its impact on the ecosystem cannot be considered in isolation.

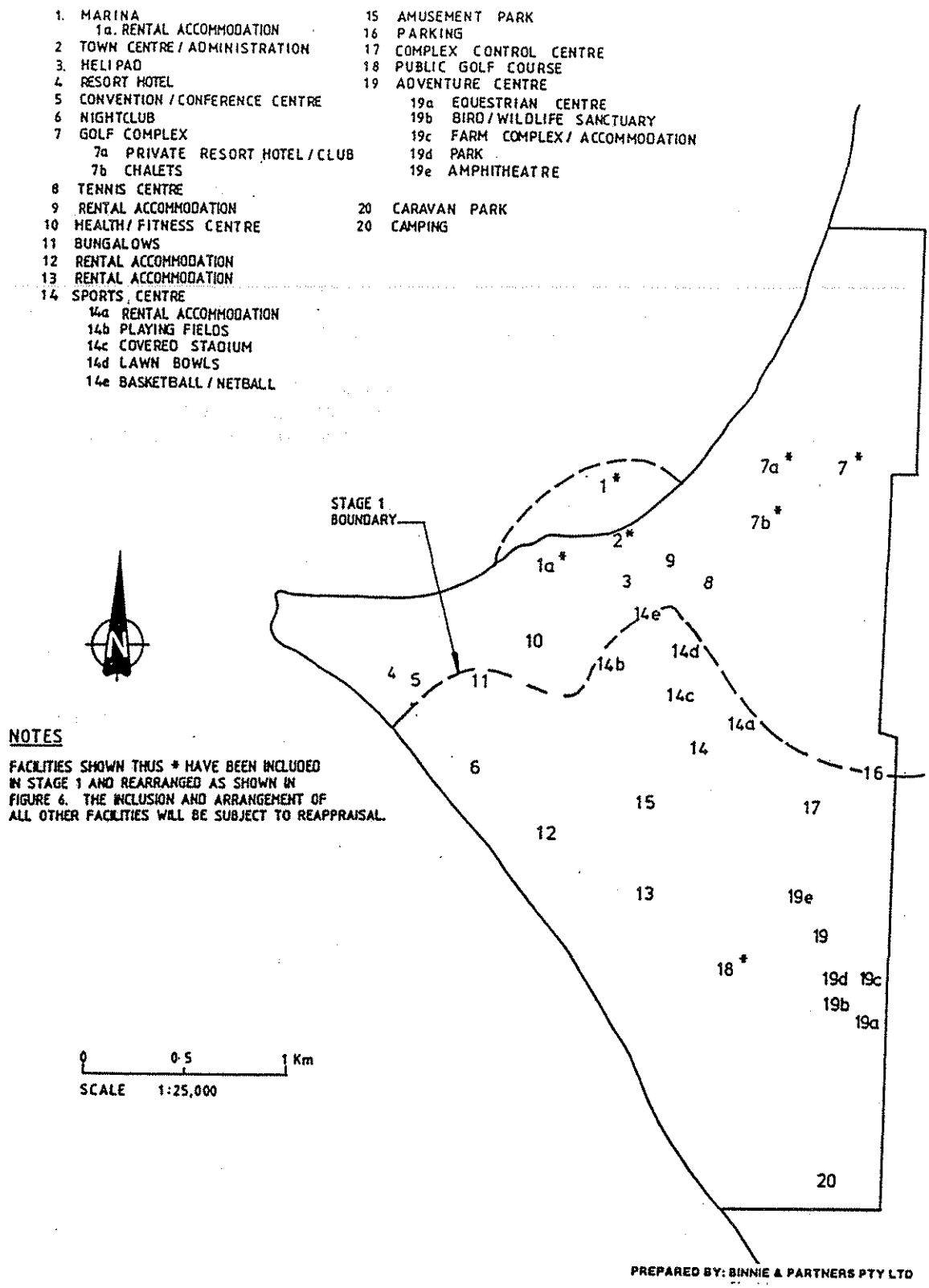


Figure 8: Preliminary Planning Framework for Stages I and II

The "assimilative capacity" of Warnbro Sound to nutrient inputs should be quantified so the potential contribution from the Port Kennedy development can be put in a useful context. In the Environmental Review and Management Programme the assimilative capacity of Cockburn Sound was estimated and used as a yardstick to calculate the assimilative capacity of Warnbro Sound, based on a volumetric ratio of each Sound's water volume. The Environmental Protection Authority considers this method leads to inconclusive results for the following reasons.

The assimilative capacity of Cockburn Sound has yet to be determined. It is known that a gradual build-up of nitrogen load in Cockburn Sound to 2000 kgd per day in 1969 coincided with seagrass loss, and that when nitrogen loads reached 4000 kgd per day in the mid-seventies algal blooms were reported. Current levels are of the order 1500 kgd per day and algal blooms still occur in summer/spring. The current ecological status of seagrasses in Cockburn Sound is unknown.

Hence, it is apparent that Cockburn Sound is now more sensitive to nitrogen inputs since algal blooms are forming at daily loading levels lower than those that were recorded when algal blooms first occurred in the mid-seventies. The reasons for this variability in the response of the ecosystem to nutrient loadings are not understood.

Warnbro Sound is a rare ecosystem in its present "pristine" state and is regarded by the Authority as an area worthy of a high level of conservation. Hence, it is felt that attitudes relating to acceptable nutrient inputs should be motivated by different issues when compared to the more industrialised waters of Cockburn Sound.

The hydrodynamic behaviour of Warnbro Sound has not been investigated in detail. The influence of the basin-like bathymetry, vertical and horizontal stratification of salinity and temperature, submarine groundwater discharge, winds, tides and regional currents in either promoting or inhibiting flushing of this water body is poorly understood.

Finally, there are still further aspects that need to be known concerning the biological systems in Warnbro Sound and on their ability to withstand stress.

On the basis of the above, it is concluded that establishment of a Marine Park is essential as a mechanism by which comprehensive investigations as well as the management of Warnbro Sound and associated waters can be suitably coordinated. This aspect is covered in Recommendation 2 (Section 5.1).

5.5.2 RECREATION USE PRESSURES ON THE MARINE ECOSYSTEM

Experience based upon other recreational developments such as the Hillarys Boat Harbour suggests that the Port Kennedy development is likely to lead to significantly increased recreational pressures on adjacent ecosystems in Warnbro Sound. A management plan, as recommended in the System 6 study should be formulated by the Department of Conservation and Land Management, following the establishment of the marina park. It is envisaged that this plan encompass infrastructure, facilities, personnel and equipment. The Environmental Protection Authority should be consulted in the preparation of the management plan.

The proponent has made a commitment in the ERMP to make a financial contribution towards an equitable proportion of the total costs of a proposed regional study of the currents and marine biota between Rottnest Island and Becher Point' (Vol II Page 103 ERMP). This commitment has been further clarified, as is indicated in Appendix 9.

For reasons covered in Section 5.5.1, in addition to the need to establish a marine park administrative structure in order to coordinate management, it is concluded that the financial contribution to be made by the proponent should be used to assist in the establishment of the proposed Marine Park, or to fund a suitable investigation as determined by a Marine Park Management Plan.

5.6 MARINA

5.6.1 MARINA DESIGN AND ENTRANCE STABILITY

The general location and engineering stability of the proposed marina structure is regarded as sound by the Department of Marine and Harbours. The Department of Marine and Harbours nevertheless indicates that engineering details concerning the marina entrance channel require to be more clearly defined, in so far as the stability of the entrance channel should be reviewed in the light of more detailed plans. In the response to issues raised (Appendix 3), the proponent recognises that the precise location of the entrance and its configuration are to be subject of detailed design following the granting of environmental approval.

A further issue associated with the possible accumulation of sediment at the mouth of the marina, is the effect it may have on water quality. Should a 'sand bar' form at the marina mouth then the possibility of bottom pooling of relatively dense waters in the marina exists. In conjunction with possible deposition of algae that may be formed in-situ or be advected into the marina from Warnbro Sound, this may lead to water quality problems within the marina waters.

It is therefore recommended that monitoring of the bathymetry between marina and outer waters be conducted. This monitoring should be accompanied by a contingency plan to eliminate accretion or reform a unified depth profile between the inner marina and outer waters should excessive accumulation of sediment occur.

RECOMMENDATION 3

The Environmental Protection Authority recommends that construction of the groynes and marina basin should not commence before provision of:

(i) final design details with adequate supporting data;

(i i) a plan detailing the extent of the entrance channel and bathymetry of the entrance; and

(i i i) details of the volume of sand to be by-passed for depth of entrance channel determined,

to the satisfaction of the Environmental Protection Authority, following advice from the Department of Marine and Harbours.

5.6.2 FLUSHING AND WATER QUALITY

In the Environmental Review and Management Programme the dominating mechanism invoked as a flushing agent was that of gravitational circulation driven by a density anomaly between the inner and outer marina waters. This density difference will be set up by the introduction of freshwater, which discharges along the coast. This mechanism, in conjunction with tidal exchange, wind induced flushing due to shear dispersion and eddy dispersion was calculated to yield predictive flushing times of 3 to 9 days.

The importance of gravitational circulation in flushing coastal marinas was discussed by the Department of Marine and Harbours in their analysis of flushing of the Hillarys Marina. The Environmental Review and Management Programme analysis for the Port Kennedy case draws on the methods and experience gained through the work conducted for the Hillarys

Marina. However, a significant difference between the two cases does exist; expected freshwater discharge rates at Port Kennedy are an order of magnitude lower than those estimated for Hillarys. Hence, some uncertainty remains as to the applicability of the theory to Port Kennedy. Lewis and Imberger's closing comments in the Environmental Review and Management Programme emphasise this point as follows "The theory has been verified under relatively strongly stratified conditions through field measurements within Hillarys Boat Harbour. Further verification of the theory, through field experimentation, is required in less strongly stratified harbours, such as the Port Kennedy Marina". To date, no measurements of actual exchange currents through marina mouths induced by gravitational circulation have been undertaken. To rely on density structure measurements alone would require the benefit of observation of such data collected over a wide range of environmental conditions. This type of data exists for the Hillarys Boar Harbour and has been made available by the Department of Marine and Harbours. As a result there is confidence that this mechanism was dominant for flushing of the Hillarys Harbour. However, to be completely confident of this mechanism's predicted role in flushing of the Port Kennedy Marina, field verification as suggested by Lewis and Imberger (above) is required.

In view of the above, it is concluded that the critical issue relating to the marina water quality is that of expected pollutant loadings in the water. This information is required so that an acceptable flushing time, to ensure acceptable pollutant concentrates, can be set. Consultants to the proponent were requested to provide this quantitative information to the Environmental Protection Authority. The response (see Appendix 9) contains a qualitative discussion of expected pollutant loadings into the marina. Based on the information provided the Environmental Protection Authority is of the view that predicted flushing times should be adequate.

It is recommended however, that water quality monitoring be undertaken to check on the concentration of pollutants in the marina water body during critical environmental conditions, such as calm, hot periods when boating activity will be highest, flushing lowest and environmental stress most severe. This monitoring programme should be formulated and forwarded, in report format, to the Environmental Protection Authority for review prior to the commencement of operation of the marina. In the event that water quality within the marina waters is found to be below acceptable levels (defined as those given in DCE Bulletin 103 (1981) for Beneficial Uses 1 (direct contact recreation), 2, 5, 7(2) and 16) then further studies to determine actual flushing rates and the relative contributions of the various physical mechanisms, as outlined above, to flushing will be required. Should flushing times be found to be inadequate then artificial mechanisms to enhance flushing and remedial measures to improve water quality will need to be applied.

RECOMMENDATION 4

The Environmental Protection Authority recommends that the proponent should prepare and undertake field investigation of the flushing characteristics of the proposed marina in order to support predicted flushing times, to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 5

The Environmental Protection Authority recommends that the proposed marina water quality monitoring programme to be undertaken be expanded to include an appropriate check on the concentration of pollutants in the marina waterbody during critical environmental conditions, and should make provision for a contingency plan to enhance flushing and improve water quality, if required, to the satisfaction of the Environmental Protection Authority.

5.6.3 TRIBUTYLTIN OXIDE AND HEAVY METALS CONTAMINATION

The issue of Tributyltin Oxide (TBTO) contamination of water, sediment and fauna has not been addressed or the ERMP .

Future use of this anti-foulent material is under current review by the Environmental Protection Authority, and its use may be limited in the near future to vessels of 25 metres length or more. The present status of TBTO use is that it can be freely applied to all vessels in Western Australia. This effectively means that for a considerable period yet, there will be boats in use with trybutyltin oxide antifouling. Even after the introduction of a ban therefore, this antifoulant will be present. In addition, substitute antifoulants will still be toxic. A simple calculation shows that it is likely that the predicted peak concentration of boats in the marina could lead to elevated levels of TBTO in the marina. Until use of TBTO is reduced to an insignificant level it would be prudent that amounts of TBTO in the water and sediments be monitored as part of the heavy metals monitoring programme of sediment within and outside the marina committed by the proponent. The spatial and temporal details of such a sediment monitoring programme should be chosen in consultation with the Environmental Protection Authority, and the programme should be made compatible with other such programmes for Western Australian waters. Monitoring programme details should be forwarded in a report form to the Environmental Protection Authority prior to the commencement of the operation of the marina.

5.6.4 SUSPENDED SEDIMENT AND TURBIDITY

The formation of localised suspended sediment plumes and subsequent transport and fallout of sediment was not quantitatively addressed in the Environmental Review and Management Programme. However, it has subsequently been indicated that dredge spoil would be disposed of in a contained manner. (Appendix 10)

Turbidity which can be created by dredging and breakwater construction would have the potential to be spread in local currents driven by winds, tides and density differences. Localised mixing of a strongly stratified water column would provide a driving source for intermediate density currents, which could transport material in the absence of wind induced or tidal flows.
Some data exist on Warnbro Sound stratification (Binnie and Partners, 1981, Cape Peron Ocean Outlet- Feasibility Study - Physical Oceanographic data). These data suggest that Warnbro Sound has the potential for appreciable vertical temperature and salinity stratification. The protected nature of the subject region to winds will be conducive to the maintenance of any vertical stratification.

5.6.5 COASTAL SEDIMENT MOVEMENT

This issue was addressed in the Environmental Review and Management Programme, which concluded that there is "leakage" of sediment of 10,000 - 15,000 m3 per year around Becher Point and onto the coast between Becher and Bridport Points. The Authority also notes comments made by the Department of Marine and Harbours on coastal stability and sediment transport, as outlined in correspondence. (Appendix 11).

The Environmental Protection Authority regards the proponent's commitment to undertake shoreline monitoring as outlined in the ERMP as an essential requirement, and that the monitoring programme be to the satisfaction of the Environmental Protection Authority, the Department of Agriculture, Department of Marine and Harbours, and the State Planning Commission.

5.7 GROUNDWATER AND WATER USAGE

The water use requirements resultant upon the proposal are relatively high, especially when compared to other potential recreation uses of the site which might have been envisaged.

The ERMP States that the numerical model used to assess the available ground water on site, indicates that a maximum 4000 kl/day can be abstracted from the unconfined aquifer without unacceptable impacts, if the Westport Canal development does not proceed. The model indicates that 3,500 kl/day is the safe abstraction limit if Westport does proceed as originally envisaged.

Against this general position is the initial Stage I water supply requirement of 5,500Kl/day reducing to 4000Kl/day in 5 years from commencement of the development . The higher volumes are required in the initial 5 years to ensure successful establishment of the golf courses and landscaping. The ERMP advocates that the shortfall in supply over the initial development period be made up from:

- the extra yield available prior to the Westport development proceeding;
- the extra yield that will be available in practice due to the deliberately conservative nature of the numerical model; and
- use of higher salinity water from Yarragadee aquifer.

In the long term, and particularly if the Westport canal proceeds, a water use level of 4000Kl/day for Stage I is envisaged. It is estimated that this can be provided for by suitable levels of abstraction from the Yarragadee in combination with abstraction from the unconfined aquifer.

The water supply for Stage II could possibly be provided for by use of treated effluent re-cycled from the Water Authority waste water treatment plant at Ennis Avenue. This supply is anticipated as having potential some years hence when the capacity and output from the treatment plant is increased with the expansion of urbanisation in the Rockingham - Warnbro district.

It is estimated that this level of groundwater usage will not adversely effect the Rockingham Lakes, will not cause saline intrusion, and will not affect other adjacent groundwater users. Nevertheless, due to a degree of uncertainty the Water Authority will require additional modelling and monitoring before a groundwater license is issued. If monitoring indicates any adverse effects the licencee will be required to modify his abstractions accordingly.The Environmental Protection Authority endorses the position and requirements indicated by the Water Authority of Western Australia.

The Environmental Protection Authority nevertheless makes the observation that the development industry in Western Australia should at the earliest stages of creating a development concept, recognise that water is a limiting factor.
Ideally, the development industry should adapt design approaches to operate well within the available water budget, and should recognise that environmentally sustainable and responsible design is one that is highly adapted to arid summer conditions, and not contrary to it.

As the water supply regime estimated by the proponent is reliant upon a high proportion of rainfall assumed as recharge in the numerical model, and as the current predictions are for a possible reduction in rainfall yields in the future, it is recommended that the proponent prepare a contingency plan to adapt the landscaping of the development to possibly drier conditions in the future.

RECOMMENDATION 6

The Environmental Protection Authority recommends that within 5 years of the project commencing, the proponent should prepare a landscape contingency plan which provides for a reduction of water usage for irrigation purposes should this be required in the future, to the satisfaction of the Environmental Protection Authority, following advice from the Water Authority of Western Australia, and the Department of Agriculture.

The Environmental Protection Authority also notes that the proposed vegetation monitoring programmes should include specific monitoring of vegetation dieback as a result of drawdown that might occur. This should include the conservation areas of Stage I , and relevant portions of the Stage II site. The Department of Agriculture, Conservation and Land Management, and the Water Authority should have the results of the monitoring programme forwarded to them on a regular basis.

5.8 TERRESTRIAL CONSERVATION AREAS

As discussed previously in Section 5.3, and as indicated in Appendix 7, the proponents have assessed the prime areas of conservation value within Stage I, and representative portions approximating at least a third of the site are proposed to be set aside for conservation purposes. Recommendation 1 (section 5.1) requires that additional conservation zones in Stage II also be determined as a pre-requisite to development approval.

The Environmental Protection Authority endorses the choice of areas selected, within Stage I and notes the various commitments associated with the retention of the natural vegetation zones.

However, the ERMP does not provide sufficiently for a comprehensive management plan for the conservation zones in both Stage I and II. The Authority considers that such is essential, and believes that the Department of Conservation and Land Management should be involved in its preparation.

RECOMMENDATION 7

The Environmental Protection Authority recommends that the proponent should prepare a management plan for the proposed conservation zones to be implemented by the Port Kennedy Management Board, to the satisfaction of the Environmental Protection Authority following advice from the Department of Conservation and Land Management.

5.9 PUBLIC ACCESS

The matter of public access to the site was a major issue raised in public submissions. The Environmental Protection Authority considers it important that ready public access to the site and its essential attractions is maintained and managed, particularly to the beaches.

The Authority recognises that many traditional users (squatters, fishermen using off road vehicles) will be displaced and that the existing mode of informal access will be curtailed, especially vehicle access along the beach.

The Authority regards this change as being inevitable in the long term and to that extent the current proposal has merely brought this about earlier than might otherwise have occurred. A similar comment is made in respect of the squatter shacks.

The Authority is of the view that the proposal will greatly increase access to the site for the general community, and is confident that deliberate provision is to be made for all socio-economic sectors of the community.

The Authority however notes that the general parking area to the south of the marina development, which will also serve those wishing to use only the beaches, is between 200 and 500 metres from the nearest portion of beach. Such distances will prove a considerable obstacle to the young, the elderly and the infirm.

While the Authority would not wish to see inappropriate design of carparks in beach foredune areas, it is concluded that sufficient design modifications should be made to improve access to the beaches. It is suggested that revised circulation to allow family drop-off points at the western and eastern edges of the marina development area should be considered. Vehicles could then return to the formal parking area provided, after depositing their occupants.

As indicated in Recommendation 1 (section 5.1), the Authority regards clarification and security of all public access areas within the site as important. This is consistent with the Authority's previous position with regard to river and coastal foreshores, and marina frontages. As Port Kennedy is public land with System 6 status, the firm declaration and security of public access to the majority of the site is a particularly critical issue.

In addition, the Environmental Protection Authority considers that the matter of whether a public boat launching ramp is provided in the proposed marina requires further consideration by both the proponent and State Government. It is the Environmental Protection Authority's view that a site which is one of a very few between Rockingham and Mandurah suitable for locating a marina, should maximise the opportunity for full public access, including a public boat launching ramp. This is a much needed facility at all points along the coast, and it is therefore socially desirable that such be included in the proposed Port Kennedy marina.

The Authority recognises that this is contrary to the basic design intent of the marina and will additionally increase the management requirements associated with the Marine Park due to some level of increased boat usage. Nevertheless the principal of a consistent approach to full public access provided in coastal facilities is considered to be of greater importance.

5.10 INTERNATIONAL SCIENTIFIC VALUE

Following the commencement of ERMP preparation the Environmental Protection Authority's attention was drawn to the degree to which the Holocene dune assemblage of the site is of international scientific significance. The literature indicates a detailed examination of radiometric dating and stratigraphic interpretation that is unmatched for much of the Australian coast. The potential of the site to yield information concerning variation in coastal storminess, storm surge and sea level variation over the past 300 years is particularly important. The site therefore also has significance in providing a means of predicting the effects of climatic change and sea level rise on certain coastal processes. This makes the site one of much greater national and international significance than is indicated in the ERMP.

Due to the importance and complexity of this issue, the Authority decided to engage independent advice, and provided the following brief:

(i) "to assess the adequacy of the Port Kennedy ERMP in terms of its coverage of, and response to, the coastal terrain and geomorphology of the site, whilst

(ii) taking into account the available published work on the area, which makes a case for the regional and international significance of the site"

The subsequent report produced is contained in Appendix II.

The conclusion reached by the Environmental Protection Authority is that whatever uses are to occur on the site, the scientific value of the site should not be significantly diminished. This in practice should mean that a maximum resource of research data should remain available in perpetuity. In the case of portions of the site to be significantly modified by construction, the Authority believes that sufficient action should be taken at the time of excavation for major scientific questions to be investigated. It is the Authority's view that it is the proponent's responsibility to prepare a suitable programme to achieve this objective, and to undertake the actions required.

In the case of Stage II, particular consideration should be given to the layout and dimensions of the conservation areas, and design of development nodes, to ensure a maximum portion of the site remains intact and available for future research.

Notwithstanding these comments the Environmental Protection Authority notes the commitment provided by the proponent on this aspect, and given the nature of Recommendation 1 of this assessment report, finds the matter adequately addressed.

5.11 MANAGEMENT ASPECTS

The Authority notes the proposed arrangement of a Port Kennedy Management Board to be set up under the terms of a project agreement. It is understood that this administrative arrangement is being devised by State Government and through negotiations with the proponent.

The Authority is of the view that due to recommended implementation of the proposed Marine Park, together with the management implications of the Terrestrial conservation zones in Parts I and II, the Management Board should also include representation from an appropriate Government agency with natural resource management skills.

RECOMMENDATION 8

The Environmental Protection Authority recommends that the composition of the Management Board be expanded to include a representative from a Government agency with natural resource management skills.

On the matter of the operation and management of the marina itself, the Authority notes that final arrangements and legal obligations will be subject to a Project Agreement signed between the proponent and the State Government. This Project Agreement should ensure that sufficient funds are made available for all ongoing marina management requirements, and should provide a contingency fund, or similar, in the event of extraordinary events, such as severe storm damage.

The Environmental Protection Authority notes that the proposal includes private freehold water frontage within the marina. These land holdings will once created depend entirely on the continued maintenance of the main western groyne for their engineering security. In the possible event of the agreed funding arrangement being unable to meet unforeseen future maintenance requirements, the existence of the freehold component would place immediate pressure on the State Government to take over the necessary management role at the taxpayers expense. The Authority believes that this would be unacceptable, and advises that the State Government should require in the Project Agreement an appropriate default clause that protects the public interest in the event of the failure of the marina structure or the failure the proposed funding arrangements. The Authority believes that the Department of Marine and Harbours should be consulted on this matter.

RECOMMENDATION 9

The Environmental Protection Authority recommends that construction of the Port Kennedy Regional Recreation Centre proposal should not commence prior to the finalisation of a suitable project agreement between the proponent and State Government, to the satisfaction of the Minister for Environment.

5.12 OTHER MATTERS

5.12.1 SERVICING

The Authority notes that full servicing, including deep sewerage, is to be provided for all aspects of the proposed development. The Authority has no further comments in this regard.

5.12.2 GREENHOUSE EFFECT

The proponents were required to address the matter of the Greenhouse Effect, and its relevance to the proposal. As yet there is much conjecture, and some estimates but little certainty, as to the precise changes that the Greenhouse Effect will cause. The timing of events is still more uncertain, making appropriate design of structures and coastal works a difficult matter.

The proponent has included consideration of climate change and the Greenhouse Effect in Appendix B of Volume III, and in Section 7.8 of Volume II of the ERMP. The Authority is satisfied that appropriate responses and provisions to reasonable possibilities over the engineering and economic life time of the structures have been made.

The Authority holds most concern at this time, over the impacts on the development as a result of possible rainfall reduction. This has been discussed in section 5.7 of this assessment report.

6. CONCLUSION

The Port Kennedy Regional Recreation Centre proposal is a large development project, on an attractive coastal site with a number of distinct characteristics, that will result in a major recreation and conservation resource for the public of Western Australia.

The proximity adjacent to the site of an as yet barely modified marine environment with varied habitats and diverse biology is a particularly significant aspect of the proposal.

The Port Kennedy site itself is destined to be a final enclave of remnant quindalup dune landscape and its associated vegetation complexes. Both the marine and terrestrial conservation values are recognised by the System 6 recommendations for M101 and M106. In addition the site is one of international scientific significance in terms of coastal geomorphology.

The Authority has recommended (section 5.1) that these aspects are of sufficient significance for each aspect to be sufficiently safeguarded as a pre-requisite to all other recommendations, and to the granting of various approvals by Government.

In assessing the proposal the Authority has taken into account a constructive and flexible approach exhibited by the proponent in responding to a number of environmental issues. The Authority also notes and endorses a comprehensive series of essential commitments provided by the proponent.

On the basis that the specified pre-requisites are adequately met, the Environmental Protection Authority finds the proposal environmentally acceptable, subject to all commitments and undertakings provided by the proponent, and recommendations of this assessment report, being implemented at the appropriate time.

7. REFERENCE

Woods P J. "Evoloution of, and Soil Development on, Holocene Beach Ridge Sequences, West Coast of Western Australia"; PhD Thesis, University of Western Australia, 1983.

APPENDIX 1

Commitments

13.0 COMMITMENTS

1. The Developer shall underwrite the Management Board for maintenance of all facilities as required by the Development Agreement. The Development Agreement will incorporate EPA conditions. The Development Agreement will be conditional upon granting of environmental approvals.

2. On completion of the construction period, the **Proponent** guarantees public access shall be provided between gazetted roads and public beaches and other areas of public open space in accordance with the diagrammatic representation shown in Figures 5 and 8.

3. On completion of the construction period, the **Proponent** guarantees public access shall be provided along all beaches and in all sections of the marina between freehold land and the waterfront.

4. On completion of the construction period, the Developer shall hand over to the Management Board public amenities as described in Section 5.3.2 and in accordance with the requirements of the Development Agreement.

5. The **Proponent** shall construct a minimum of 100 pens for use by the public on a long and short term rental basis after the end of the construction period in accordance with the requirements of the Development Agreement.

6. The **Proponent** shall construct an 18 hole golf course for use by the public after the end of the construction period in accordance with the requirements of the Development Agreement.

7. The **Proponent** shall ensure that representative areas of conservation value, as shown diagrammatically in Figure 6, shall be marked out from the start of the construction work. These areas shall be set aside and managed as described in detail in Section 12.2.

8. The **Proponent** shall arrange that existing tracks, existing potential erosion zones and areas exposed during construction are sealed and rehabilitated during the construction period by inclusion of the requirements in the contract specification. The proposed methods for stabilisation and ongoing monitoring shall be as described in detail in Section 12.3.

9. The **Proponent** shall develop a fire management plan in conjunction with the Bush Fire Control Board and the Department of Conservation and Land Management The fire management plan shall be implemented at the inception of construction by inclusion of the requirements in the construction contract. At the completion of the construction period, the **Proponent** shall take over responsibility for the fire management plan. The proposed fire management plan shall be as outlined in Section 12.2.4.

10. The **Proponent** shall monitor all impacts on terrestrial habitats as described in Sections 12.2 and 12.5. The **Proponent** shall provide the necessary labour and equipment to implement corrective measures.

11. Subject to resolution of requirements with the relevant Government Departments, the **Proponent** shall incorporate, in the final design, office space for use by an inspector or ranger from each of the Fisheries, Marine & Harbours and Education Departments and the Department of Conservation and Land Management.

12. Prior to commencing construction, the **Proponent** shall initiate monitoring of the shoreline at the marina site. Ongoing monitoring and management of sediment transport and sand bypassing shall be undertaken by the **Proponent** as described in Section 12.3.

13. The **Proponent** shall monitor and manage groundwater abstraction as described in Section 12.4. Field testing of the shallow aquifer will commence after environmental approval for the project is received in order to define the need or otherwise for use of supplementary sources such as the deeper Yarragadee aquifer.

14. Following completion of construction the **Proponent** shall monitor the marine and harbour water quality as described in Section 12.5. If monitoring reveals problems the **Proponent** shall undertake further assessment, testing and remedial measures as resolved with the Environmental Protection Authority and the Department of Marine & Harbours.

15. The **Proponent** shall contribute an amount of money, to be resolved with the Environmental Protection Authority, as an equitable portion of the total cost of a proposed regional study of the currents and marine biota between Rottnest Island and Becher Point.

16. The **Proponent** shall implement fertiliser management and monitoring as described in Section 12.8 after construction of the golf course. In the event that Westport canals are constructed to the east of the golf course, fairways and tees adjacent to the canals will be modified by soil amendment to reduce nutrient leakage.

17. The **Proponent** shall arrange any additional UXO searching as required during the construction period.

18. The **Proponent** shall take all necessary construction measures to mitigate impacts of dust, erosion and noise as resolved with the Shire of Rockingham and Department of Agriculture. Planting of trees, shrubs and grass for the development shall be undertaken as soon as practical following completion of the earthworks.

19. The Proponent shall include in the construction contract requirements that the Contractor report any archaeological sites discovered during construction and leave undisturbed until advised by the Western Australian museum.

APPENDIX 2

Summary of Issues Raised in Submissions

SUMMARY OF MAIN ISSUES RAISED IN PUBLIC SUBMISSIONS OF PROPOSED PORT KENNEDY REGIONAL RECREATION CENTRE

1. INTRODUCTION

There was a total of 31 submissions which arrived in time to be summarized in this report and 108 proforma letters. The two most frequently mentioned issues in these submissions were firstly, the concern that the Port Kennedy area will be lost to the general Western Australian public if the proposal goes ahead and will be sacrificed to wealthy international interests and tourists. Secondly the System six recommendations are not being adhered to. Other issues raised in the submissions are set out below.

2. ALTERNATIVES, REGIONAL PLANNING AND CUMULATIVE IMPACTS

2.1 Some submissions state the ERMP does not adequately address all the alternative plans which could be adopted for Port Kennedy. "The no-build option was not considered as an alternative due to the lack of management in the past. While stage one will displace squatters and other uncontrolled uses and activities, this is not a justification in itself for proceeding with the development. Applying effective management control through other means (e.g. a regional park), as an option for consideration has not been mentioned."

2.2 The opinion is expressed that more appropriate sites for a tourist development occur elsewhere in the state.

2.3 The view is expressed that the area is fragile and if development goes ahead it will need to be on a smaller scale and of a more sympathetic style than the resort hotel complex proposed.

2.4 The term recreational centre is used for what constitutes the nucleus of an urban development.

2.5 The proposed development should only be assessed in the context of urbanisation of the coast between Rockingham and Mandurah. Sufficient consideration has not been given to the open space and conservation value of the site during planning of the region.

2.6 "Urban and industrial development in the near vicinity will continue to expand. This will result in greater demand for recreational use of the coast and marine waters. Protection of coastal lands for public recreation (in its broadest interpretation) should be paramount."

2.7 Cumulative impacts of this development in addition to others in the region, past and future, have not been addressed by appropriate government departments and hence cannot be adequately discussed in the ERMP.

2.8 The study conflicts clearly with the Rockingham Coastal Study 7-3-2-4 Developments and Recommendations 3-7. 3.1.6, 7.3.2.6, and 7.3.4.6.

3. EXCLUSIVENESS

3.1 Twelve submissions raised objection to the idea that the proposed development will cater for wealthy people in exclusion to locals and the public at large including families and present users.

3.2 The ERMP "fails to consider how much of the coastline of Australia has been sacrificed to big business and international interests," and led to the exclusion of the general public from this popular area.

3.3 Ordinary people can no longer afford to go to Rottnest and at present Port Kennedy is an equivalent alternative. The proposed development will further exclude ordinary people and low income earners in particular.

4. FLORA, FAUNA AND MARINE SPECIES

4.1 It is apparent that no detailed study of the flora has been undertaken.

4.2 The coastal heath flora in the centre of the site is one of the best preserved in the metropolitan region. This vegetation will be extensively destroyed if the proposed golf courses are constructed. "Botanically these vegetation units are more interesting and important than the individual species."

4.3 The proposed conservation zone reserves only a portion of the Olearia axillaris, Jacksonia furcellata complex and southern portion of the Olearia axillaris and Melaleuca aerosa complex while the Acacia lasiacarpa complex is within "subsequent stages". Clearly these vegetation complexes are not being adequately protected.

4.4 Representatives of the variability in vegetation assemblages caused by the gradient in climate along the coast from Geraldton to Busselton has not been adequately secured in reserves. Becher Point represents one of these assemblages and should be conserved.

4.5 The ERMP does not indicate that natural vegetation lost from the development site by the proposal shall be replaced. Replanting, protection and management of indigenous flora and fauna are not adequately addressed. Brushing should be used to stabilize sand.

4.6 The ERMP makes no mention of the blue wren and Smoker Parrot that occur at Port Kennedy, nor to the need to reintroduce native fauna to the site.

4.7 "The area contains habitat for two rare and endangered reptiles and the proposed development would further reduce their already restricted habitat.".

4.8 A detailed faunal survey has been omitted from the ERMP. It is highly probably that the two rare and endangered reptiles the skink Lorista lineata and the snake Vermicella calonotes are present.

4.9 The importance of the area to vertebrate fauna habitat has not been given adequate evaluation in the ERMP.

4.10 Concern is expressed for the Tammar-like creatures seen in the area.

4.11 The number and types of fish present are not adequately addressed in the ERMP.

4.12 No mention is made in the ERMP as to the impact of the project on the seagrass of the sound.

5. WETLANDS

5.1 The ERMP indicates, through modelling that the potential effects on Lake Walyungup are expected to be limited. This will be required to be confirmed by monitoring under licence conditions.

5.2 In the Becher Point cuspate foreland there are unique wetlands (the Becher Suite) and secondly to the south of Becher Point in the vicinity of the proposed Secret Harbour development there are also unique wetlands (the Peelshurst Suite). "These wetlands and their vegetation are not represented elsewhere in the geomorphic units of the Swan Coastal Plain, because they are restricted to the Quindalup Dune system." "Furthermore, the Quindalup Dune system in the Becher Point area is not represented elsewhere in the state." Thus the wetlands of this area are regionally unique and significant.

5.3 Concern is expressed that the proposed artificial lakes may not conserve the native flora and fauna because the water level will alter.

5.4 The scientific and educational importance of the wetlands is neglected in the ERMP.

6. CONSERVATION ZONES

6.1 The high boundary to area ratio of the conservation zones will mean that degradation will likely be a problem in these zones.

6.2 The northern conservation zone should be extended further north to incorporate all of the remaining coastal dunes within Warnbro Sound, and to a distance of 300 metres inland from the high water mark.

6.3 "If the Westport Canal development, to the immediate north, proceeds this will result in a channel through the proposed "Conservation Zone" and will place additional pressure on the natural resources of the area for recreational use."

7. CHARACTER AND HERITAGE VALUE

7.1 The Rottnest like atmosphere will be changed by the development.

7.2 The existing natural atmosphere with the fragrance of salt bush and other flora will be destroyed as will the natural heritage of the area.

7.3 It is considered that the proposed development will damage the environment more than existing users since the development will eliminate chances of regeneration of the environment due to the scale and extent of proposed commercial development, earthworks, dredging and sundry works.

8. SCIENTIFIC, INTERNATIONAL AND EDUCATIONAL AND CONSERVATION VALUE

8.1 It is stated that most of the scientific literature about Port Kennedy has been ignored in the ERMP.

8.2 "The coastal geomorphology is significant. Becher Point is a terrain of regional and international significance for the study of sea level history, cuspate foreland stratigraphy/sedimentology and climate history. An area that combines geomorphic sedimentologic, pedogenic dune vegetation and wetland features is of prime significance and warrants priority conservation for teaching, research and heritage."

8.3 The importance of the location, ignored by the ERMP, is further evidenced by the following:-

i) Becker Point has been selected as a study site for calcrete pattern for an international audience.

ii) Significant late Halocene climate change in South West Australia is evident at Becker Point.

iii) Becher Point has become internationally known and sited in the scientific literature.

iv) Port Kennedy is important because of the unique opportunity to study coastal formations processes. Data collected on ancient shoreline systems will provide valuable assistance in understanding the possible coastal impacts of the Greenhouse Effect.

v) Excellent examples of mobile dune systems will be destroyed by the proposed development and increased recreation activity. These naturally mobile coastal dunes are important for research and education.

8.4 The use of spoil dredged from the marina to build up foredunes and primary dunes many not have a particle size compatible with that in the present dune formation. Particle size has a direct influence on the shape and size of dune formations. Using incompatible spoil particle size will alter the path of historic dune development in this area of the coast.

8.5 The proposal conflicts clearly with the State Conservation Strategy aims eg 6.2.1, 6.2.4 and 6.1.6.

8.6 The proposed development conflicts with the System Six Red Book recommendation that the area be used as a Regional Park for conservation and landscape preservation.

8.7 The ERMP claims that much of the site is degraded but results from other studies have found that areas affected by fire and human habitation do regenerate given time and careful management, hence the Port Kennedy area could also be rehabilitated.

8.8 Nine submissions and 89 proforma letters express the view that the site for the development should be declared a regional park in accordance with the system six recommendations and it be vested in the Department of Conservation and Land Management (CALM) and a comprehensive management plan developed for the area by CALM.

8.9 The area has high conservation value and no development should take place until CALM has developed a management plan.

8.10 The view is expressed that "the proposed Shoalwater Islands Marine Park, and the integration of land at Point Peron and Becher Point, would create one of the most important and renowned regional parks in the Perth metropolitan region. This potential should not be lost nor compromised for any development which may be out of keeping with community interests and priorities."

8.11 "Warnbro Sound and the adjacent shallow seagrass beds are important areas that require careful management. From a regional conservation standpoint, the deep water area and seagrass banks of Warnbro Sound, to the east of the EPA proposed M101 reserve, are in many respects considerably more important that the limestone reef." The ERMP fails to address this point.

8.12 "The EPA proposed M101 marine reserve would follow boundaries recommended and described in the System Six Report. Recent investigations by CALM, however, show that these boundaries are not adequate for a marine park in either an ecological conservation sense or for effective management. The proposed development will have a direct impact on the area CALM is considering should be reserved as a marine park. Determination and endorsement of the boundaries for the proposed Shoalwater Islands Marine Park should precede final consideration of the proposed development."

9. MANAGEMENT

9.1 GOLF COURSES, NUTRIENTS AND GROUND WATER

9.1.1 The use of fertilization on the golf courses could lead to pollution of the groundwater, Warnbro Sound and wetlands. Appropriate monitoring is not in the ERMP.

9.1.2 Fertilizers could have a negative impact on flora and fauna, conservation values, recreational use and ultimately regional economy.

9.1.3 Impacts of fertilizer on the seagrasses and possible effects on sand stability need to be addressed.

9.1.4 The heavy draw down on the watertable caused by watering of golf courses could lead to the death of native vegetation, the drying out of wetlands and possibly salt water intrusions into the groundwater.

9.1.5 The opinion is expressed that the private golf course appears to be a luxury, which for environmental reasons should be omitted from the proposal.

9.1.6 Groundwater draw must be licensed as the development is within the Rockingham Groundwater area. "The Water Authority will require additional modelling and monitoring before a license will be issued." This is necessary because of the high proportion of rainfall assumed to be recharge in modelling (34.5%). "A groundwater licence for the project will be granted for the available resource but it may not be sufficient for the entire project."

9.2 HEAVY METAL CONTAMINATION

9.2.1 The 380 boats using the marina may create a heavy metal contamination problem and this needs to be addressed in the ERMP.

9.3 FLOODING, VERMIN, FIRE, UXO, GREENHOUSE EFFECT, SEWERAGE

9.3.1 Areas proposed for the resort hotel and golf course have been known to be inundated with water in wet years.

9.3.2 Management of vermin has not been adequately addressed in the ERMP.

9.3.3 The preparation of a fire management plan is required.

9.3.4 Further searching for UXO may be required in the area. "No guarantee can be given that all UXO will be located during search operations. However provided searching is carried out as advised by the State Emergency Service the UXO risks will be reduced to an acceptable level."

9.3.5 The impact of the Greenhouse effect on land is not adequately addressed in the ERMP.

9.3.6 It is stated in one submission that the area has sewerage capability problems already with regard to sewerage treatment and this project will probably cost the government considerably. Concern is expressed as to which sewerage treatment plan is to be used.

9.4 COASTAL MANAGEMENT PLAN

9.4.1 One government department reported that a coastal management plan should be prepared and implemented to the satisfaction of the Commissioner of Soil Conservation. Sand stabilization, dune rehabilitation, controlled pedestrian access and ongoing maintenance must be addressed.

9.5 MANAGEMENT BOARD

9.5.1 "Certain land categories such as freehold and leasehold will be granted whilst a "Management Board" will be responsible for managing and monitoring "conservation zones" and other public open-space. As the project is a joint 50/50 venture, considerable government funds would be provided for both development and management costs of the project, and for the Management Board. It is unclear to what degree of, and guarantee for, funding of the management board, nor the regularity of mechanisms or power of control the Board will have. No consideration has been given for a CALM representative on the proposed Board, despite the fact that it will have a major management role adjacent to the proposed development."

9.5.2 Concern is expressed about who will be responsible for management and restoration of eroded beaches caused by the marina, access pathways and stabilization fencing. This problem is not adequately addressed in the ERMP.

10. **PUBLIC ACCESS AND BOAT RAMP**

10.1 Eight submissions stated that the omission of a boat launching ramp from the proposal is considered unsatisfactory. The nearest launching facilities are at Safety Bay and the return journey from Port Kennedy to Safety Bay, in the afternoon, is quite hazardous.

10.2 A very large section of vehicle beach access will be closed off to the general public and locals, this is also considered unsatisfactory.

10.3 It is suggested that if vehicles are to be excluded then a bus from Rockingham should be organised.

10.4 It is unclear where permanent parking will be located. Parking facilities should be provided, nearby to avoid long walks to the beach.

10.5 Controlled and indiscriminant use of the area by off road vehicles is not adequately addressed in the ERMP.

10.6 Commercial fishermen will be severely disadvantaged if access to the beach is denied.

10.7 Controlled access through conservation zones and foreshore reserves is supported.

10. MARINA AND ITS IMPACT

11.1 Three submissions expressed the view that there should be no marina.

11.2 One submission from a government authority pointed out that the entrance to the marina is not clearly defined in relation to existing bathymetry (see figures, 5 of volume 2, figure 1.2 of volume 3, Coastal Engineering study and draft project agreement) but the assessment of water exchange in the harbour was based on an entrance channel 60m wide and 3.25 metres deep.

11.3. In view of the shallow inshore bathymetry at this location a plan should be prepared detailing the extent and bathymetry of the entrance channel and the stability of the channel should then be reviewed by the proponent.

11.4 "The length of the spur on the eastern breakwater can only be determined after the bathymetry at the entrance has been verified."

11.5 The volume of sand to be bypassed for the entrance channel was not determined. This should be addressed in the ERMP since the resulting maintenance costs could be excessive.

11.6 It was pointed out that the ERMP does not adequately address the fact that once the statutory approvals have been obtained for the marina the responsibility for administering design and construction approvals including maintenance should rest with existing authorities. The responsibility for marina projects has been given by the 1986 cabinet, to the Minister for Transport who uses the Department of Marine and Harbours to manage and administer such projects. An assured source of funding must be identified to enable long term maintenance funds to be accumulated.

11.7 The consequences of sand movement due to the Port Kennedy marina have not been adequately addressed in the ERMP. It is reported in submissions that the groin at the north eastern end of Warnbro Sound has caused Becher Point to decrease in length by 300 metres and a very deep channel has formed in previously shallow water. Silting has occurred at Safety Bay where boat launching is becoming increasingly difficult and the beach at Warnbro is now washing away.

11.8 Concern is expressed about general erosion of the beach and dunes north of the proposed marina after it has been constructed studies to determine the effect of the development on Waikiki beaches are not apparent and should be addressed by the proponent.

11.9 It is stated in one submission that the beach near the marina has only recently built up and it is considered that a high capital expenditure development in these circumstances is inappropriate, because erosion

could become on uncontrollable problem. Concern is expressed about the guarantees the proponent will make when the existing environment is is changed by the development.

11.10 The coast south of Becher Point has eroded 370 metres between 1924 and 1979 approximately 6.7m/year. The coastal reserve should be 700m because the Coastal Development Committee of the Town Planning Department adopted a 100 year planning horizon for this coast based on a coastal hazard line delimiting areas susceptible to wind and wave erosion.

The most appropriate use of areas on the seaward side of this line is for reserves for low intensity recreation and conservation. No permanent structures should be built in these areas. The ERMP does not address this decision.

12. OTHER FACILITIES

12.1 The opinion is expressed that adequate barbeque facilities are not provided in the development.

12.2 Submissions state that horse trails, cycle ways and footpaths are not adequately addressed in the ERMP.

12.3 Clubhouses for fishing groups are not provided in the development.

12.4 A few submissions state that some cottages should have long term leases e.g. 99 years.

12.5 Camping facilities are not adequately addressed in the ERMP.

12.6 One submission pointed out that a basic general store with liquor licence, administration building, bike and boat hire, rental cottages and chalets, leasehold cottage groups (similar to Point Peron) a caravan site (mostly on site) all need to be provided.

12.7 One submission states that the proposed three storey building will be a scar on the horizon.

13. OTHER SOCIAL AND ECONOMIC IMPACTS

13.1 No consideration is given to social and economic impacts (either negative, positive or opportunity costs) of the proposed development. This is a major omission and must be fully addressed before further assessment. Costs and returns have not been adequately discussed.
"It is unclear what the venture constitutes as an initial investment and as an ongoing cost to the government, and what return can be expected on the investment. Moreover, the alternative use of such funds (i.e. for development of and management of a regional park) has not been considered. The lack of any opportunity costing of the development is a major omission and needs to be addressed before further assessment can be made."

13.2 One submission states that "the fifteen benefits of the project listed in the ERMP are in the majority very speculative in nature, fly on the face of current economic policy and are often untenable in the face of reports, statistics, and facts concerning similar ventures along our coast. The proposal will have much competition from Yanchep/Two Rocks Mindarie Keys, Hillary's Boat Harbour, Observation City, Rottnest

Island, the Fremantle Hotels and Harbour facilities, Woodman Point Recreation areas, hotels and golf courses and some 35 sporting clubs and recreation centres in Rockingham and Warnbro, changes planned for Point Peron areas and the planned cultural centre and Ocean Marina in Mandurah." The view was expressed that international tourists would hardly go to Port Kennedy. (Latest figures from 1986/87 for international, inbound travellers (216,800) - 99% stayed within the metropolitan region). A large percentage were business travellers. In addition the 5 star hotels in the metropolitan area had an occupancy rate of 53% in 1988, and four star hotels had an occupancy rate of 54%."

13.3 One submission stated "there is no demonstrated need for the expenditure of $160 million, albeit only for stage 1."

13.4 The ERMP does not address the problem that the development and maintenance costs may fall back on the community and government. The original design concept by the MRPA was more realistic and affordable to the tax payer.

13.5 Lights and noise associated with the marina plus actual removal of beaches will frighten fish from the area and physically prevent them from shoaling in the area, reducing economic gains of commercial fishermen. Appropriate consideration of the effects of the proposed development on commercial fishing operations is not addressed in the ERMP. The marina will cover the main commercial fishing area. No indication is given in the ERMP that commercial fisherman will be able to fish within the marina confines. Specific valuation and documentation of similar habitat to be provided north of the proposed marina needs to be made. There is doubt that the new area will be used by fish stocks in the same abundance.

13.6 In order to continue beach seining fishermen need access to the beach in 4WD vehicles. Few metropolitan beaches are suitable for beach seining.

13.7 Compensation to fishermen is not discussed in the ERMP.

13.8 The concern is expressed that there are no safeguards to ensure that the shopping precinct will compete unfairly with Rockingham business.

13.9 An approach road via Enis Avenue will not benefit Rockingham business.

14. BIAS

14.1 The view was expressed that the report is biased and unfairly accuses present and prior users of the area of poor management.

APPENDIX 3

Proponents Response to Issues Raised

PORT KENNEDY REGIONAL RECREATION CENTRE

ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME

Comments and Responses

PORT KENNEDY JOINT VENTURE

INDEX

PREFACE TO COMMENTS AND RESPONSES

COMMENTS AND RESPONSES

PREFACE TO COMMENTS AND RESPONSES

PREFACE TO COMMENTS AND RESPONSES

P1 GENERAL

The summary of public comments on the ERMP indicates that there are two main issues which require explanation and clarification. These are:

i) The scientific and conservation significance of the site and the implications of the System Six Study's findings in both specific and general terms.

ii) The proposed use of the site in relation to continued access for the general public.

These two issues are addressed separately in this Preface.

The review of comments on these two issues should be put in the context of a number of misunderstandings that are evident. The most obvious misunderstandings are:

i) That government funds will be required for construction and management of the development and that these funds could consequently be put to alternate uses. Whilst WA Development Corporation have a 50/50 share in Port Kennedy Joint Venture with Fleuris Pty Ltd, the development will be funded by private investment at no cost to the taxpayer.

ii) That the general public will be excluded from the development. Public facilities and public access are required by the State Planning Commission (SPC) Development Brief and are guaranteed by the Proponent and the Project Agreement.

iii) Many submissions appear to be based on the impression that the whole Port Kennedy site will be developed. In practice, only carefully selected parts of the site will be affected in Stage 1 of the Regional Recreation Centre.

P2 SYSTEM SIX, SCIENTIFIC AND CONSERVATION SIGNIFICANCE

The high importance the Proponent has attached to areas of scientific importance and high conservation value can be demonstrated by the approach taken in developing the proposed site layout. This approach is described in detail below and summarised as follows:

- o investigation and identification of the specific scientific and conservation values of the site early in the preparation of the ERMP,
- o modification of the original plan to reflect important constraints,
- o delay of ongoing preparation of the ERMP to prepare an interim submission to the Environmental Protection Authority to indicate the interpretation and weight given to the identified constraints and the response of the development plan to those constraints,
- o incorporation of Environmental Protection Authority responses to the interim submission in further revision of the planned layout.

The scientific and conservation aspects of the site were not identified as having major importance in the initial stages of the proposed development of the site, up to and including the Development Brief issued by the State Planning Commission in March 1986. However, after consideration of the preliminary advice from specialist consultants at the start of the ERMP preparation, it became apparent that conservation would have to be a major component in subsequent detailed planning of the site.

The major conservation aspects, which were addressed in detail in the ERMP, are as follows:

- o the dune succession and curvilinear dunes,
- o the seasonal wetlands,
- o important plant associations and vegetation complexes, and
- o vegetation in good condition showing little or no evidence of human impact.

It was, however, also evident that much of the Stage 1 site was degraded and exhibited common plants in common associations.

The initially proposed Stage 1 layout was therefore modified to reflect the weight attached to conservation aspects of the site by the Proponent. In recognition of the importance of the site, the Proponent then prepared an interim submission to the Environmental Protection Authority which included:

- o description of the features of the site identified by detailed investigations of the terrestrial environment,
- o indication of the interaction of the proposed layout with the identified features, and
- o assessment of the proposal with regard to the System Six Study findings.

In the period the interim submission was being prepared and was under review by the EPA, other aspects of the ERMP were delayed as some guidance on this issue was considered important prior to finalisation of the development approach.

The Environmental Protection Authority response to the interim submission indicated that conservation of the dune succession and associated sequence of vegetation complexes should be given greater weight in Stage 1. On this basis the northern conservation zone was increased in size to incorporate an area some 400m by 350m (14ha) at the northern end of the site. (The Proponent recognises these comments were given by the EPA in an endeavour to assist in preparation of the ERMP and should not be interpreted as tacit or final approval.)

It is concluded that the consultative approach to design and development is indicative of the Proponent's concern for the site. This approach also demonstrates the Proponent's willingness to modify the site layout (to a less commercially desirable format) to accommodate requirements for conservation and environmental management.

P3 PUBLIC USE AND ACCESS

P3.1 Commitment to Provision of Facilities for the General Public

The State Planning Commission brief required that the "development of Port Kennedy should occur as a well-planned year-round tourist and recreation facility available primarily to middle and lower income families and groups, as well as to whatever other market sectors are selected by the Developer, and be compatible with similar nearby developments".

This is the framework for the Proponent's proposal and the facilities included in Stage 1 should be viewed in this

context.

It was also recognised in the Development Brief that a major privately financed project such as this must be economically viable. The private resort hotel and associated private golf course assist in this regard and as such are fundamental to the project. This should not be interpreted as making the whole Recreation Centre an exclusive development. In Stage 1, there is dormitory accommodation in the holiday bungalows and budget family accommodation has been provided in the marina rental units and beach rental units. A public golf course, originally proposed for subsequent development stages in the southern part of the site, has been relocated to increase the public component in Stage 1.

Further low and middle income accommodation, community camps and a caravan/camping park are proposed for subsequent development in the southern part of the site, subject to further environmental review by the Proponent and the Environmental Protection Authority.

Detailed proposals for the remainder of the site could not be presented in the ERMP for two reasons:

i) Once the Project Agreement is signed, the Management Board will be formed and subsequent proposals for further development will require their approval.

ii) Once approved by the Management Board, further environmental studies on aspects such as coastal processes and groundwater will need to be undertaken by the Proponent prior to submission of proposals to the Environmental Protection Authority.

However, commitments to development in the southern part of the site are addressed by the requirements of the Development Brief and the Project Agreement.

P3.2 The Need for the Development

Justification for proceeding with the development is based on recognition of the site as a primary recreation resource and the community need for such a recreation resource within easy reach of Perth.

Recent occupancy rates for Rottnest are quoted as 87% of available accommodation (Minister responsible for Rottnest, 16.4.89) all year round. Although there are a number of clear differences between Rottnest and Port Kennedy Regional Recreation Centre, 60 to 80% of the proposed development is aimed at the local market.

This project has been initiated by government. The government has identified the site's potential as far back as 1949, a position confirmed by:

- the 1955 Stephenson Hepburn plan provisions,
- the detailed plan for the area produced in 1961 by the Town Planning Department,
- the 1971 Cabinet decision to reserve Port Kennedy for public recreation,
- the 1978 concept report produced by the Metropolitan Region Planning Authority,
- the 1985 invitation for registration of interest in private development of the project,
- the 1986 State Planning Commission Development Brief,
- assessment of responses to the Development Brief from which the current proposal was selected.

The cost of maintaining areas of regional open space has been acknowledged by various government agencies (DCE, 1983; SPC, 1987) as a major problem. In conformance with the SPC Development Brief, the Proponent has therefore presented a privately funded proposal which balances the stated government objectives with the conservation requirements of the site.

Features which identify the site as a primary recreation resource are as follows:

- The opportunity to provide passive and active recreation areas on the same site.
- One of the few sheltered north facing beaches in the metropolitan area. It should be noted that two other major areas containing north facing beaches, Rottnest Island and Woodman Point, are both System Six areas (C45 and M90 respectively) and have both combined recreation and conservation objectives.
- The shallow waters at Bridport Point, the minimal littoral drift and the protected waters offer the most economical southerly location for a marina in the metropolitan area to complement the high potential for water based recreation.
- Camp and dormitory facilities for community groups, as well as facilities for use by a broad range of the general public, should have the opportunity for location on a coastal site within reasonable distance of the major population centre. Whilst these groups are not as vocal and well organised as others in our society, their needs should not be ignored and the opportunity to provide such facilities at Port Kennedy is an important consideration.
- The opportunity to fund and manage connection of the southern part of the site with adjacent undeveloped crown land at Lark Hill and Lake Walyungup remains after the development of the Stage 1 area. Note that land abutting Stage 1 to the east is zoned urban and that this land is likely to be developed in the near future.

P3.3 Existing Uses

It is the Proponent's position that the following existing uses would be eliminated under any management plan for the site:

- squatters
- uncontrolled four-wheel drive vehicle activities,
- uncontrolled camping,
- uncontrolled campfires and barbeques.

The Proponent welcomes any proposals from other existing users for consideration for inclusion in Stage 1 or subsequent phases of the development.

COMMENTS AND RESPONSES

COMMENTS AND RESPONSES

1. INTRODUCTION

COMMENT

There were a total of 31 submissions which arrived in time to be summarised in this report and 108 proforma letters. The two most frequently mentioned issues in these submissions were firstly, the concern that the Port Kennedy area will be lost to the general Western Australian public if the proposal goes ahead and will be sacrificed to wealthy international interests and tourists. Secondly the System Six recommendations are not being adhered to. Other issues raised in the submissions are set out below.

RESPONSE

As outlined in the Preface to these Comments and Responses:

- the area will become more accessible and will not be lost to the general public,

- the Proponent considers that the proposal does not conflict conceptually with the System Six recommendations and that, following detailed evaluation of the site undertaken for the ERMP, the proposal for Stage 1 represents an acceptable balance between conservation and recreation.

2. ALTERNATIVES, REGIONAL PLANNING AND CUMULATIVE IMPACTS

2.1 COMMENT

Some submissions state the ERMP does not adequately address all the alternative plans which could be adopted for Port Kennedy. "The no-build option was not considered as an alternative due to the lack of management in the past. While Stage 1 will displace squatters and other uncontrolled uses and activities, this is not a justification in itself for proceeding with the development. Applying effective management control through other means (eg a regional park), as an option for consideration has not been mentioned."

RESPONSE

A site such as Port Kennedy is suitable for a wide range of potential users. This is emphasised by review of options considered historically for the site. These options range from "no-build and seaside residential" to allocation of 165ha for a nuclear power generation station (MRPA, 1978).

The Proponent has addressed the principal alternative plans for the site in review of the no-build and partial urban development options. On the basis of historic proposals for the site, a viable regional park which addresses the management costs of the site and the site's recreation potential may only be distinguishable from the proposed Regional Recreation Centre by the requirement for government funds.

Further response to this comment requires evaluation of the definition of a regional park, review of the likelihood of government funding and consideration of the recreation potential of the site.

i) The definition of the term "Regional Park" is given in Section 5.4 of the "System Six Study Report", Department of Conservation & Environment, 1981 as follows:

"The demand for large accessible areas of open space for fairly intensive outdoor recreation is increasing. Areas of this type are defined here as Regional Parks. They have three basic functions: to provide for recreation, conservation of natural environment, conservation of attractive man modified landscapes. The term may, where appropriate, be qualified as in "linear regional park" or "riverine regional park". A wide range of recreation activities of greater variety and intensity than in National Parks, is appropriate to regional parks. The natural features of regional parks helps determine which activities are suitable but these features can also be important on their own account. Regional parks may also consist entirely of or partly of attractive man modified rural landscapes or involve other land uses provided these have recreational potential."

The Port Kennedy Regional Recreation Centre will have large accessible areas of open space for passive and active outdoor recreation. It will also have each of the three basic functions of a Regional Park as noted above. The proposed development therefore complies entirely with the functional requirements that have been identified.

ii) Alternative proposals for the site date back nearly three decades. During this time management of existing users and regeneration of the environment could have been, but has not been, implemented. This proposal offers the opportunity to arrest the continuing degradation of the site, and to manage the areas of conservation value.

Given that uncontrolled recreational activity is the primary cause of degeneration, one method of site restoration would be to impose a total restriction on all access to the site for any active recreational purpose. Even under this scenario, it is doubtful whether the area would fully regenerate without large scale rehabilitation. Such restoration of other areas that have been nominated as suitable "Regional Parks" is not known to be underway or under serious financial consideration in Western Australia at the present time. The difficulties of obtaining funds for restoration of conservation lands has been recently demonstrated through the inability to adequately control Veldt Grass in Kings Park and the resultant destructive fires of the summer of 1988/89.

More importantly, the concept of total exclusion of public access does not in any way comply with the functional requirements of regional parks.

It is therefore reasonable to conclude that availability of government funds for management of conservation areas are a constraint to the level of site management that can be implemented by the state or local governments. The present proposal for utilisation and commercial development of the degraded portions of the site is considered to be the best available way of generating sufficient financial resources to suitably manage those parts of the site that have demonstrable conservation value.

In addition, these aspects are implicitly confirmed by the Government approval for invitation of privately funded development proposals via by the SPC Development Brief.

iii) Features which identify the site as a primary recreation resource are outlined in the Preface to these comments and responses and are briefly repeated below.

- The opportunity to provide passive and active recreation areas on the same site.
- One of the few sheltered north facing beaches in the metropolitan area.
- The shallow waters at Bridport Point, the minimal littoral drift and the protected waters offer the most economical southerly location for a marina in the metropolitan area to complement the high potential for water based recreation.
- Camp and dormitory facilities for community groups, as well as facilities for use by a broad range of the general public, can be located on a coastal site within reasonable distance of the major population centre.

- The opportunity to fund and manage connection of the southern part of the site with adjacent undeveloped crown land at Lark Hill and Lake Walyungup remains after the development of the Stage 1 area.

In conclusion, a regional park which utilises the recreation potential of the site and generates funds for management of the site would probably be very similar to the proposed Regional Recreation Centre. As the scale of expenditure required to conduct rehabilitation to the standard and extent proposed in the current development is unlikely to be considered justifiable in the absence of a commercial return, whether the Proponent is a government agency or private developer, the current proposal should be recognised as the best available opportunity to achieve proper environmental management of the Port Kennedy site.

2.2 COMMENT

The opinion is expressed that more appropriate sites for a tourist development occur elsewhere in the state.

RESPONSE

Based on feasibility studies, the Port Kennedy Regional Recreation Centre is anticipated to be reliant on the Perth metropolitan area for 60 to 80 percent of its usage. This usage rate depends on marketing the site as a much needed alternative to Rottnest and hence a short travel time to the site is important.

International tourism is reliant on air travel and the more successful tourist destinations are within one hour's travel of international airports.

The selection of the Port Kennedy site for a Regional Recreation Centre is based on consideration of open space and recreation requirements for the region encompassed in the SPC Development Brief for the site.

Thus, in terms of regional planning and the intended use of the site, the Proponent is not aware of more appropriate sites.

2.3 COMMENT

The view is expressed that the area is fragile and if development goes ahead it will need to be on a smaller scale and of a more sympathetic style than the resort hotel complex proposed.

RESPONSE

The area's fragility has been recognised by the Proponent in developing Stage 1 of the Regional Recreation Centre by assessing a given area's ability to accept development, as set out in Section 6.4.2 of the ERMP.

The proposed 225 room hotel is small by Australian standards and is in keeping with the site's environment. The low profile resort hotel compares more than favourably with developments such as Observation City, Burswood Island and those on the Gold Coast which are of much greater size.

2.4 COMMENT

The term recreational centre is used for what constitutes the nucleus of an urban development.

RESPONSE

The term Regional Recreation Centre is used to describe Stage 1 of a project which contains:

- a harbour with boating facilities and holiday rental units,
- dormitory rental accommodation,
- family rental units,
- public beach facilities including barbecue/picnic, ablution and food kiosks,
- playing fields,
- public golf course,
- private resort hotel and golf course.

To cater for people using the area a number of offices, shops, restaurants and a tavern are included in Stage 1.

Subject to further environmental review, future proposals for the site include:

- camp site,
- further holiday and low cost rental accommodation,
- a range of sporting facilities (tennis, bowls, etc),
- bird and wildlife sanctuary,
- amphitheatre,
- adventure centre, and
- equestrian centre.

Neither for Stage 1 nor in the future is the Proponent intending to (or allowed to by the Project Agreement) include urban development as a component of the project. The proposal does not constitute urban development.

2.5 COMMENT

The proposed development should only be assessed in the context of urbanisation of the coast between Rockingham and Mandurah. Sufficient consideration has not been given to the open space and conservation value of the site during planning of the region.

RESPONSE

The proposed development is the result of extensive review of open space, conservation and recreation opportunities along the metropolitan coast by various government departments since before 1961. Further detailed environmental assessment has been undertaken for this ERMP. The Regional Recreation Centre provides a balance of conservation areas, open space and active recreation facilities which is appropriate in the context of urbanisation of the coast between Rockingham and Mandurah.

2.6 COMMENT

"*Urban and industrial development in the near vicinity will continue to expand. This will result in greater demand for recreational use of the coast and marine waters. Protection of coastal lands for public recreation (in its broadest interpretation) should be paramount.*"

RESPONSE

The Proponent considers that provision of a broad range of public recreation facilities of the type desired by the general public should be paramount.

This is the basis for the planned development as set out in the SPC Development Brief and the ERMP.

2.7 COMMENT

Cumulative impacts of this development in addition to others in the region, past and future, have not been addressed by appropriate government departments and hence cannot be adequately discussed in the ERMP.

RESPONSE

For specific aspects (groundwater, littoral drift etc) the ERMP has addressed the cumulative impacts of this and adjacent developments.

The annual increase in the metropolitan population of approximately 2% per year results in the following cumulative impacts:

- o greater pressure on the available space and the consequent conflicting land use requirements, particularly in coastal regions,
- o all marine areas coming under increasing recreational fishing pressure, and
- o increasing public use of land based recreation facilities, both active and passive.

The Port Kennedy Regional Recreation Centre can be seen as an expression of these cumulative impacts and as a mechanism to manage some of their consequences. However, justification of the population increase and urban expansion within the metropolitan area is beyond the scope of the ERMP.

2.8 COMMENT

The study conflicts clearly within the Rockingham Coastal Study 7.3.2.4 Developments and Recommendations 3; 7.3.1.6; 7.3.2.6 and 7.3.4.6.

RESPONSE

The ERMP conflicts with the Rockingham Coastal Study (SPC, 1988) in the way any detailed study conflicts with a more wide ranging study, particularly as both reports were in preparation at the same time and interchange of information was not possible. However, in most respects the two studies are in reasonable agreement.

The referenced sections of the Rockingham Coastal Study are shown below in italics and are followed by the Proponent's responses.

Recommendations 3:
The impact of present and proposed activities and developments in the Rockingham area that could possibly affect the quality of the oceanic waterbodies directly, through discharge of stormwater or waste, or indirectly through the groundwater system, should be carefully assessed and if warranted, the activity stopped or the development refused or changed.

Recommendation 7.3.1.6 (Singleton to Secret Harbour)
That the foreshore reserve shown on the MRS and TPS should not be reduced in width unless in association with a major development which has been carefully assessed to be in the interests of the wider community and where a legally enforceable agreement on management responsibility has been drafted.

Recommendation 7.3.2.6(Becher Point/Port Kennedy)

a) That the foreshore to the south of Becher Point should be increased to at least 400m with no major facilities developed in the area unless on the understanding that they will not be protected in the event of erosion. (This requires a change to the MRS and TPS.)

b) Development of the Port Kennedy area which disturbs land or vegetation should be restricted, preferably to an area north of Bridport Point behind a foreshore reserve at least 100m wide to allow for future development of public foreshore facilities as foreshadowed in the Port Kennedy Concept Plan (eg carpark, marina, picnic areas, etc). Only essential clearing of native vegetation and planting of grass should be contemplated.

c) A corridor of land extending inland from Becher Point to Mandurah Road through the public purpose reverse, should be set aside as a Conservation/Recreation Reserve and only developed in such a way that the landforms particularly are preserved. (This requires change to the MRS and TPS.)

Recommendation 7.3.4.6 (Mersey Point)
That any developments proposed that have potential to disturb the seagrass meadows or which contribute pollutants to Warnbro Sound must be assessed in light of their potential effect on the Warnbro Sound system as a whole.

7.3.2.4 Developments
Because the Port Kennedy land is of regional significance in terms of recreational as well as scientific reasons (its vegetation), it would be appropriate that it is developed to retain its recreational and scientific character(i). Further inland the public purpose reserves should also be developed in such a manner that part of the beach ridge plain is preserved in undisturbed condition(ii). On this basis, Port Kennedy should only be developed for limited public rental accommodation with sufficient space left around the shores for carparks and other public facilities. Ideally these developments should be restricted to land next to the most popular beaches (ie north of Bridport Point) thereby leaving the remainder of the area's vegetation relatively undisturbed(iii). In addition, as groundwater will be limited, and it is not desirable that fertilisers enter Warnbro Sound, disturbance of the natural vegetation for the purpose of creating large grassed areas that will require watering and fertiliser should be avoided(iv). All permanent developments should be set back well from the beach to allow for shoreline movements(v). Development of marine related facilities in Warnbro Sound would be appropriate as the sheltered and protected waterbody is ideal for sailing, fishing, etc. In this respect, thought could be given to integrating developments on Port Kennedy land with those at Westport, especially as there is the opportunity to avoid creating a second set of breakwaters on the coast(vi).

3 (and 7.3.4.6)
The potential effects of the proposed development on the Warnbro Sound System have been addressed in detail in the ERMP. Further assessment is contained in responses to 9.1.1, 9.1.2 and 9.1.3.

7.3.1.6
The Proponent considers that the proposal recognises and caters for the interests of the wider community. Management responsibilities associated

with approval under the Environmental Protection Act 1986 are legally enforceable as are the requirements of the Project Agreement.

7.3.2.6

a) The erosion of the foreshore south of Becher Point is outside the area addressed by the ERMP for Stage 1. Subsequent planning for the area in question will need to address this aspect in detail.

b) The Stage 1 layout complies with the general intent of this recommendation. Extension of the development area up to the eastern boundary is considered environmentally acceptable in the context of the degraded state of this area revealed by detailed site investigations undertaken for the ERMP.

c) Inspection of the development layout plans demonstrates that the present proposal will not constrain or prevent compliance with this recommendation.

7.3.4.6

This recommendation is essentially the same as recommendation 3, but more specific. The response to recommendation 3 above, addresses both aspects.

7.3.2.4

There are six aspects to the recommendation (as noted in the text) which may be responded to as follows:

i) The ERMP investigations indicate that development of Port Kennedy as proposed will enable its recreational and scientific character to be retained and enhanced.

ii) The proposal provides for the preservation of large tracts of beach ridge plain including large areas covering the full chronological sequence of deposits.

iii) The proposal is consistent with the requirements of the SPC Development Brief for the area. Detailed site investigations indicate the development of a broader area of land than those areas adjacent to the popular beaches should be considered environmentally acceptable. The most important areas of relatively undisturbed vegetation will not be affected by the development.

iv) Detailed modelling has indicated that there is sufficient groundwater within the superficial sediments upon which to base this development. Further groundwater supplies are available from deeper confined aquifers.

The proposed golf courses will be carefully managed with relation to fertiliser application. Environmental management will include a horticultural management plan for the golf course. Fertiliser application will be based on minimum requirements and measurement of nutrient levels in soil and plant matter. Advanced fertiliser application methods will also be employed to prevent nutrient encroachment to adjacent conservation areas. Comprehensive monitoring of nutrients in the groundwater is detailed in ERMP Section 12.

v) Shoreline movements in Warnbro Sound have been studied in detail and have been used as the basis for locating Stage 1 facilities of the Regional Recreation Centre. Shoreline movements south of Becher Point will be studied further prior to developing proposals for subsequent stages.

vi) Connection of the Westport Canals to the marina, to avoid construction of two sets of breakwaters has two potentially unacceptable environmental impacts. Firstly, flushing of the canals would be greatly reduced. Secondly, additional saline intrusion of the groundwater would occur.

In addition, the integration of urban facilities with the Port Kennedy recreation facilities is inconsistent with the Regional Recreation Centre development philosophy.

3. EXCLUSIVENESS

3.1 COMMENT

Twelve submissions raised objection to the idea that the proposed development will cater for wealthy people in exclusion to locals and the public at large including families and present users.

RESPONSE

The object of the Regional Recreation Centre is to attract locals and the public at large, including families and present users, to a sympathetically designed and well managed development. Detailed marketing studies estimate usage to be 60 to 80% local, 10 to 25% interstate and 5 to 10% international.

Stage 1 includes dormitory and family rental accommodation. Subject to environmental review, further camping, dormitory and family rental accommodation is proposed for subsequent stages.

Approximately 68% of the 330ha Stage 1 area is managed for public use. The private hotel and golf course, which is less than 14% of the overall 740ha site area, is the funding mechanism which underwrites the establishment and management of the public facilities.

3.2 COMMENT

The ERMP "fails to consider how much of the coastline of Australia has been sacrificed to big business and international interests" and led to the exclusion of the general public from this popular area.

RESPONSE

A larger number and wider range of the general public will be attracted to this popular area after provision of the proposed facilities than at present.

Public access is guaranteed to all beaches and waterfront within the marina. This is covered by Commitment No. 3 of the ERMP.

3.3 COMMENT

Ordinary people can no longer afford to go to Rottnest and at present Port Kennedy is an equivalent alternative. The proposed development will further exclude ordinary people and low income earners in particular.

RESPONSE

The Proponent will provide facilities for a wide range of uses by the general public and does not propose to exclude ordinary people from use of Port Kennedy.

One of the reasons "ordinary people can no longer afford to go to Rottnest" is that Rottnest has a finite capacity with which to serve a metropolitan population growing at 2% every year. This emphasises the need for an alternative site such as is proposed for Port Kennedy.

It is inferred from the comment that existing unmanaged use such as construction of unauthorised squatter shacks and disposal of refuse in an uncontrolled manner is equivalent to Rottnest and should be allowed to continue. The Proponent considers that these uses for the site are not equivalent to Rottnest Island and are also undesirable. Such uses for the site would be eliminated by any management plan proposed for Port Kennedy.

4. FLORA, FAUNA AND MARINE SPECIES

4.1 COMMENT

It is apparent that no detailed study of the flora has been undertaken.

RESPONSE

A vegetation and flora survey of the area is described in Appendix D of the ERMP and was based on:

- o discussion with the specialist botanical consultant who conducted the site investigations,
- o our review of the technical literature, and
- o discussion with appropriate Government agencies.

The Proponent believes that the flora and vegetation survey conducted for the ERMP was appropriately detailed.

4.2 COMMENT

The coastal heath flora in the centre of the site is one of the best preserved in the metropolitan region. This vegetation will be extensively destroyed if the proposed golf courses are constructed. "Botanically these vegetation units are more interesting and important than the individual species."

RESPONSE

Field studies of vegetation condition conducted for the ERMP indicated that coastal heath in the centre of the site showed significant changes due to human influence and had undergone significant weed invasion, including invasion by species considered to be aggressive. The results of field studies indicate that those parts of the centre of the site that will be developed could not be considered to be well preserved. Coastal heath of equivalent floristic composition and in much better condition lies in the south of the study area. This part of the site is outside the proposed Stage 1 development.

The proposed Stage 1 development will not result in removal from site of vegetation units that are not represented elsewhere in equivalent or better condition.

4.3 COMMENT

The proposed conservation zone reserves only a portion of the Olearia axillaris, Jacksonia furcellata complex and southern portion of the Oleara axillaris and Melaleuca acerosa complex while the Acacia lasiacarpa complex is within "subsequent stages". Clearly these vegetation complexes are not being adequately protected.

RESPONSE

As outlined in the ERMP, the area of these vegetation complexes retained in Stage 1 is a balance between the existing larger areas in degraded condition and the smaller restored and protected areas retained in the development.

The Stage 1 layout as described in the ERMP shows that approximately 50% of the area supporting Olearia axillaris, Jacksonia furcellata complex (OJ) will be affected by the development, whilst the remaining 50% will be rehabilitated and managed for the purpose of conservation. Rehabilitation works will include:

- o Removal of rubbish.
- o Filling and smoothing to original contours of sand tracks that presently dissect the area.
- o Revegetation of sandy tracks using topsoil and brush recovered from those areas of Olearia axillaris, Jacksonia furcellata complex that will be developed. This will enable plant propagules representing an appropriate blend of species to be reintroduced to these areas. Revegetation success will be monitored and necessary additional works implemented as required to achieve stable structure and floristic composition.
- o Fencing off of the conservation area to exclude unauthorised access.
- o Establishment of an appropriate system of firebreaks.
- o Development of a fire fighting contingency plan.

Whilst a portion of the existing OJ complex will be developed, rehabilitation and management of the remaining portion as described will enable conservation of this vegetation complex within a secure reserve in optimised ecological condition.

The ERMP indicated that 65% of the Oleara axillaris - Melaleuca acerosa complex (Oa Ma) will be developed in Stage 1 whilst the remaining portion (35%) will be retained and secured within a conservation reserve to be managed as previously described in this section.

It is important to note the philosophy that has been used in the layout of the golf course areas to understand how these proportions have arisen. The primary determining factor has been a desire to retain and protect dune-swale landform features of the beach ridge plain within the golf courses. This has been achieved by generally aligning golf course fairways within the swales and the consequent retention of both the form of the dune crest and swale sequence and areas of vegetation on the dune crests. Although this layout has a "cost" in that it increases the overall area of the golf course, it has the benefit of landform conservation and vegetation retention. The quantity of Oa Ma complex that will be cleared is somewhat over estimated by the ERMP figures in that they do not account for retention within dune crests and within a buffer zone between the primary dune and the golf courses.

A further consideration in the current preliminary golf course layout has been the need to maximise the use of existing disturbed areas for development. There is a heavily dissected sand track located immediately east of the primary dune that extends along the full length of the primary dune between the northern site boundary and the squatter's area. The preliminary layout uses this track as the location of walkway/cycleway areas to the marina and hotel and to form the western boundary of the golf course. This boundary would be separated from the fairways by a native vegetation buffer strip of between 20m and 100m retaining further vegetation in Category C (good) condition and additional areas of Oa Ma complex. The width of the buffer zone

strip will be determined by detailed design with the intent of maximising the retention of indigenous vegetation.

The "alternative approach" to golf course layout, is to regrade a part of the landform within the golf course area, perhaps near the eastern boundary, to enable a tighter configuration of fairways and utilise a smaller overall area. The "cost" of this approach is a loss of landform and dune crest vegetation, whilst the benefit would be retention of a broader band of vegetation within the northern coastal conservation reserve.

In view of the recognised significance of the landform and the condition of the majority of vegetation in the golf course area, the Proponent considers the "alternative approach" has, on balance, no environmental advantage over that proposed in the ERMP. The layout proposed in the ERMP has the added advantages of preserving the attractive coastal character of the site and minimising UXO searching that would be needed if major recontouring of the site were proposed. The indicative preferred golf course layout is shown in the plan attached to these Comments and Responses.

In summary, the Proponent's preferred course layout is to generally align the fairways along the swales. The area currently shown in the ERMP is generous to allow some flexibility during detail design. It is anticipated that reduction to this area, achieved during detail design, will be added to the northern conservation zone. The final layout will be resolved after submission to the EPA.

4.4 COMMENT

Representatives of the variability in vegetation assemblages caused by the gradient in climate along the coast from Geraldton to Busselton have not been adequately secured in reserves. Becher Point represents one of these assemblages and should be conserved.

RESPONSE

The significance of certain parts of the site in terms of conservation of vegetation complexes is recognised by the Proponent and has been accounted for in the proposed site layout through the intention to create secure conservation reserves for flora and vegetation. The primary contention of the development philosophy is that creation, rehabilitation and proper management of secure conservation reserves is preferable to continued broad scale degradation.

4.5 COMMENT

The ERMP does not indicate that natural vegetation lost from the development site by the proposal shall be replaced. Replanting, protection and management of indigenous flora and fauna are not adequately addressed. Brushing should be used to stabilise sand.

RESPONSE

The ERMP describes, in a number of places, the rehabilitation procedures that will be employed by the development. This information is summarised below.

Conservation zones within the Stage 1 area will be rehabilitated. Works will include:

i) Removal of rubbish.

ii) Restoration of soil profiles and topographic form.

iii) Revegetation of cleared areas and tracks using the most up to date methods and employing topsoil and brush matter from appropriate areas where limited clearing will occur. Follow up monitoring and corrective work will be conducted.

iv) Restriction of future access to areas to be set aside as conservation reserves and all other vegetated areas where access would cause destabilisation of soil or vegetation.

v) Rehabilitation of areas disturbed by construction using techniques described above.

vi) Creation of appropriate firebreaks and development of a fire fighting contingency plan.

Outside of the Stage 1 area, management works will concentrate on control of access and management of fire.

4.6 COMMENT

The ERMP makes no mention of the blue wren and Smoker Parrot that occur at Port Kennedy, nor to the need to re-introduce native fauna to the site.

4.7 COMMENT

"The area contains habitat for two rare and endangered reptiles and the proposed development would further reduce their already restricted habitat."

4.8 COMMENT

A detailed faunal survey has been omitted from the ERMP. It is highly probable that the two rare and endangered reptiles the skink Lorista lineata and the snake Vermicella calonotes are present.

4.9 COMMENT

The importance of the area to vertebrate fauna habitat has not been given adequate evaluation in the ERMP.

4.10 COMMENT

Concern is expressed for the Tammar-like creatures seen in the area.

4.6 - 4.10 RESPONSES

Comments 4.6 to 4.10 are of a similar nature and are best treated within a single response.

It is correctly noted that a detailed fauna survey was not conducted for the ERMP, rather a review and compilation of existing information was conducted. The ERMP acknowledged that not all species that could occur at the site would be included in the species list.

The basis for the approach adopted in the ERMP was as follows:

- The management philosophy for the conservation of fauna is based on retention, rehabilitation, management and protection of habitat.

- The development has been restricted to areas

where habitat is degraded and at the present time probably provides little more than a buffer zone between residential areas at Warnbro, farming land to the east and the remaining areas of the site where good quality habitat is still in existence. Whilst this buffer undoubtedly has some value, it is considered that improvement of habitat quality through the planned rehabilitation programme and the strict control of access to valuable habitat areas would be a more beneficial means of conserving fauna than a continuation of the existing pattern of usage and associated habitat degradation.

Conservation and management of habitat in this way will be even more relevant as recreation pressures increase in the future.

For the areas under consideration in the Stage 1 development, the Proponent considers the extent of work undertaken was adequate.

4.11 COMMENT

The number and types of fish present are not adequately addressed in the ERMP.

RESPONSE

The fish that occur in parts of Warnbro Sound have been described in previous studies of the area conducted for the Westport project (Delta Holdings, 1986) as referred to in the Port Kennedy ERMP. Fish recorded from Warnbro Sound and nearby Shoalwater Bay are listed in the Westport ERMP. They can be divided into the following four groups on the basis of the habitats in which they occur:

- pelagic fish,
- demersal (sand platforms),
- seagrass, and
- demersal (silt-mud basin).

In addition, schools of commercially important species such as herring, salmon and bait-fish occasionally occur along the beaches.

Both commercial and recreational fishing occur in the area, mainly for migratory or transitory species. The major commercial fishing carried out in Warnbro Sound is for bait-fish. Recreational fishing is for herring, tailor, skipjack, trevally, whiting, garfish, snapper and occasionally salmon. Blue-manna crabs are also caught by recreational fishermen.

The proposed management strategy for protecting the fishery resources near Port Kennedy involves protection of three elements of the ecosystem. These three elements and the relevant section of the ERMP in which these elements are addressed are:

- habitats (ERMP Sections 11.9.4 and 11.9.5),
- water quality (ERMP Sections 11.5.1, 11.9.2 and 11.9.3), and
- populations (ERMP Section 11.9.9).

It is considered that, with appropriate management, the proposed development would not cause significant adverse impacts upon the marine ecosystem. There would be minimal impacts upon existing habitats and water quality, thereby protecting the ecological requirements of fish populations. Provisions exist through legislation administered by the Department of Fisheries, and for the M101 area by the Department of Conservation and Land Management, to control levels of fishing pressure, thereby protecting the fish populations themselves.

4.12 COMMENT

No mention is made in the ERMP as to the impact of the project on the seagrass of the Sound.

RESPONSE

The ecological importance of seagrass communities in Warnbro Sound is emphasised in Section 9.7.3 of the ERMP. The potential impacts of the project upon the seagrasses include the following:

i) Additional nutrient inputs to the Sound may promote growth of phytoplankton and epiphytes, which may adversely affect seagrass communities. This aspect is discussed in Section 11.9.2 of the ERMP and is further clarified in responses to comments 9.1.1 -9.1.3. It is concluded that minimal impact would occur.

ii) There may be temporary effects upon seagrass meadows near to the marina site due to increased water turbidity during construction. This aspect is discussed in Section 11.9.3, which concludes that significant impact is unlikely.

iii) Construction of the marina will alienate the area occupied, which includes an area of Posidonia (seagrass) meadow. The seagrass of the marina site is patchy. This aspect is discussed in ERMP Section 11.9.4. It is estimated that approximately 1% of the total area of seagrass meadow in Warnbro Sound would be lost.

The Proponent is committed to monitoring water quality within the marina and an adjacent area of Warnbro Sound. If the monitoring indicates significant concerns regarding the nutrient status or turbidity in Warnbro Sound associated with the project, specific studies would be implemented to assess implications upon the seagrass communities (refer ERMP Commitment No. 14).

5. WETLANDS

5.1 COMMENT

The ERMP indicates, through modelling, that the potential effects on Lake Walyungup are expected to be limited. This will be required to be confirmed by monitoring under licence conditions.

RESPONSE

The requirement for monitoring is recognised by the Proponent in ERMP Commitment No. 13 and Section 12.4.

Detailed monitoring requirements will be resolved with the Water Authority and included as a condition of the licence.

5.2 COMMENT

In the Becher Point cuspate foreland there are unique wetlands (the Becher Suite) and secondly to the south of Becher Point in the vicinity of the proposed Secret Harbour development there are also unique wetlands (the Peelhurst Suite). "These wetlands and their vegetation are not represented elsewhere in the geomorphic units of the Swan Coastal Plain, because they are restricted to the Quindalup Dune system." "Furthermore, the Quindalup Dune system in the Becher Point area is not represented elsewhere in the state." Thus the wetlands of this area are regionally unique and significant.

RESPONSE

There are two aspects to this comment, that require separate treatment. One aspect relates to the seasonal wetlands, whilst the second somewhat unclear comment relates to representation of the Quindalup Dunes system in the state.

a) Seasonal Wetlands at Becher Point

The ecologically unusual characteristics of the seasonal wetlands that occur at the site were recognised very early in the environmental investigations programme and consequently a great deal of attention was given to assessing their biological characteristics and conservation value. All the wetlands are very shallow and they are ephemeral, containing surface water during only the wetter months of the year.

Site investigations identified two primary categories of wetland type within the site using physical classification criteria.

i) Round Shaped Seasonal Wetlands near Becher Point

There are only three of these seasonal wetlands within the study area. Two are located close to the sea, behind a low foredune and are known to be very young, less than one thousand years. They contain vegetation of the genera Juncus, Sarcocornia, Rhagodia, Centella, Suaeda, Aster and Sonchus. The third lies within the squatter's area and has little natural vegetation left.

ii) Linear Wetlands

There is a series of linear wetlands located within the larger, lower lying swales of the relict beach ridge plain that forms the hinterland between the coast and the Pleistocene shoreline. Within the Port Kennedy study area, there are five major linear wetlands (of more than 1km length), six smaller wetlands (of the order of 0.5km long) and a number of small localised wetlands within less subdued swales. Between the eastern Port Kennedy boundary and the Pleistocene shoreline there are a number of further occurrences.

Survey work conducted both on site and by careful review of colour photographic information indicated that the seasonal wetlands could be further divided into three categories on the basis of biological condition. These may be considered as follows:

Category A: Significant detrimental change made by human impact including complete removal of vegetation, compaction of peaty soil, invasion of weeds, scouring through repeated off-road vehicle transit and dumping of rubbish and car bodies.

Category B: Definite changes made by man including some or all of those listed above, but at a lower level of impact.

Category C: No significant evidence of changes made by human impact.

Wetlands with Category A condition tend to be located in the central north eastern part of the study area whilst wetlands in good conditions are located in the south and south west parts of the study area.

Integration of this information in the site development layout process has resulted in the following response regarding utilisation of the site's natural resources.

i) No seasonal wetlands of Category C condition will be included within the project area for the purpose of development.

ii) The two circular wetlands at Becher Point will be included in a Conservation Zone which will be carefully managed for the purpose of protection of flora and fauna. Management will include restriction and control of access, which is presently a major problem, fire management and rehabilitation of the existing pockets of degraded land.

iii) One of the five larger linear wetlands will be incorporated within the golf courses. This wetland is in Category A (degraded) condition and is specifically the worst example of wetland degradation from previous use on the site (refer ERMP Photograph 3). It has been extensively and repeatedly burnt and used continually by off-road vehicles causing extensive loss of vegetation and soil compaction. There is also some littering with car bodies and domestic refuse. In its present condition it has very low or negligible conservation value and could not be returned to anything resembling its former condition without extensive rehabilitation of soil and vegetation. Realistically, this is unlikely to be possible or economically justifiable under any hypothetical future regime of alternative site

administration or usage.

The landscape treatment of this wetland within the context of the golf course development will retain and restore its essential wetland characteristics but will include modifications associated with selected deepening to create a permanent water body to be used as a compensation basin for the irrigation system. The wetland will also be revegetated using appropriate species.

iv) Three of the smaller linear wetlands will also be incorporated in the golf course area. These areas have Category B condition, having significant degradation but retaining components of their essential ecological character. The development philosophy for these wetlands incorporates retention of wetland characteristics through the preservation of visually beneficial stands of Paperbark (Melaleuca rhaphiophylla). Clearing and earthworks will be limited as far as possible.

The design philosophy for the golf course areas recognises the undesirability of unnecessarily modifying existing wetlands and the benefit of incorporating attractive wetland areas within the landscape and will apply this philosophy in detailed design.

The overall project development philosophy recognises the conservation value of certain of the site's wetlands and has responded through designing the layout of the development so that they will not be affected by the Stage 1 development.

b) Representation of Quindalup Dunes

The comment raised in the public submission is somewhat confusing. It reads "Furthermore, the Quindalup Dunes in the Becher Point area not represented elsewhere in the state".

Clearly, Becher Point is a unique landform in terms of the specifications of location, shape and specific size and dimension characteristics. Whilst it is the best developed of the accretionary cusps along the Swan Coastal Plain it is certainly not the only one of these landforms.

Well developed holocene accretionary cusps occur at Jurien Bay, Whitfords and Cape Peron whilst analogous landforms of lesser development occur at Woodman Point, Fremantle, Burns Beach, Quinns Rock, Two Rocks, Ledge Point, Wedge Island and Lancelin.

The proposed development incorporates chronologically intact sequences of relict beach plain and other Holocene dune landforms within conservation areas, whilst a further local example of conservation of this landform is located within Rockingham Lakes regional open space (M103).

The broader requirements for incorporation of good examples of this landform within the State's system of conservation reserves will not be compromised by the proposed development.

5.3 COMMENTS

Concern is expressed that the proposed artificial lakes may not conserve the native flora and fauna because the water level will alter.

RESPONSE

The primary purpose of the golf course area will be for recreation. Although conservation goals are incorporated in the design philosophy, they are secondary in this part of the development. Broader scale studies of the whole site, as detailed in the response to 5.2, indicate the modification of wetlands with Stage 1 should be considered environmentally acceptable for the reasons identified.

5.4 COMMENT

The scientific and educational importance of the wetlands is neglected in the ERMP.

RESPONSE

The importance of the seasonal wetlands has been addressed by the chosen layout and by technical Appendices C and D and ERMP Sections 7, 11 and 12.

6. CONSERVATION ZONES

6.1 COMMENT

The high boundary to area ratio of the conservation zones will mean that degradation will likely to be a problem in these zones.

RESPONSE

The boundary to area ratio factor is optimised in a circular shaped area. It is clear from review of existing conservation reserves in Western Australia that this shape is rarely achieved.

The boundaries of the conservation zones have been determined by:

- o the existing vegetation in good condition,
- o the development node around the marina,
- o the southern boundary of the Olearia axillaris, Melaleuca acerosa complex. This boundary should be regarded as an interim position and will be extended to incorporate vegetation along the southern coast in any subsequent development.

Control of degradation will be achieved through strict control of access and fire management. The network of tracks and clearings that currently exist within the proposed conservation areas will be removed and the land rehabilitated using appropriate techniques and indigenous plant species. It is contended that the rate of ecological degradation will be diminished by these proposed works and future management controls.

6.2 COMMENT

The northern conservation zone should be extended further north to incorporate all of the remaining coastal dunes within Warnbro Sound, and to a distance of 300m inland from the high water mark.

RESPONSE

Whilst the Proponent recognises the desirability of linking conservation zones, extension outside the site boundaries is outside the Proponent's responsibility.

The width of the current conservation zone is approximately 100m and the area has been determined by analysis of soil, slope and stability characteristics together with vegetation and landform. The Rockingham Coastal Study (SPC, 1988) also recommends a foreshore reserve 100m wide. The boundary approximately coincides with the existing well used sand track located behind the primary dune. It is proposed to reuse the existing track alignment to develop a walk/cycle track in order to minimise further impact on vegetation. Between the track and the golf course will be a further buffer zone of retained existing vegetation. It is anticipated that this buffer zone will be between 20m and 100m wide. This will produce an area of natural vegetation with an overall width of 120 to 200m, including further areas of the Olearia axillaris, Melaleuca acerosa complex and vegetation in Category C (good) condition. As the golf course design has not been finalised (pending environmental approval), the additional vegetation areas have not been included in calculated areas for the northern conservation zone at present. A preliminary golf course layout is shown in the plan attached to these Comments and Responses.

6.3 COMMENT

"If the Westport Canal development, to the immediate north, proceeds this will result in a channel through the proposed "Conservation Zone" and will place additional pressure on the natural resources of the area for recreation use."

RESPONSE

It is understood that the financial feasibility of Westport is still being reviewed and that the original Stage 1 canal layout is likely to proceed. As shown in the plan attached to these Comments and Responses, part of the entrance channel for Westport was located on a strip of Port Kennedy land approximately 40m wide running along half of the northern edge of the conservation zone (not through the zone as stated in the comment). This was given environmental approval by the EPA in its report on Westport. The loss of area is in the order of 1ha. If Westport proceeds as originally planned, an equivalent area will be excised from the proposed golf course.

The future likelihood of increased recreation pressure on coastal conservation reserves is recognised by the proposed development. As there are a number of other developments proposed for the area, recreation pressure will increase regardless of whether Westport proceeds or not. The Port Kennedy development has appropriately planned for future recreation pressure through the design of access control measures for the coastal recreation reserve. Areas of dunes and vegetation unsuited to high pedestrian (and vehicular) traffic will be fenced off. Access within the dune area will consist of walkways fenced on either side to discourage departure from the tracks. The location and route of pedestrian walkways will be carefully selected by on site survey and will only utilise areas that can sustain this usage. Formalisation of selected existing access tracks through the dunes will be beneficial to maintaining the coastal reserve in good condition.

7. CHARACTER AND HERITAGE VALUE

7.1 COMMENT

The Rottnest like atmosphere will be changed by the development.

RESPONSE

The precise meaning of this comment is unclear. There are several existing site characteristics which are quite atypical of Rottnest's "atmosphere". The most obvious differences are:

1. Uncontrolled four-wheel drive and motor cycle activity, often at high speed, along the beaches and through the hinterland, particularly on weekends.

2. Unsightly, unhygienic and environmentally undesirable deposits of domestic refuse, litter and junk that occur along the access roads, in the wetlands, within the squatter's areas and on the beach.

3. Unauthorised occupation of parts of the site by squatters.

Under the present proposal, the restoration of the site will improve the area's atmosphere by the management of vehicular access, the removal of rubbish and rehabilitation of degraded land as well as making the site more accessible to the general public.

7.2 COMMENTS

The existing natural atmosphere with the fragrance of salt bush and other flora will be destroyed as will the natural heritage of the area.

RESPONSE

The site investigations showed that the future sustainability of environmental and natural heritage values are presently at risk within certain parts of the site. The proposed development provides a vehicle for management of the remaining areas of good condition land, and for restoration of specific areas of inherently good quality land that have been degraded by previous usage. Those areas where heritage values are currently highest will be maintained in current condition or improved by works associated with the development. Compared to present usage patterns, heritage value will be better protected.

7.3 COMMENT

It is considered that the proposed development will damage the environment more than existing users since the development will eliminate chances of regeneration of the environment due to the scale and extent of proposed commercial development, earthworks, dredging and sundry works.

RESPONSE

Alternative proposals for the site date back nearly three decades, during which time management of existing users and regeneration of the environment could have been, but has not been, implemented. This proposal offers the opportunity to arrest the continuing degradation of the site, and to manage the areas of conservation value.

Investigation and documentation of the present condition of the site identified those areas where previous degradation was most severe. Development of the site has been restricted to those areas and has been excluded from areas of demonstrable high conservation value as much as possible.

Investigation of the current condition of the site also provided some insight into the processes by which current usage is causing environmental degradation. These are as follows:

i) Construction of squatters' shacks has caused clearing of vegetation and trampling and dissection of peripheral areas.

ii) Occupancy and maintenance of the shacks creates building refuse, and domestic refuse in the form of food wastes, plastics, papers, bottles, etc, which are indiscriminantly dumped into wetland areas and other vegetated sites. It appears that the rubbish dumps are regularly burned as the vegetation around many of the sites has been severely burnt on a frequent basis.

iii) The burning of rubbish at illegal disposal sites, together with uncontrolled access and activity by users in four-wheel drive vehicles and motor bikes, is resulting in frequent fires which are detrimentally altering the species composition of the flora and assisting the invasion of weeds.

iv) Uncontrolled off-road vehicle access through the steep primary dunes on the Warnbro Sound coast is causing soil erosion and loss of vegetation cover and landscape quality. A large amount of litter is also left on the beach by users gaining access through the tracks.

v) Uncontrolled off-road vehicle usage in the interior areas of the site is alienating increasing areas of vegetation and wetland. There is a multitude of sandy tracks through the interior. The trend is for these tracks to increase in width, particularly on the crests of beach ridges where soil stability reduces with continued use and alternative access on adjacent stable vegetated ground is sought. Large quantities of rubbish are also dumped illegally in the area by persons taking advantage of the access provided by these tracks.

Under the present regime of administration and management, these processes will intensify as population growth in Rockingham and Mandurah causes increased use of the site for both environmentally responsible and environmentally destructive recreation activities.

Whilst the proposed development will change the environmental characteristics of certain parts of the site (selectively those that have relatively low conservation value) the development will also provide an administrative framework for control of environmentally unacceptable activity within the remainder of the site. In addition, significant rehabilitation works will be conducted within the proposed conservation reserves, and these areas will be actively managed in conjunction with the development of recreation facilities.

The scale of expenditure required to conduct

rehabilitation to the standard and extent proposed in the current development is unlikely to be considered justifiable in the absence of a commercial return regardless of whether the developer is a government agency or a private developer. The current proposal should be recognised as the best opportunity that has ever been available to achieve proper environmental management of the Port Kennedy site.

In summary, whilst the proposed development will modify the present characteristics of specific areas of the site that have already been environmentally degraded, it will also provide an opportunity to restore the environmental and landscape amenity of large tracts of land within the site that are worthy of conservation and appropriate management, but are currently deteriorating. It is contended that the proposal will be environmentally preferable to continuation of present patterns of usage and environmental deterioration.

8. SCIENTIFIC, INTERNATIONAL AND EDUCATIONAL AND CONSERVATION VALUE

8.1 COMMENT

It is stated that most of the scientific literature about Port Kennedy has been ignored in the ERMP.

RESPONSE

Extensive literature review was an integral part of the ERMP preparation as evidenced by bibliographies in the ERMP (Section 16.1) and the technical appendices. Consideration of the information available in the literature, in conjunction with detailed studies of the site prepared for the ERMP, have determined the proposed Stage 1 layout.

8.2 COMMENT

"*The coastal geomorphology is significant. Becher Point is a terrain of regional and international significance for the study of sea level history, cuspate foreland stratigraphy/sedimentology and climate history. An area that combines geomorphic sedimentologic, pedogenic dune vegetation and wetland features is of prime significance and warrants priority conservation for teaching, research and heritage.*"

RESPONSE

The site investigations conducted for the ERMP had findings that were essentially in agreement with the views expressed in this comment, with the proviso that not all of the site uniquely displayed all of the essential characteristics noted above. For example, the relict beach ridge plain, which contains sedimentological and geomorphic evidence of sea level change and climate history, is best developed in the southern part of the site and this area will not be modified by Stage 1. The sequence of beach ridges is more chronologically complete and better developed in the hinterland of the site's southern coastline (south east of Becher Point) than with the hinterland of the Warnbro Sound coastline, where Stage 1 is located.

Similarly, dune vegetation and wetlands are better developed and are in better condition in the southern parts of the site, which will not be affected by Stage 1.

In summary, the value and amenity of the site for geomorphological, sedimentological, pedological and biological teaching, research and heritage will not be significantly reduced by the development. In addition, the development will provide a financial and administrative vehicle for maintenance of these values in the future.

8.3 COMMENT

The importance of the location, ignored by the ERMP, is further evidenced by the following:

i) Becher Point has been selected as a study site for calcrete pattern for an international audience.

ii) Significant late Holocene climate change in south west Australia is evident at Becher Point.

iii) Becher Point has become internationally known and cited in the scientific literature.

iv) Port Kennedy is important because of the unique opportunity to study coastal formation processes. Data collected on ancient shoreline systems will provide valuable assistance in understanding the possible coastal impacts of the Greenhouse Effect.

v) Excellent examples of mobile dune systems will be destroyed by the proposed development and increased recreation activity. These naturally mobile coastal dunes are important for research and education.

RESPONSE

The response to this comment includes reference to previous statements in this document and the ERMP regarding the existing characteristics and conditions of the site and the extent of impact upon them.

The general nature of this comment appears to derive from an impression that the whole of the Port Kennedy site will be developed as a result of the present proposal. This is clearly not the case. The ERMP document goes to great lengths, through the provision of accurate maps and definitive descriptive text, to show that only certain and carefully selected parts of the site will be affected by the development.

In response to specific aspects of Comment 8.3 and dealing with each in terms of the assertion of loss or diminishment of amenity, it is possible to show that each is baseless:

i) The development will not occlude the site from availability for calcrete development research. Land within the southern portion of the site has geomorphic and pedological characteristics of equivalent age and better development. This is shown by a comparative review of the research (Woods and Searle, 1983) with the proposed shape and area of the land to be developed and land that will be left intact.

ii) Evidence of late Holocene climate change in south western Australia will not be lost, removed or damaged by the development. Physical alteration of the landforms and shallow sediments will be limited to very small areas.

iii) The chronological succession of relict beach ridges will be retained in full within most of the site. Further, these areas will be made available to researchers wishing to conduct limited drilling operations or related research. The relict beach ridge areas will also be available for teaching purposes.

iv) Study of ancient shorelines will not be precluded as a result of the proposed development. The beach of the primary dune at Bridport Point over a distance of 800m is the only area where the physical characteristics of the present shoreline will be significantly altered. There is a succession of ancient shorelines beneath the seaward toe of each of the consecutive beach ridges within the hinterland. Therefore a complete record of ancient shoreline position and sediment distribution characteristics at each shoreline position will be available within extensive parts of the site.

v) The only examples of truly mobile dunes, that is dunes that are free of vegetative cover or other physical stabilisation, that occur on site are located in the most southern part of the site, near the present Department of Community Services beach camp. This area will not be affected by the proposed development.

8.4 COMMENT

The use of spoil dredged from the marina to build up foredunes and primary dunes may not have a particle size compatible with that in the present due formation. Particle size has a direct influence on the shape and size of dune formations. Using incompatible spoil particle size will alter the path of historic dune development in this area of the coast.

RESPONSE

The dune adjacent to the hotel and marina will be generally retained in its present form, but eroded areas will be built up and terraced with sand dredged from the marina to emphasise the landform. The foredune and primary dune to the north and west of the hotel and marina area will be conserved.

The dune area that will receive dredged material is substantially degraded by human activity. The vegetation condition is poor or very poor, and there are extensive areas of local erosion.
The dredged material from the marina will include Becher Sand, whilst the dunes consist of Safety Bay Sand. Becher Sand is the lower stratigraphic unit of Holocene sediments which forms the contemporary submarine sand promontory and seagrass systems of Becher Point, and also extends inland beneath the coastal plain. Safety Bay Sand is the upper unit occurring above sea level, which forms the aeolian beach ridge and beach system (Semeniuk and Searle, 1985).

In terms of sand grain composition, the seagrass bank sediments (Becher Sands) are similar to those of the beach ridge dune suite (Safety Bay Sand): in fact they provide supply of sand sediment to the beach environment. However, aeolian processes tend to sort the Safety Bay Sands whereby the dune and beach ridge areas have predominantly fine and medium sands, with coarser material being confined to the beach. The offshore "reservoir" of Becher Sand is poorly sorted, and in the areas of the marina consists of fine, medium and coarse sand (Semeniuk & Searle, 1985.)

Becher Sand is not considered to be incompatible material with which to build and rehabilitate dunes consisting of Safety Bay Sand. The inclusion of some coarse sand in material added to the dunes will significantly assist in stabilising eroded areas. The management objective for this area of degraded dunes is to achieve a stable and varied landscape reflecting naturally occurring topography elsewhere within the coastal strip. This will be readily achieved using dredged material.

It is also noted that the path of historic dune development in this specific area of the coast has already been greatly altered by previous human activities and, in the area in question, would also be affected by the construction of the marina. In addition, the pattern of dune development is dependent as much upon the condition and composition of beach and dune vegetation as it is upon sediment composition (Bell, 1986).

8.5 COMMENT

The proposal conflicts clearly with the State Conservation Strategy aims, eg 6.2.1, 6.2.4 and 6.1.6.
RESPONSE

The State Conservation Strategy aims that are referred to are as follows:

6.2.1 Species and Habitat Protection

- *Prevent further decline in species and genetic diversity in WA.*
- *Adequately protect and manage representative areas.*

6.2.4 Integration of Environmental Management with the Economic Process

- *Cost the environmental component of future developments during their initial planning phase.*
- *Recognise that diversification in use of resources can promote environmental stability and sustainability.*

6.1.6 Participation

- *Develop mechanisms by which the community can be directly involved from the initial planning of major developments.*
- *Foster a commitment by decision-makers at all levels to the strategy.*

The proposed development recognises and embraces each of these individual objectives as demonstrated below.

Objective 6.2.1
The development will not result in loss of any individual species of flora and fauna. Although some parts of the site will certainly be transformed into a non-natural format, the associated creation of secure reserves and their rehabilitation and management will be a positive step towards preservation of species diversity. The proposed development will result in the arrest of the gross degradation processes that are currently in operation. The areas of vegetation that will be retained in conservation reserves are the best representative examples of the vegetation complexes within the site.

Objective 6.2.4
Environmental management has been integrated with the economic development process. The development philosophy adopted by the Proponent recognises that some aspects of site development will have environmental costs. The development philosophy minimises these costs and restores the environmental/economic balance by allocating financial expenditure to environmental management in the form of site investigation, creation of conservation reserves, rehabilitation of landform and vegetation, control of weeds, management and control of access, and protection against extensive or frequent fire.

The proposed development plan is a straightforward example of how diversified utilisation of natural resources can promote environmental stability and sustainability. The development will promote environmental stability by the creation of an administrative and financial vehicle to enable

protection and sustained management of the most environmentally valuable parts of the site. This is considered to be a positive step towards conservation compared to the current condition and management of the site.

Objective 6.1.6
The Proponent has complied with all reasonable requirements for community involvement through its appropriate representations in addition to meeting each and every regulatory requirement in regard to development and environmental management. The process involved in preparing and publishing an ERMP secures considerable opportunity for public involvement and comment.

The ERMP has gone to considerable length to provide maps and descriptive text within the ERMP so that the full intent and implications of the proposed development can be understood by an audience comprising both the regulatory authorities and the lay public.

The Proponent has further expended considerable effort in reviewing, interpreting and responding to all submissions that have been made in respect of the proposal. For those submissions where review has indicated that comments derive from inaccurate impressions of the nature of the development, the reason for the inapplicability of the comment has been explained. Where submissions have indicated there is a desire for an alternative approach to development, sincere consideration of the feasibility of the proposed alternative has been given. For example, during the detailed golf course design, the location of the western boundary abutting the northern conservation zone will be reconsidered following comments within the submissions regarding vegetation (see 9.3).

The commitment of the Proponent to the State Conservation Strategy is evidenced from the integration of specialist environmental advice and findings of site investigations within the planning process. Whilst initially the site development philosophy had no preconceptions as to the requirements for conservation within the site, recommendations regarding the creation of conservation areas, their location and the need for rehabilitation and ongoing active environmental management, have all been incorporated in the site development philosophy and the ongoing planning process. This has been the development philosophy to date and will continue to be in the future. The Proponent will not proceed with any site work without first seeking advice and discussion with appropriate qualified specialist consultants and the Environmental Protection Authority.

The Proponent reiterates these principles of development philosophy and restates its intention to function in an environmentally responsible manner at all times.

8.6 COMMENT

The proposed development conflicts with the System Six Red Book recommendation that the area be used as a Regional Park for conservation and landscape preservation.

RESPONSE

The proposed development is consistent with the specific System Six Red Book recommendations regarding the site and also with the broad implicit objectives of the System Six Study Recommendations.

Demonstration of the proposal's compliance with these recommendations requires a re-examination of the definition that has been assigned to the term "Regional Park" within the System Six Study Documents.
The definition of the term "Regional Park" is given in Section 5.4 of the "System Six Study Report", Department of Conservation & Environment, 1981 as follows:

"The demand for large accessible areas of open space for fairly intensive outdoor recreation is increasing. Areas of this type are defined here as Regional Parks. They have three basic functions: to provide for recreation and conservation of natural environment, and conservation of attractive man modified landscapes. The term may, where appropriate, be qualified as in "linear regional park" or "riverine regional park". A wide range of recreation activities of greater variety and intensity than in National Parks, is appropriate to regional parks. The natural features of regional parks helps determine which activities are suitable but these features can also be important on their own account. Regional parks may also consist entirely of or partly of attractive man modified rural landscapes or involve other land uses provided these have recreational potential."

The Port Kennedy Regional Recreation Centre will have all of the three basic functions of a Regional Park as noted above and therefore complies entirely with the functional requirements that have been identified.

The proposed construction of a marina is consistent with the intention that suitable recreation activities are determined by the natural features of the site. The marina will be a focal point for recreational activities that utilise the near shore coastal waters.

Similarly the golf courses and associated accommodation will be appropriate vehicles for intensive recreational facilities to be provided within the degraded hinterland of the site. The gently undulating relict beach ridge plain is a very suitable location for the golf courses. The alignment (as far as possible) of the fairways with the existing swale lines, the preservation and appropriate enhancement of vegetation and landform of the beach ridge crests within the golf course, and of the degraded linear wetlands, is entirely consistent with the concept that regional parks may consist of partly or wholly man modified landscapes with intensive recreation function and amenity.

In conclusion, it is considered that the implementation of the proposal will not impair the compliance of the site's characteristics or its management objectives with the requirements of a regional park, as defined by the Environmental Protection Authority.

8.7 COMMENT

The ERMP claims that much of the site is degraded but results from other studies have found that areas affected by fire and human habitation do regenerate given time and careful management, hence the Port Kennedy area could also be rehabilitated.

RESPONSE

It is noted that this comment is not supported by references to other specific studies, nor by financial analysis of the cost of the "time and careful management" required to rehabilitate the site.

To gauge the likelihood that adequate funding to implement the necessary rehabilitation works would be allocated by appropriate government agencies, it is useful to assess whether there are previous or existing examples of government funded land rehabilitation within other areas that have been nominated as suitable "Regional Parks" within System Six. Restoration on such a large scale is not known to be underway or under serious financial consideration in Western Australia at the present time. The difficulties of obtaining funds for restoration of conservation lands has been recently demonstrated through the inability to adequately control Veldt Grass in Kings Park and the resultant destructive fires of the summer of 1988/89.

Given that uncontrolled recreational activity is clearly the primary cause of degeneration, one method of site restoration would be to impose a total restriction on all access to the site for any active recreational purpose. Even under this scenario, it is doubtful that the wetland areas would regenerate to their original condition due to factors such as soil compaction by vehicles, which would have a long lasting effect. More importantly, the concept of total exclusion of public access does not in any way comply with the functional requirements of regional parks.

Funds for management of conservation areas are understood to be a perennial constraint to the level of site management that can be implemented by the state or local governments. The present proposal for utilisation and commercial development of the degraded portions of the site is considered to be the best available way of generating funds to suitably manage those parts of the site that have demonstrable conservation value.

8.8 COMMENT

Nine submissions and 89 proforma letters express the view that the site for the development should be declared a regional park in accordance with the System Six recommendations and it be vested in the Department of Conservation and Land Management (CALM) and a comprehensive management plan developed for the area by CALM.

RESPONSE

The response to comment 8.6, including a review of the definition of the term "Regional Park", demonstrates that the proposed development will comply with the structural and functional characteristics of a regional park and will not impair the site's utility for this purpose.

8.9 COMMENT

The area has high conservation value and no development should take place until CALM has developed a management plan.

RESPONSE

Land at Port Kennedy is wholly in Crown Ownership and is zoned for Public Purposes (Special Uses) and Parks and Recreation. The land is not part of the CALM estate and hence there is no statutory requirement for CALM to prepare a management plan or to participate in management of the land.

However, following implementation of the proposal, it is intended to establish an ongoing programme of liaison with CALM regarding management of conservation areas.

8.10 COMMENT

The view is expressed that "the proposed Shoalwater Islands Marine Park, and the integration of land at Point Peron and Becher Point, would create one of the most important and renowned regional parks in the Perth metropolitan region. This potential should not be lost nor compromised for any development which may be out of keeping with community interests and priorities."

RESPONSE

The proposed development is a mechanism for promoting community facilities.

The proposed development would result in Port Kennedy becoming one of the major focuses for recreation and one of the most significant remaining areas of coastal regional open space in the south-western corridor. Development of the site will complement other proposed recreational facilities in adjacent areas to provide a variety of active and passive recreation facilities as well as conserving a range of representative natural environments. The project will provide the necessary initial capital and ongoing funds for conservation, restoration and management of Port Kennedy without financial burden upon the government of Western Australia.

8.11 COMMENT

"Warnbro Sound and the adjacent shallow seagrass beds are important areas that require careful management. From a regional conservation standpoint, the deep water area and seagrass banks of Warnbro Sound, to the east of the EPA proposed M101 reserve, are in many respects considerably more important than the limestone reef." The ERMP fails to address this point.

8.12 COMMENT

"The EPA proposed M101 marine reserve would follow boundaries recommended and described in the System Six report. Recent investigations by CALM, however, show that these boundaries are not adequate for a marine park in either an ecological conservation sense or for effective management. The proposed development will have a direct impact on the area CALM is considering should be reserved as a marine park. Determination and endorsement of the boundaries for the proposed Shoalwater Islands Marine Park should precede final consideration of the proposed development."

RESPONSES

The ERMP addresses the marine habitats in Section 9.0 and impacts on those habitats in Section 11.9. The Proponent has considered and is aware of the proposal to extend the boundaries and has provided a commitment (ERMP Commitment No. 15) to contribute funding to a proposed study of the area to enable a detailed management plan to be prepared for both Warnbro Sound and the

limestone reef.

The ERMP recognises the ecological importance of the seagrass communities in Warnbro Sound. However, as discussed in the response to Comment 4.12, significant adverse impact upon these communities due to the proposed development is considered to be very unlikely to occur.

In the event that the boundaries of the proposed M101 marine reserve were extended to include Warnbro Sound, the impacts of the proposed development would remain as follows:

- alienation of the 18ha area comprising the marina,
- loss of approximately 1% of the existing seagrass communities in Warnbro Sound, equivalent to approximately 0.5% of the seagrass community within the extended M101 boundaries,
- increased public access to the proposed M101 marine reserve.

System Six Recommendation M101 states that this proposed reserve area "constitutes open space of regional significance .... because of its high conservation, education and recreational values and its proximity to the Perth residential areas". The Port Kennedy Regional Recreation Centre will facilitate recreational enjoyment of the proposed reserve M101. Port Kennedy will form a contiguous part of the marine park and contribute to its management.

It is concluded that determination and endorsement of the boundaries of the proposed marine park need not precede final consideration of the development.

9. MANAGEMENT

9.1 Golf Courses, Nutrients and Groundwater

9.1.1 COMMENT

The use of fertilisers on the golf courses could lead to pollution of the groundwater, Warnbro Sound and wetlands. Appropriate monitoring is not in the ERMP.

RESPONSE

This issue received considerable attention in the ERMP. Section 11.9.2 describes a specific fertiliser application regime and irrigation controls to minimise fertiliser leaching from the golf courses. Nutrient dispersion from the Stage 1 landscaped areas to the conservation zones and other parts of the Port Kennedy site is expected to be minimal, especially since lateral dispersion due to runoff through the surface environment will not occur because of the site topography. Although there is likely to be some leakage of nutrients into the shallow aquifer and thereby into Warnbro Sound, significant impact upon marine biota is considered to be unlikely (ERMP Section 11.9.2 and Response 9.1.3).

A comprehensive monitoring strategy is proposed in ERMP Sections 12.4, 12.5, 12.6 and 12.8 to confirm predictions regarding nutrient leaching. Monitoring will include the following:

- o A line of five monitoring bores will be established between the coast and Ennis Avenue (Mandurah Road) to monitor impacts on the regional hydrology. Water from these bores will be tested annually for water quality, including nutrients.
- o Production bores will also be tested annually for nutrients.
- o Two monitoring bores will be located between the golf course and the beach and will be tested annually for nutrients.
- o Six monitoring bores will be installed in two of the seasonal wetlands, and will also be tested annually for nutrients.
- o Monitoring of water quality, including nutrients, will be conducted quarterly at three locations inside the marina and one location outside.
- o Annual monitoring of nutrients in sediment samples will be conducted at locations within and outside of the marina.

9.1.2 COMMENT

Fertilisers could have a negative impact on flora and fauna, conservation values, recreational use and ultimately regional economy.

RESPONSE

As discussed in the response to Comments 9.1.1 and 9.1.3, nutrient losses from fertilisers will be minimised and should not cause adverse environmental impacts. The nutrient content of groundwater under the site will be monitored to confirm this.

Fertilisers would only be applied to landscaped areas, and will serve to improve recreational use. Impact on the regional economy is not considered likely.

9.1.3 COMMENT

Impacts of fertiliser on the seagrasses and possible effects on sand stability need to be addressed.

RESPONSE

The ERMP addresses the possible effects from nutrient losses from fertilisers upon the marina biota in Warnbro Sound (ERMP Section 11.9.2). This discussion recognises the potential vulnerability of seagrasses to increased growth of phytoplankton and epiphytes following increased nutrient additions. It is also recognised that the loss of seagrass communities, were it to occur, could significantly impact on sediment stability, which could in turn precipitate further losses of seagrass meadows. However, Section 11.9.2of the ERMP calculates that the potential nutrient losses to Warnbro Sound from fertiliser application would be acceptable. The Proponent would routinely monitor nutrient losses to the superficial aquifer and to Warnbro Sound, and if the results indicate any cause for concern, would implement a monitoring programme to determine whether there were significant effects upon microalgal growth and seagrasses.

As far as the Proponent is aware, detailed information is not available on leaching of fertilisers (with the proposed fertiliser management programme), attenuation of nutrients through the Safety Bay Sand, the flushing characteristics of Warnbro Sound and the sustainable loading of Warnbro Sound. It is concluded from studies undertaken to evaluate these aspects elsewhere that several years work would be required to produce accurate estimates. Therefore, the ERMP has adopted the approach of presenting probable upper bound values for each of these aspects inferred from available data. Actual nutrient losses are likely to be substantially less, as discussed in the following:

- o Total nutrient application rates are estimated at 30 tonnes/year nitrogen and 2.4 tonnes/year phosphorus. The ERMP proposed that a fertiliser management strategy would be implemented, based on regular tissue and soil testing, to determine the specific nutrient requirements and application of minimum quantities of individual nutrient blends as determined to be necessary. With such a strategy it is likely that the actual fertiliser application rates would be significantly less than those allowed in the ERMP.
- o Fertiliser application requirements would reduce within three to five years once the golf courses, playing fields and gardens were fully established.
- o The high carbonate content of soils at Port Kennedy indicates they will efficiently attenuate phosphorus. Very little phosphorus would leach to Warnbro Sound.
- o It is conservatively assumed in the ERMP that 50% of the nitrogen applied during winter, and 12.5% of the nitrogen applied during summer, would be lost to Warnbro Sound. This equates to an overall loss of 20%. Actual losses are likely to be significantly less for the following reasons:
  - A high proportion (53%) of the applied fertiliser would be to greens and tee

areas, where a liquid fertiliser would be applied by spraying a little at a time and at frequent intervals. All grass clippings from the tees and greens would be either composted or exported from the site. The overall losses of nitrogen to shallow groundwater would probably be significantly less than 10% of that applied (Kolenbrander, 1972; Gerritse et al, 1988).

- Nitrogen within the shallow groundwater would be partially taken up by deep rooting trees and perennial shrubs, which would be retained and augmented within the proposed development area.

- Some of the nitrogen within shallow groundwater would migrate to the base of the superficial aquifer system and would be expected to undergo some denitrification (pers. comm. Dr RE Martin). This would result in reduction of residual nitrates.

It is considered that the estimated nutrient loadings to Warnbro Sound of 16kg/day nitrogen and 1.3kg/d phosphorus are conservative and represent probable maximum loadings. Probable loadings are estimated to be less than 10kg/day nitrogen and 0.5kg/day phosphorus.

The implications of the additional nutrient loading upon Warnbro Sound cannot be stated with certainty, but are unlikely to be significant. Nitrogen would be the growth-limiting nutrient for algae in Warnbro Sound and the rate of production of algae, and possibly the algae population density, may tend to be proportional to the load of nitrogen applied. However, this would be moderated by the rate of nutrient export to the open ocean.

After substantial seagrass die-back due to increased nitrogen loadings in Cockburn Sound, the Cockburn Sound Environmental Study (Department of Conservation and Environment, 1979) defined the long-term objective for that embayment as a reduction of nitrogen inputs to 1,000kg/day, which was believed to be the input level in the late 1960's before die-back of seagrass occurred. Because Warnbro Sound is approximately one-fifth the area of Cockburn Sound, the ERMP conservatively assumed that the recommended nitrogen loading for Warnbro Sound should remain less than 200kg/day.

A comprehensive study would be required in order to determine the implications of probable maximum retention of nutrients in Warnbro Sound to recommended maximum nutrient loadings. This is understood to be a component of the proposed EPA regional marine study. The Proponent is committed to contribute to this study (ERMP Commitment No. 15). However, based on better connection to the Indian Ocean, it appears reasonable to assume that Warnbro Sound is flushed at least two or three times more efficiently than Cockburn Sound and so the comparative nitrogen loading threshold would probably be more in the order of 500kg/d.

In summary, the approximation in the ERMP that nitrogen losses from the Recreation Centre may involve up to 8% of the normal sustainable load capacity of Warnbro Sound is therefore very conservative. The "most probable" estimates indicate that the project would contribute less than 10kg/day of nitrogen to Warnbro Sound, equivalent to 2% of the Sound's probable sustainable load.

9.1.4 COMMENT

The heavy drawdown on the watertable caused by watering of golf courses could lead to the death of native vegetation, the drying out of wetlands and possibly salt water intrusions into the groundwater.

RESPONSE

Although mapping of the water table south of Rockingham is incomplete, available hydrographic information clearly shows a seasonal oscillation related to rainfall recharge. Amplitudes of more than 1m are typical.

The Proponent's application for a licence to abstract water from the shallow aquifer will be supported by additional detailed modelling of the available water resource and the effects of groundwater abstraction, conducted in consultation with the Water Authority. However, the modelling described in the ERMP (Appendix B) has indicated that the required water supply can be secured from shallow groundwater with only a slight depression of the water table. The total abstraction of 4,000kL/d is expected to induce a local drawdown to approximately 0.5m in the vicinity of the borefield, with minimal drawdown over a wider area. Except within very close proximity of the borefield, drawdown will be well within the range of seasonal or periodic natural variations (Appendix B, Figures 6, 7 and 8). Phreatic plants drawing from the aquifer are therefore unlikely to be affected whilst the coastal heath vegetation of the beach ridge landform does not rely on groundwater for survival.

It is similarly unlikely that the seasonal wetlands at Port Kennedy would be adversely affected.

The Proponent is committed (ERMP, Commitment No. 10) to annually monitor the vegetation species diversity and conditions at six sites in the conservation zones, restored areas and the areas outside Stage 1, including seasonal wetlands. The Department of Conservation and Land Management would be consulted during the design of the monitoring programme. In addition, six monitoring bores will be installed in two of the wetlands to record water level changes in the shallow aquifer.

Groundwater abstraction will also be managed to avoid salt water intrusion. The Proponent recognises the critical requirement to maintain a positive hydraulic gradient towards the coast to prevent any inland encroachment of the salt wedge, and will closely monitor groundwater levels and the position of the saline wedge to facilitate appropriate management.

9.1.5 COMMENT

The opinion is expressed that the private golf course appears to be a luxury, which for environmental reasons should be omitted from the proposal.

RESPONSE

The private hotel and golf course are required to secure the commercial viability of the development. The alternative method of financing the project is mixed urban and recreational use, which is considered to be less desirable (ERMP Section 6.2.3) both in terms of type of use and the

conversion of public land for urban development.

The discussion presented in the ERMP demonstrates that, with appropriate management, the proposed private golf course would cause negligible impact on the environment.

9.1.6 COMMENT

Groundwater draw must be licensed as the development is within the Rockingham Groundwater area. "The Water Authority will require additional modelling and monitoring before a licence will be issued." This is necessary because of the high proportion of rainfall assumed to be recharged in modelling (34.5%). "A groundwater licence for the project will be granted for the available resource but it may not be sufficient for the entire project."

RESPONSE

The position regarding licensing for groundwater abstraction is understood by the Proponent. The recharge figure adopted is determined by calibration of the model for known rainfall versus measured groundwater fluctuation.

If the available resource is found to be insufficient, then it would be supplemented from the Yarragadee aquifer. This aspect will be determined in consultation with the Water Authority.

9.2 Heavy Metal Contamination

9.2.1 COMMENT

The 380 boats using the marina may create a heavy metal contamination problem and this needs to be addressed in the ERMP.

RESPONSE

The ERMP (Appendix E) recognises that minor heavy metal contamination will occur in the marina due to leaching of metals from antifouling paints (copper and tin) and sacrificial anodes (aluminium and zinc). This is an environmental concern common to all marinas, and is highly dependent upon paint formula, which cannot be controlled. A particular (and manageable) concern is that paint scrapings and spillage from marina hardstand areas should not enter the marina in drainage.

Natural processes in the marine ecosystem tend to concentrate heavy metals in the sediments. Heavy metals are not very soluble in oxygenated seawater and so their introduction to the marina will generally result in an equilibrium condition where most of the metals will be sorbed by suspended particulate matter and then deposited in sediment depositional areas. Marine animals also readily absorb heavy metals, although they are able to regulate the concentration of most metals to normal levels provided uptake is not excessive. Heavy metals usually will be present in solution simply as an uncomplexed ion, so preferential sorption with biota will be low and bioaccumulated concentrations will be similar to sediment levels.

Of very significant concern regarding all marinas in Western Australia is the environmental impacts of tributyl tin (TBT) in antifouling paints. The use of TBT in antifouling paints has recently caused substantial concern elsewhere in the world, and its use is now generally being regulated. TBT is released by antifouling paints directly to the aquatic environment, although the analytical techniques capable of detecting them in very low concentrations have only recently been developed. With acute effects observed for aquatic organisms at concentrations as low as 1 ug/L (ppb) and sublethal effects detected at concentrations of 0.01 ug/L, TBT has been shown to be damaging at levels far below those yet recorded for any other marine pollutant. As a lipophilic compound, TBT also bioaccumulates to high concentrations (up to 3 orders of magnitude above ambient levels).

The Proponent is committed to monitoring sediment concentrations of heavy metals within and outside of the marina, including lead, copper, tin and zinc (ERMP Section 1.26). The absence of appropriate "clean" laboratory facilities in Western Australia precludes the analysis of TBT, and the Proponent urges regulatory control of the use of TBT antifouling paints.

As indicated in ERMP Commitment No. 14, if heavy metal testing indicates possible environmental concerns then detailed studies would be initiated, in conjunction with the Environmental Protection Authority and Department of Marine & Harbours.

9.3 Flooding, Vermin, Fire, UXO, Greenhouse Effect, Sewerage

9.3.1 COMMENT

Areas proposed for the resort hotel and golf course have been known to be inundated with water in wet years.

RESPONSE

The Proponent is aware of this potential problem. However, this is not considered to have any environmental impacts but will need to be addressed prior to construction.

The maximum probable groundwater level near the resort hotel is 3.0m based on a line of bores sunk in 1957/58 to estimate water table levels for the 1961 Town Planning Department proposal for the site. These maximum levels are approximately 2m higher than the predicted average winter groundwater and have the potential to cause infrequent seasonal flooding of low lying swales. These aspects will be addressed at detail design stage following further refinement of the groundwater model.

9.3.2 COMMENT

Management of vermin has not been adequately addressed in the ERMP.

RESPONSE

Management of vermin will be covered by a detailed management plan to be prepared for the site.

9.3.3 COMMENT

The preparation of a fire management plan is required.

RESPONSE

A fire management plan will be prepared by the Proponent as recognised in ERMP Commitment No. 9.

9.3.4 COMMENT

Further searching for UXO may be required in the area. "No guarantee can be given that all UXO will be located during search operations. However, provided searching is carried out as advised by the State Emergency Service, the UXO risks will be reduced to an acceptable level."

RESPONSE

This is confirmed by the Proponent's discussions with the State Emergency Service during preparation of the ERMP.

9.3.5 COMMENT

The impact of the Greenhouse Effect on land is not adequately addressed in the ERMP.

RESPONSE

This comment is unclear. Potential impacts of the Greenhouse Effect are addressed in Section 7.8 and Appendix G so far as background information allows.

9.3.6 COMMENT

It is stated in one submission that the area has sewerage capability problems already with regard to sewerage treatment and this project will probably cost the government considerably. Concern is expressed as to which sewerage treatment plant is to be used.

RESPONSE

Discussions between the Water Authority and the Proponent do not support this comment. Sewage from the development will be pumped to the Water Authority's Port Kennedy sewage treatment plant near Ennis Avenue as detailed in Section 11.7.2. Arrangement for payment of headworks charges by the Proponent to the Water Authority will ensure equitable contribution to any consequent capital works.

9.4 Coastal Management Plan

9.4.1 COMMENT

One government department reported that a coastal management plan should be prepared and implemented to the satisfaction of the Commissioner of Soil Conservation. Sand stabilisation, dune rehabilitation, controlled pedestrian access and ongoing maintenance must be addressed.

RESPONSE

Preparation and implementation of a coastal management plan will be undertaken in liaison with the Commissioner of Soil Conservation as recognised in ERMP Sections 2.5, 11.2.6, 11.11.5, 12.2.3 and Commitment No. 8.

9.5 Management Board

9.5.1 COMMENT

"Certain land categories such as freehold and leasehold will be granted whilst a "Management Board" will be responsible for managing and monitoring "conservation zones" and other public open space. As the project is a joint 50/50 venture, considerable government funds would be provided for both development and management costs of the project, and for the Management Board. It is unclear to what degree of, and guarantee for, funding of the Management Board, nor the regularity of mechanisms or power of control the Board will have. No consideration has been given for a CALM representative on the proposed Board, despite the fact that it will have a major management role adjacent to the proposed development."

RESPONSE

Funding for management of the development is covered by the Project Agreement which is in the process of being finalised.

Responses to specific issues raised in this comment are as follows:

- No government funds or guarantees will be required for development and management.
- The Management Board will take over the Proponent's management obligations and commitments as determined by the Project Agreement. The remaining commitments would be the developer's responsibility. These obligations will be finalised by the environmental review process. Once the obligations are defined then the degree of, and guarantee for, funding and the mechanisms and power of the Board can also be finalised. This factor was one reason why the Project Agreement could not be finalised in parallel with the ERMP without pre-empting the environmental process.
- The make up of the Management Board was determined by the government with a view to facilitating the development with the principal State Agencies involved in the approvals procedure.

9.5.2 COMMENT

Concern is expressed about who will be responsible for management and restoration of eroded beaches caused by the marina, access pathways and stabilisation fencing. This problem is not adequately addressed in the ERMP.

RESPONSE

The Proponent will be either directly responsible for management or responsible for funding the relevant government agencies by rates or sinking funds or other such mechanisms as required by the Project Agreement and other statutory licensing arrangements.

10. PUBLIC ACCESS AND BOAT RAMP

10.1 COMMENT

Eight submissions stated that the omission of a boat launching ramp from the proposal is considered unsatisfactory. The nearest launching facilities are at Safety Bay and the return journey from Port Kennedy to Safety Bay, in the afternoon, is quite hazardous.

RESPONSE

The two principal reasons for omission of a public boat launching ramp are:

i) In the ultimate development it is planned to exclude vehicles from the site to promote a Rottnest like "atmosphere". This requirement originates from the SPC Development Brief and is considered by the Proponent to be compatible with the intended use of the site.

ii) In view of the current lack of a management plan for the proposed marine park, the Proponent does not consider it responsible to propose inclusion of a boat launching ramp prior to further marine studies proposed by the Environmental Protection Authority.

Access to the marina and emergency facilities will be available if weather conditions make travel by small boat within Warnbro Sound hazardous.

10.2 COMMENTS

A very large section of vehicle beach access will be closed off to the general public and locals, this is also considered unsatisfactory.

RESPONSE

Increased use of the beach by the general public will occur as a consequence of the development. Therefore, vehicular access to the beach through the development will be restricted for reasons of public safety, as is the case with other metropolitan beaches. Management of vehicular access is also necessary to ensure the existing erosion of the dunes does not continue. Control of vehicles on the beach will remain the responsibility of the City of Rockingham.

10.3 COMMENT

It is suggested that if vehicles are to be excluded, then a bus from Rockingham should be organised.

10.4 COMMENT

It is unclear where permanent parking will be located. Parking facilities should be provided nearby to avoid long walks to the beach.

RESPONSE

Arrangements for exclusion of vehicles and provision of permanent parking will be planned in subsequent phases of the development and are not addressed in this ERMP.

10.5 COMMENT

Controlled and indiscriminate use of the area by off-road vehicles is not adequately addressed in the ERMP.

RESPONSE

The existing uncontrolled and indiscriminate use of the area by off-road vehicles is recognised by the ERMP as an unacceptable environmental impact. In areas of the site controlled by the Proponent, off-road vehicle use will not be permitted. Access to the rest of the site from the southern boundary of Stage 1 will be prevented by physical barriers. Access along the beach from north and south of Port Kennedy is a local government responsibility.

10.6 COMMENT

Commercial fishermen will be severely disadvantaged if access to the beach is denied.

RESPONSE

This aspect is addressed in detail in the response 13.5. In summary, it is proposed that access through the marina can be provided for licensed commercial fishermen.

10.7 COMMENT

Controlled access through conservation zones and foreshore reserves is supported.

RESPONSE

This is in accordance with the development proposal.

11. MARINA AND ITS IMPACT

11.1 COMMENT

Three submissions expressed the view that there should be no marina.

RESPONSE

The need for this type of facility is considered to be demonstrated by the popularity with the general public of equivalent facilities and the demand for boat mooring in the region.

The proposed marina is located in one of the most favourable positions in the metropolitan area for the following three reasons:

i) The northern coast of Becher Point is not subject to the significant littoral drift experienced on more exposed coastlines.

ii) Warnbro Sound is a well protected body of water and is ideal for water based recreation.

iii) The proposed site has shallow water depths of between 3 to 4m making construction simple and economical.

Thus in terms of environmental impact, fitness for purpose and economics this site is considered ideal for construction of a marina. Bridport Point is also the most southerly such site between Perth and Mandurah.

The proposal for a marina is in accordance with previous proposals for the site and the SPC Development Brief.

11.2 COMMENT

One submission from a government authority pointed out that the entrance to the marina is not clearly defined in relation to existing bathymetry (see Figures 5 of Volume 2, Figures 1.2 of Volume 3, Coastal Engineering Study and draft project agreement) but the assessment of water exchange in the harbour was based on an entrance channel 60m wide and 3.25m deep.

11.3 COMMENT

In view of the shallow inshore bathymetry at this location, a plan should be prepared detailing the extent and bathymetry of the entrance channel and the stability of the channel should then be reviewed by the Proponent.

11.4 COMMENT

"The length of the spur on the eastern breakwater can only be determined after the bathymetry at the entrance has been verified."

RESPONSES

The precise entrance location and configuration has not been determined. This will be the subject of detailed design once environmental approval has been granted.

The hydrographic survey undertaken indicates naturally occurring deep water quite close to the proposed entrance. Long term stability of the entrance channel is therefore not expected to be a problem.

The Proponent undertakes to provide a deep water channel to the marina. This will be designed to minimise wave penetration into the harbour and future maintenance dredging. The length of the spur groyne on the eastern breakwater will be determined during this detailed design phase.

It is expected that the detailed design will be done in consultation with and to the approval of, the Department of Marine & Harbours.

11.5 COMMENT

The volume of sand to be bypassed for the entrance channel was not determined. This should be addressed in the ERMP since the resulting maintenance costs could be excessive.

RESPONSE

The coastal engineering studies undertaken indicated that the extent of sand bypassing should be very small, less than 5,000m^3 in any one year. For a project of this size such sand bypassing should not be a significant economic consequence.

The stability of the entrance channel should be able to be maintained by the use of the spur groynes. Only occasional maintenance dredging should be required.

11.6 COMMENT

It was pointed out that the ERMP does not adequately address the fact that once the statutory approvals have been obtained for the marina, the responsibility for administering design and construction approvals including maintenance should rest with existing authorities. The responsibility for marina projects has been given by the 1986 cabinet, to the Minister for Transport who uses the Department of Marine & Harbours to manage and administer such projects. An assured source of funding must be identified to enable long term maintenance funds to be accumulated.

RESPONSE

The ERMP does not address these aspects in detail because legal obligations of the Proponent will be covered in the finalised Project Agreement and incorporated in the Project Lease.

Subject to the finalised Project Agreement the Proponent will undertake initial sediment bypass until responsibility is assumed by the Department of Marine & Harbours in accordance with the agreed terms.

Subject to the finalised Project Agreement, initial funding will be the responsibility of the Proponent. Subsequent funding for sediment bypass will be guaranteed by a mechanism acceptable to the Department of Marine & Harbours.

11.7 COMMENT

The consequences of sand movement due to the Port Kennedy marina have not been adequately addressed in the ERMP. It is reported in submissions that the groyne at the north eastern end of Warnbro Sound has caused Becher Point to decrease in length by 300m and a very deep channel has formed in previously shallow water. Silting has occurred at Safety Bay where boat launching is becoming increasingly difficult

and the beach at Warnbro is now washing away.

RESPONSE

The temporary groyne for Westport at the northern end of the Port Kennedy site was quite extensively monitored over a two year period. The shoreline measurements indicated that the direction of sand movement varied throughout the year and the net sediment transport rate was small, less than 5,000m^3/year.

Shoreline accretion/recession was restricted to about 300m either side of the groyne.

The temporary groyne would have had no impact on coastal changes at Becher Point or Safety Bay.

11.8 COMMENT

Concern is expressed about general erosion of the beach and dunes north of the proposed marina after it has been constructed. Studies to determine the effect of the development on Waikiki beaches are not apparent and should be addressed by the Proponent.

RESPONSE

Beaches to the north of the development will be monitored. Sand bypassing will be carried out should that monitoring indicate that there is a need.

11.9 COMMENT

It is stated in one submission that the beach near the marina has only recently built up and it is considered that a high capital expenditure development in these circumstance is inappropriate, because erosion could become an uncontrollable problem. Concern is expressed about the guarantee the Proponent will make when the existing environment is changed by the development.

RESPONSE

The beach near the marina is in an accretionary zone, as is the whole of Becher Point. The ERMP showed the accretion since 1912. Studies of the evolution of Becher Point (Woods and Searle, 1983), aerial and aerial photographic analysis indicates that the area was accreting well before that but no detailed survey data is available. Based on all the available information, erosion at this site will not be a problem.

11.10 COMMENT

The coast south of Becher Point has eroded 370m between 1924 and 1979 approximately 6.7m/year. The coastal reserve should be 700m because the Coastal Development Committee of the Town Planning Department adopted a 100 year planning horizon for this coast based on a coastal hazard line delimiting areas susceptible to wind and wave erosion.

The most appropriate use of areas on the seaward side of this line is for reserves for low intensity recreation and conservation. No permanent structures should be built in these areas. The ERMP does not address this decision.

RESPONSE

The area of erosion referred to is well outside the Stage 1 development addressed by the ERMP. There is no doubt that the planning of the area in question will need to take full account of long term coastal erosion.

Erosion south of Becher Point will be the subject of further studies for future stages of the development. The area is, however, not the subject of this ERMP.

12. OTHER FACILITIES

12.1 COMMENT

The opinion is expressed that adequate barbecue facilities are not provided in the development.

12.2 COMMENT

Submissions state that horse trails, cycle ways and footpaths are not adequately addressed in the ERMP.

RESPONSES

It is proposed to provide sufficient barbecue facilities, trails and footpaths to cater for the anticipated use of the site. The extent of such facilities will be defined by the Project Agreement.

12.3 COMMENT

Clubhouses for fishing groups are not provided in the development.

RESPONSE

Provision has been made to accommodate other groups and utilities needs. The Proponent invites the originator(s) of this comment to submit proposals directly for consideration.

12.4 COMMENT

A few submissions state that some cottages should have long term leases, eg 99 years.

RESPONSE

Lease arrangements between the Proponent and the Government have been defined by the Development Brief and will be in accordance with the requirements of the Project Agreement.

Sub-lease arrangements for the Regional Recreation Centre accommodation cannot be offered by the Proponent under terms which are more favourable than the lease arrangements in the Project Agreement.

12.5 COMMENT

Camping facilities are not adequately addressed in the ERMP.

12.6 COMMENT

One submission pointed out that a basic general store with liquor licence, administration building, bike and boat hire, rental cottages and chalets, leasehold cottage groups (similar to Point Peron) a caravan site (mostly on site) all need to be provided.

RESPONSES

Proposals for a caravan and camping site are under consideration by the Proponent at present, for location in subsequent stages. Other facilities outlined in this comment are planned in the proposed Stage 1 facilities and further similar facilities are proposed in subsequent stages.

12.7 COMMENT

One submission states that the proposed three storey building will be a scar on the horizon.

RESPONSE

The proposed building conforms with coastal planning requirements preventing high rise development. The location of the building has been chosen to maximise screening by the existing landform and proposed landscaping as outlined in ERMP Section 11.10.2.

13. OTHER SOCIAL AND ECONOMIC IMPACTS

13.1 COMMENT

No consideration is given to social and economic impacts (either negative, positive or opportunity costs) of the proposed development. This is a major omission and must be fully addressed before further assessment. Costs and returns have not been adequately discussed. "It is unclear what the venture constitutes as an initial investment and as an ongoing cost to the government, and what return can be expected on the investment. Moreover, the alternative use of such funds (ie, for development and management of a regional park) has not been considered. The lack of any opportunity costing of the development is a major omission and needs to be addressed before further assessment can be made.

RESPONSE

Social and economic impacts have been addressed in the ERMP, in particular in Sections 11.10 and 3.0 of the ERMP in accordance with the EPA guidelines.

This comment is founded on the assumption that government funds will be used for the development. It is clearly stated in the ERMP that the development will be privately funded and will not result in expenditure of capital during the construction phase or continuing cost to the community. Therefore, detailed financial analysis is not required. Briefly, the principal opportunities offered by the development are:

- The opportunity to develop a recreation facility for the Western Australian public and visitors to the state on a sheltered north facing beach, at no cost to the community.
- The opportunity to develop a management plan for the site as a whole and the significant areas set aside for conservation, at no cost to the community.
- The opportunity to develop water based facilities at one of the best sites for a marina in the metropolitan area, again at no cost to the community.

As discussed in responses to Comment 8.6, the Regional Recreation Centre will not impair compliance of the site's characteristics or its management objectives with the requirements of a regional park.

13.2 COMMENT

One submission states that "the 15 benefits of the project listed in the ERMP are in the majority very speculative in nature, fly in the face of current economic policy and are often untenable in the face of reports, statistics, and facets concerning similar ventures along our coast. The proposal will have much competition from Yanchep/Two Rocks, Mindarie Keys, Hillarys Boat Harbour, Observation City, Rottnest Island, the Fremantle Hotels and Harbour facilities, Woodman Point recreation areas, hotels and golf courses and some 35 sporting clubs and recreation centres in Rockingham, Warnbro, changes planned for Point Peron areas and the planned cultural centre and Ocean Marina in Mandurah." The view was expressed that international tourists would hardly go to Point Kennedy (Latest figures from 1986/87 for international, inbound travellers (216,800- 99% stayed within the metropolitan region). A large percentage were business travellers. In addition, the 5-star hotels in the metropolitan area had an occupancy rate of 53% in 1988, and 4-star hotels had an occupancy rate of 54%.

RESPONSE

The majority of the 17 benefits stated in ERMP Section 3.3 will be a direct consequence of the project proceeding and are not speculative.

Current economic policy supports growth of the tourism industry to encourage reduction of Australia's international debt and improve the balance of trade.

Extensive feasibility studies undertaken by the Proponent demonstrate the viability of the proposed project. The Proponent has proposed a means of funding which has been accepted by State Government agencies as a viable method of generating the income necessary, not only to provide a commercial return to the Proponent, but also to provide the funding for establishment and maintenance of the extensive public facilities.

13.3 COMMENT

One submission stated "there is no demonstrated need for the expenditure of $160M, albeit only for Stage 1."

RESPONSE

This comment is unclear. The need for expenditure of $160M has to be demonstrated to the supplier of the private capital for the project. As no taxpayers money, government loans, guarantees, assurances or funds will be involved in the development phase, there is no implicit requirement to demonstrate need for the expenditure to other parties. However, the $160M will include significant expenditure on public facilities.

13.4 COMMENT

The ERMP does not address the problem that the development and maintenance costs may fall back on the community and government. The original design concept by the MRPA was more realistic and affordable to the taxpayer.

RESPONSE

The community will be protected against the need to provide any funding by the Project Agreement.

The reason for considering private development in the SPC Development Brief for the Regional Recreation Centre was presumably because the funding of the MRPA proposal by the tax payer was not believed to be appropriate or affordable.

The development proposal provides public amenities, facilities and services at no cost or risk to the community.

13.5 COMMENT

Lights and noise associated with the marina plus actual removal of beaches will frighten fish from the area and physically prevent them from shoaling in the area, reducing economic gains of commercial fishermen. Appropriate consideration of the effects of the proposed development on commercial fishing operations is not addressed in the ERMP. The

marina will cover the main commercial fishing area. No indication is given in the ERMP that commercial fishermen will be able to fish within the marina confines. Specific valuation and documentation of similar habitat to be provided north of the proposed marina needs to be made. There is doubt that the new area will be used by fish stocks in the same abundance.

RESPONSE

Development of the marina would be unlikely to cause any significant changes to fish migration patterns or shoaling behaviour. Marinas at Ocean Reef, Hillarys, Success Harbour and the Fishing Boat Harbour at Fremantle have not caused noticeable adverse effects on fish migration. Migrating schools of fish which seasonally occur along this coastline would readily navigate around the marina and shoaling would occur elsewhere to the north or west of the marina site. The marina will alienate only 6% of the shoreline of Warnbro Sound, and its area of influence upon migrating fish will be unlikely to extend significantly beyond the marina boundary.

Commercial fishermen would not be able to fish within the marina harbour, but could continue to fish near the beach to the west and east. The marina will interfere with the commercial fishermen's unobstructed access along the beach, however, the actual inconvenience to fishermen that is due purely to the development will be only marginal, as outlined in the following.

Commercial seining for baitfish is conducted seasonally in Warnbro Sound by seven licensed fishermen from Mandurah and nine licensed fishermen from Cockburn -Rockingham. The licensed fishermen from Mandurah do not have beach permits, issued by the City of Rockingham, for this area of coastline so conduct their fishing operations from small boats. The Cockburn - Rockingham fishermen use four-wheel drive vehicles, for which free access along the beach would be obstructed by the marina.

The ability of commercial fishermen to travel along the Warnbro Sound shoreline is likely to be limited in the near future as a matter of course, due to increasing pressure from the growing residential population in the area. The entrance to the proposed Westport Canals, located 2km north from the Port Kennedy marina, will also obstruct vehicle movement along the beach.

Similarly, the ability of four-wheel drive vehicles to have uncontrolled access through the dunes and the area inland will be and should be prohibited.

13.6 COMMENT

In order to continue beach seining, fishermen need access to the beach in 4WD vehicles. Few metropolitan beaches are suitable for beach seining.

RESPONSE

Following discussions with a representative of the licensed fishermen, the Proponent considers access for fishing off the beach can be provided through the marina boat yard, subject to environmental and operational conditions. Permitted access would be restricted to the few licensed fishermen holding beach permits from the City of Rockingham. The option of using some of the marina pens for permanent moorings is also available. Access from the beaches will continue to be controlled by the City of Rockingham.

13.7 COMMENT

Compensation to fishermen is not discussed in the ERMP.

RESPONSE

As outlined in the two preceding responses, commercial fishermen would suffer very little inconvenience due to the proposed development, beyond that due to existing competing use-pressures upon the coastline. The Proponent has no responsibility to compensate the commercial fishermen who utilise the area.

13.8 COMMENT

The concern is expressed that there are no safeguards to ensure that the shopping precinct will compete unfairly with Rockingham business.

RESPONSE

The shopping precinct will operate in accordance with the requirements of the Development Brief and Project Agreement. The Proponent does not envisage significant competition with shops in Rockingham due to distance and contrasting use. Rockingham central business district is an established centre targeted to provide for the needs of the region. Port Kennedy is aimed at the holiday market which is predominantly sourced from new markets outside the region.

13.9 COMMENT

An approach road via Ennis Avenue will not benefit Rockingham business.

RESPONSE

Agreed. However, the project will be reliant on nearby suppliers for a wide range of service requirements with consequent benefit to Rockingham business.

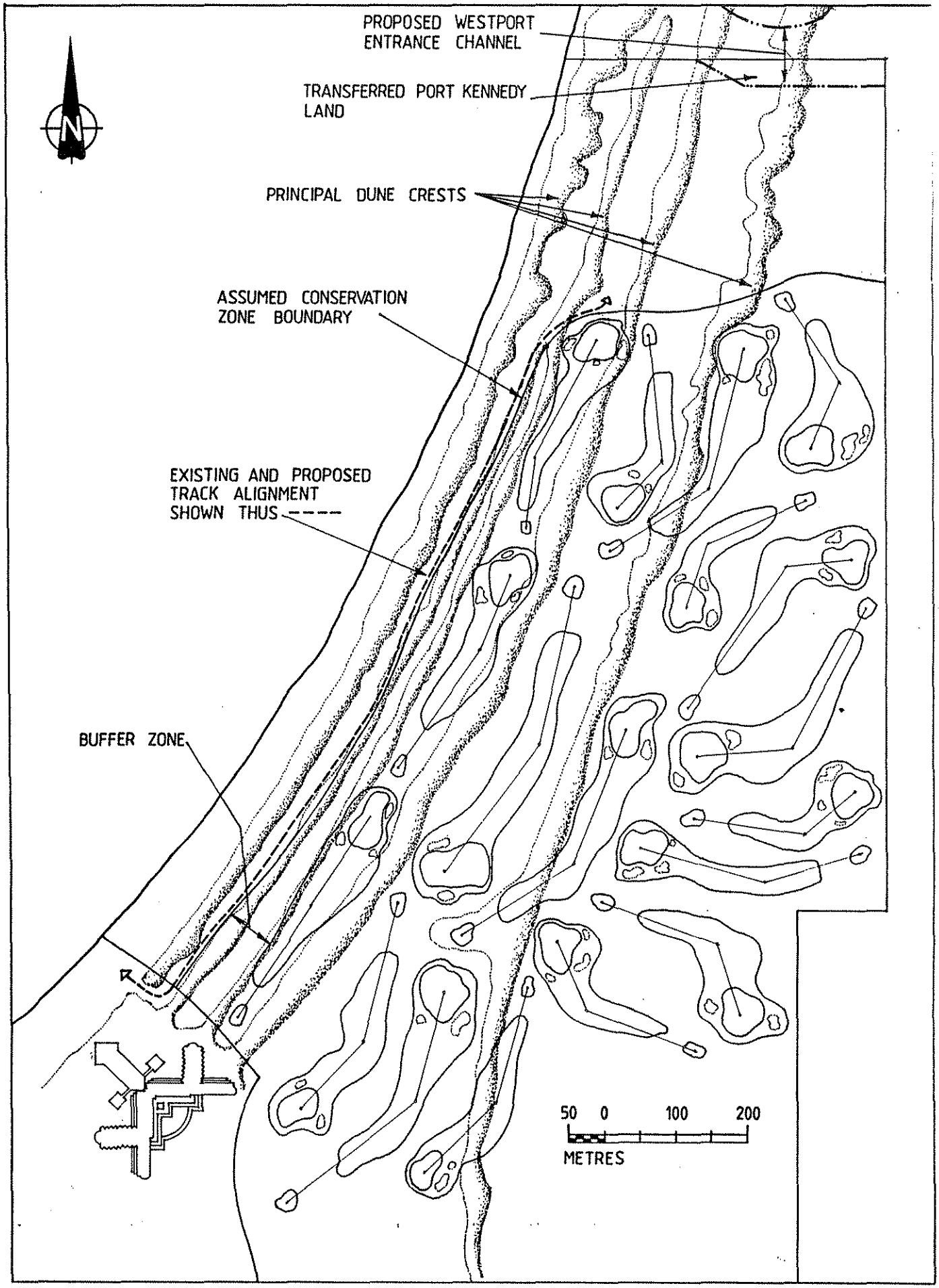
14. BIAS

14.1 COMMENT

The view was expressed that the report is biased and unfairly accuses present and prior users of the area of poor management.

RESPONSE

Some of the present and prior users have been demonstrably poor managers of the area. The Proponent does not consider this comment exhibits bias.



PORT KENNEDY JOINT VENTURE STAGE 1	PORT KENNEDY	PORT KENNEDY INDICATIVE PREFERRED GOLF COURSE LAYOUT

BIBLIOGRAPHY

BIBLIOGRAPHY

Bell, A (1988). Alien Dune Plants Reshape our Beaches: Ecos 54, 3-6

DCE (1983). The Darling System - System Six, Report 13.

Delta Holdings (1986). Westport ERMP.

Gerritse, RG; Barber, C and Adeney, JA (1988). The Effect of Urbanisation on the Quality of Groundwater in Bassendean Sands.

Kolenbrander, GJ (1972). The Eutrophication of Surface Water by Agriculture and the Urban Population. Dutch Nitrogenous Fertiliser Review, 15, 56-57.

MRPA (1978). Port Kennedy Regional Recreation Centre Design Concept.

Semeniuk, V and Searle, DJ (1985). The Becher Sand - A New Stratigraphic Unit for Holocene Sequences of the Perth Basin. J. Roy. Soc. WA. Vol. 67.

SPC (1986). Port Kennedy Regional Recreation Centre, Development Brief.

SPC (1987). Planning for the Future of the Perth Metropolitan Region.

SPC (1988). Rockingham Coastal Study.

Woods, PJ and Searle, DJ (1983). Radiocarbon Dating and Holocene History of the Becher/Rockingham Beach Ridge Plain, West Coast, Western Australia, Search 14:44-46.

APPENDIX 4

Summary of Past Use Proposals for Port Kennedy

PORT KENNEDY : BACKGROUND LEADING TO THE PRESENT PROPOSAL FOR DEVELOPMENT

FOR: J. SINGLETON

BY: D. MICHAELSEN

DATE: 28 FEBRUARY 1989

1. DEFENCE FORCE USAGE:

Before and during the Second World War, the land generally between the coast and the Lakes and south of Safety Bay Road was used by the Defence Forces as a practice range. It is not clear as the the precise location of the range, however, several unexploded shells have been discovered in the area to the east and north-east of Port Kennedy.

2. STEPHENSON-HEPBURN PROPOSAL (1955):

Stephenson and Hepburn considered that the Port Kennedy Townsite might be suspect in terms of development because of the high subterranean water level and potential flooding. They suggested that Rockingham and Safety Bay would continue to grow as a holiday centre and the BP oil refinery at Kwinana had given sufficient emphasis to ensure that residential development would extend adjacent to Warnbro Sound as far as Becher Point. Furthermore ..." Becher Point, at the southern end of Warnbro Sound, should remain in State Government ownership and, in the longer term, should be developed as a recreational area".

3. THE 1961 DEVELOPMENT PLAN:

The Town Planning Board adopted a policy that areas within the Port Kennedy Townsite should be made available on the basis of limited subdivision. As a consequence, the Town Planning Department produced a development plan for the area in 1961. On 6 June in that year, the Town Planning Board resolved to approve that proposed plan, which proposed a suburban-type subdivision in the north eastern and south eastern portions, divided by a large area of sporting and recreational facilities and institutional sites.

4. ILLEGAL SQUATTER SETTLEMENT:

Implementation of the 1961 plan did not eventuate despite strong interest shown be some groups and individuals. The State Housing Commission and the public enquired about purchasing lots within the planned subdivision, but squatter had already staked

their claims in the area up to 10 years before. The squatters were mainly holiday makers and/or professional fishermen. Since 1961 various attempts were made by the Lands and Survey Department and the Rockingham Shire Council to evict them but the squatters resisted these attempts and have remained there largely because of the lack of plans to utilise the area.

5. UNSUCCESSFUL PROPOSALS:

One proposal was made by the Mines Department in which it applied for practically the whole of the Port Kennedy Townsite for storage of explosives as an alternative to the existing explosives depot at Woodman Point.
The Rockingham District Greyhound Racing Club applied to the Rockingham Shire Council in December 1972 for a 21 year lease of a 10 hectare portion of Lot 584 for use as one of the alternative locations for the establishment of a greyhound racing track.

6. INSTITUTIONAL USES:

Institutional uses have attracted a lot of interest in the Port Kennedy area. Since the mid-1950's various institutions have applied for land for the construction of various campsites. In August 1960, the Town Planning Department indicated that a welfare camp area would be established at Port Kennedy. The prime purpose of that camp would be to cater for all the institutions which were not able to secure camps at Point Peron because of lack of space. The release of the land was deferred pending the completion of the 1961 plan for Port Kennedy. The plan was, however, abandoned and no allocation of land took place. Further attempts to secure a leasehold for campsites were also unsuccessful for a variety of reasons until, in 1974, a separate 16 hectare reserve in the southern section of the Townsite was created and vested in the Department of community Welfare. Following several site meetings between representatives of a number of affected and involved government departments, the Department of Community Welfare proceeded to develop its site in accordance with environmental guidelines.
The YMCA also applied to the Lands and Survey Department for a campsite lease.
In 1969 the State Electricity Commission proposed a power generating station, either thermal or nuclear, at Port Kennedy. It was planned to use a 165 hectare site extending over approximately 1.5 kilometres of the coastline. However, anticipated future grant of the South West Corridor indicated that Port Kennedy was not the best location for such a power station, and it was decided to locate it 45 kilometres north of Perth.

8. CABINET REQUESTS:

Along with the decision to relocate the proposed power station north of Perth, the then Minister for Town Planning (Hon. L.A. Logan, MLA) recommended to Cabinet in March 1970 that -

1. The Port Kennedy Townsite area be reserved for Parks and Recreation and that this be formalised through the Minister for Lands and the Metropolitan Region Planning Authority (MRPA).

2. Investigations proceed through the Tourist Development Authority in liaison with the Local Authority and the Town Planning Department on the Planning of the area for tourist and recreation purposes.

3. An alternative site be selected for the location of the proposed power station.

In September 1971 Cabinet adopted a recommendation by the Minister for Town Planning (Hon. H.E. Graham, MLA) that the whole of Port Kennedy Townsite area should be reserved for public recreation and that industry should be excluded. The Government then revoked the 1969 order which stated that the northern portion would be set aside for a State Electricity Commission power station.

9. THE 1971 SCHEMATIC OUTLINE PLAN:

This plan was developed to support the press statement which followed the Cabinet decision. It was a re-definement of the 1969 Development Plan. It incorporated a yacht club and jetty, a hotel and shopping and civic facilities, as well as a golf club and large areas of caravan and camping grounds and hotel accommodation.

10. THE PORT KENNEDY RECREATION CENTRE CONCEPT:

In 1978, a report on the Port Kennedy Recreation Centre concept was prepared by the Town Planning Authority, in response to the directive from Cabinet stating the a substantial area of Port Kennedy should be reserved for public recreation. The report put forward a design concept for a regional recreation centre at Port Kennedy providing a wide range of sporting, recreational and leisure facilities at moderate user costs to cater for the increasing demand.
A draft of this report was endorsed by the MRPA and Cabinet gave approval to the general concept for the area.

11. COMPLEMENTARY STUDIES:

1. THE LAKES REGIONAL OPEN SPACE STUDY was completed by the own Planning Department in June 1971 and was adopted in principle by the MRPA in August 1972.
The study aimed at the formulation of a design concept for the development of the area including and surrounding Lake Cooloongup and Lake Walyungup. Public recreation activities, the conservation of wildlife and the local ecology were prime considerations.

2. In 1972, the Coastal Development Committee was appointed to advise the State Government on a variety of questions relating to sand drift and sea erosion. It reported its findings in the first half on 1984.
The Port Kennedy coastline presented one of the worst cases of beach erosion in the State, and the findings of this report suggested means by which to overcome those problems.

3. In January 1974, T.S. Martin and Associates was commissioned by the MRPA to undertake a study of the South-West Corridor as a part of a continuing review of Corridor development proposed by the Authority. The main purpose of the study was to prepare a report recommending a strategy for Corridor development up to the end of the century.

4. The Department of Conservation and Environment initiated the "Red Book" study of conservation Reserves for Western Australia in 1972. The aim of that report was to identify opportunities for setting aside areas of land in the most intensively used part of this State for the purpose of conservation of natural areas and recreation in natural surroundings. The "System 6" study recognises the high conservation value of the area because "there is little similar land available between Fremantle and Mandurah".
The study also recognised that the area constitutes open space of regional significance because of its high conservation and recreation values, and its proximity to the Perth and Mandurah residential areas. However, the report also states that the land tenure is varied and not all the land has conservation as primary management objectives.
Important management considerations include encouraging growth and regeneration of local indigenous flora, removing shacks and tracks from the area and providing direct public access to open space of regional significance.

On 19 March, 1984, State Cabinet accepted in principle Part I of the report and approved the progressive implementation, as far as possible, of the detailed recommendations in Part II.

5. In December, 1984, the Centre for Applied Business Research of the University of Western Australia released a report it had prepared for the Department of Industrial Development. The

objective of this study was to examine broad development opportunities within the Rockingham Shire and to consider the formulation of an appropriate development strategy. That report discussed the development of recreational facilities at Port Kennedy in terms of the economic strategy of the region.

In March, 1985, the State Government invited suitably qualified applicants to register their interest in being appointed to carry out a development project at Port Kennedy. It was proposed that a parcel of Crown LAnd was made available for development of a resort centre in return for a developer carrying out at least the first stage of development containing holiday, recreational, sporting and leisure facilities. The Port Kennedy Interim Management Committee, after considering the submissions, agreed that short-listing of developer proposals should not take place prior to the preparation of a brief covering overall proposals to which potential developers could respond in more detailed and definite terms.

In May, 1985, the Minister for Planning, HON. R.J. Pearce (MLA), announced the Government's decision to review the Perth Corridor Plan and the Metropolitan Region Scheme (MRS). Responsibility for the review was given to the MRPA and passed to the State Planning Commission in December 1985. The Review Group presented its report ot the SPC in October 1987. The Report reiterated the importance of the Regional Open Space System and included Port Kennedy in the Parks and Recreation Reserves.

==========

APPENDIX 5

Port Kennedy Regional Recreation Centre Development Brief

PORT KENNEDY

REGIONAL RECREATION CENTRE

DEVELOPMENT BRIEF

GOVERNMENT OF WESTERN AUSTRALIA
STATE PLANNING COMMISSION

SECTION 1

1.1 BACKGROUND

In 1978 the State Cabinet approved a proposal by the Metropolitan Region Planning Authority for recreation development on 700 ha of Crown Land at Port Kennedy, south of Rockingham. The proposal included public rental or leasehold cottages and chalets, caravan parks, camping grounds, organisation camps and sporting facilities, a boat harbour, civic, commercial and cultural facilities, and a hotel/motel.

In March 1985 the Government of Western Australia invited suitably qualified applicants to register their interest in being appointed to carry out a development project at Port Kennedy.

The Port Kennedy Interim Management Committee, after considering the submissions, agreed that short-listing of developer proposals should not take place prior to the preparation of a brief covering overall proposals to which potential developers could respond in more detailed and definite terms.

1.2 INTRODUCTION AND OBJECTIVES

It is the intention of the State Government to ensure that there are coastal recreation facilities available for all of the population and visitors.

It is proposed that the development of Port Kennedy should occur as a well-planned year-round tourist and recreation facility available primarily to middle and lower income families and groups, as well as to whatever other market sectors are selected by the Developer, and be compatible with similar nearby developments.

It is also intended that the initial and ongoing development of Port Kennedy will provide employment opportunities for the area.

In principle it is proposed that a parcel of Crown Land be made available for development of a resort centre in return for a developer carrying out at least the first stage of development containing holiday, recreational, sporting and leisure facilities.

1.3 NEARBY EXISTING OR PROPOSED DEVELOPMENTS

Port Kennedy is located between the sub-regional centre of Rockingham and the coastal resort town of Mandurah. The Becher Point area of the site forms the southern part of Warnbro Sound.

The following is a brief description of known proposals for the development and use of land immediately adjacent to Port Kennedy. Additional information and details should be obtained directly from each party involved.

Proposals of a Tourism and Recreation nature for the Rockingham and Mandurah area have not been identified specifically and respondents are referred to the Reference Information to obtain details to assess the impact and influence of those proposals.

1.3.1 Secret Harbour

A development by Secret Harbour Pty. Ltd.

Immediately to the south is the Secret Harbour project.

Secret Harbour is in the process of being developed into a water lifestyle-oriented residential and resort development and yacht harbour on a 469 hectare site.

It is proposed to contain approximately 5300 residential units/townhouses and houses and about 1100 strata title living and holiday units with an international standard resort/hotel/convention/ entertainment complex.

The development is proposed to eventually support a population of 15,000.

The population will be supported by schools, localised shops, taverns, churches and community facilities.

Secret Harbour, although aimed at the higher income market, will be complemented by Port Kennedy proposals and has Government support.

Secret Harbour Pty. Ltd. is presently completing its submissions for the approval of the Minister for Planning under the terms of an Agreement with the State Government (Tourist Development [Secret Harbour] Agreement Act) and putting in place the financial package to enable commencement of the development of the harbour and adjacent Stage One releases. Development will commence in 1986/87. That part of the project adjacent to the southern boundary of the Port Kennedy land will not occur until 1995. The project will take approximately 15 years to finalise.

1.3.2 Westport

A development by Delta Holdings Pty. Ltd.

Immediately to the north is the Westport Stage One project.

At Stage One this development will comprise 234 fully serviced residential lots.

Over the next seven years, it is proposed that facilities include a golf course, yacht club, marina and launching ramp, and wetland sub-division which will have approximately 2500 residential lots.

The first 80 lots are being sold.

1.3.3 Southern Districts Thoroughbred Association

The Association proposes to establish a horse training and racing complex by leasing approximately 90 hectares of the land known as 'Lark Hill' which is Government-owned.

The Association has been formed to advance the thoroughbred industry in the south-west corridor.

It is proposed that a training track will be progressively developed in three stages to full international race course standard and will also involve other equestrian uses such as polo, show jumping and riding schools.

The need for such a facility has been demonstrated to provide for the continued expansion of the racing industry in Western Australia which is resulting in overcrowding and restricted use of other venues. In this location, ideally suited to the purpose, such a facility will be adjacent to an increasing horse population in an area suitable to the rearing of horses.

The State Planning Commission and Shire of Rockingham support in principle this development.

The present status of approval for the proposal is that the Metropolitan Planning Council has resolved to advise the Association that the State Planning Commission is prepared to enter into a lease agreement for a period of 21 years subject to satisfactory resolution of special conditions.

1.3.4 Lark Hill

The area known as Lark Hill was acquired by the then Metropolitan Region Planning Authority to consolidate a number of larger holdings for community purpose use.

1.3.5 Rockingham Lakes Regional Park

The State Planning Commission has prepared a Report proposing a framework and strategy for the management and development of the Rockingham Lakes Region Open Space. The concept provides for a range of developments as well as retention of large tracts of bushland in order to achieve a balance between recreation/leisure uses and conservation objectives.

Development within the Region Open Space will remain in abeyance until power to undertake and permit development is resolved and a Management Body is appointed.

The area covered is approximately 2667 hectares of which 1787 is dry land.

The planning strategy for the South-West Corridor includes the Rockingham Lakes Region Open Space as part of the overall open space system within the Corridor.

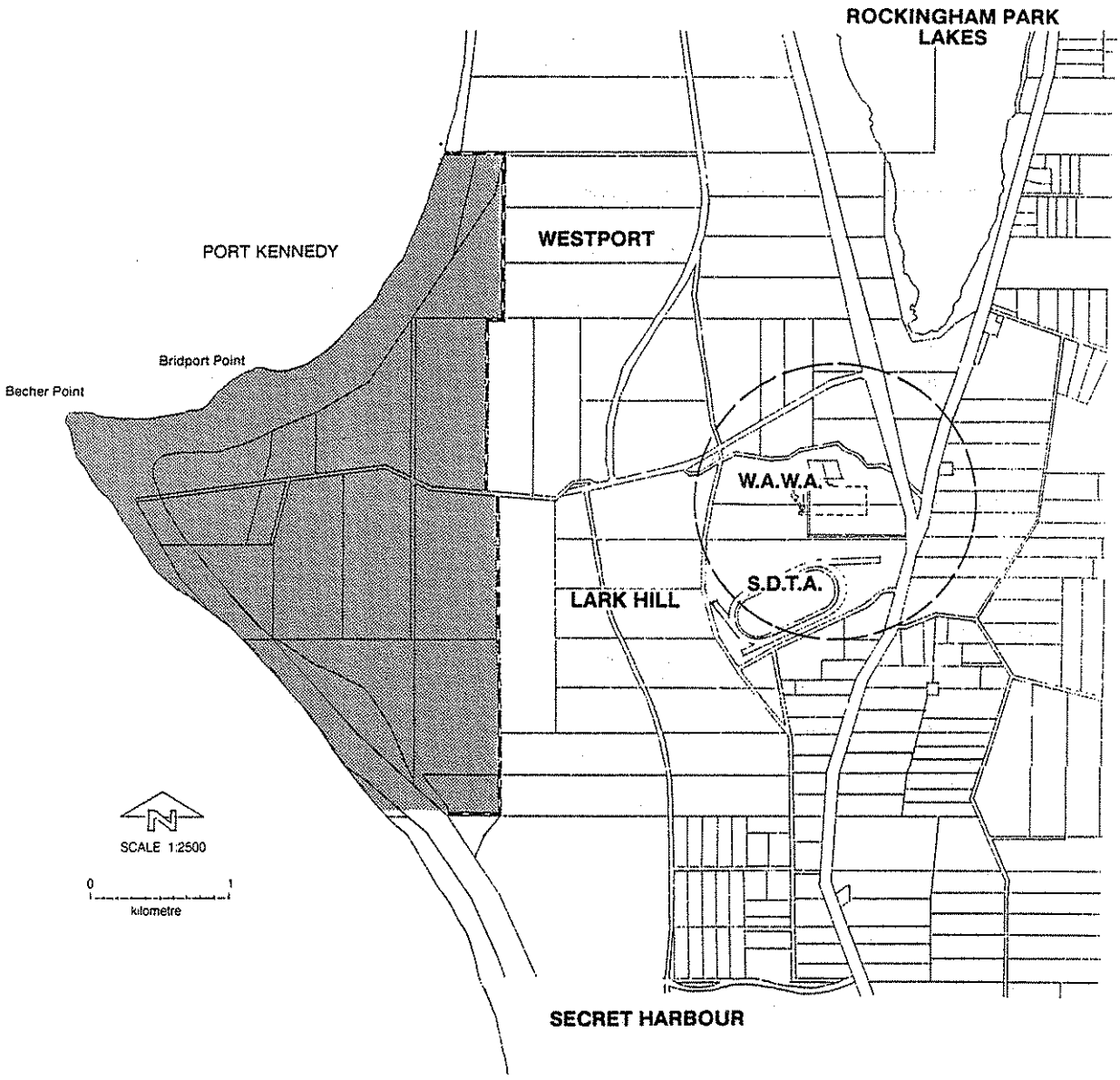
The Report acknowledges that the rapidly increasing urbanisation of the surrounding region suggests that pressure to use the Lakes Region Open Space for recreation and leisure activities will increase.

1.3.6 Port Kennedy Wastewater Treatment Plant

The Water Authority of Western Australia proposes to have its Port Kennedy Wastewater Treatment Plant on lots 766 and 767 ready for operation by April 1986. It will initially service the Westport Project and later Secret Harbour and other developments.

Whilst the Authority is strongly opposed to new permanent residential development within a zone of one kilometre radius from the inner Plant boundary the racing complex, which is immediately to the south, is considered an ideal use for neighbouring land.

The operation of the Plant will not affect use of groundwater for irrigation purposes.



LOCALITY MAP

SECTION 2

2.1 STAGE ONE

The Government recognises that financial viability of a development will largely be dependent on early establishment of income-producing facilities and financing capacity.

Proposals therefore can be based on the Government considering the transfer of up to 25 hectares of Crown Land to freehold ownership. The area to be considered should preferably be within the vicinity of Bridport Point.

It has been agreed in principle that freehold ownership land could be developed for the following types of activities as a Resort Centre:

(i) Retail (for seven day trading refer to Section under 'Government Assistance')

(ii) Tavern/restaurant

(iii) Hotel-family holiday related to beach activities

(iv) Low-rise condominium units

(v) Cottages/cabins for rent

(vi) Civic/cultural/entertainment

(vii) Health Resort/over 55's specialisation

Proposals may include other forms of recreational or tourist development for consideration as options, particularly those which are not dependent on seasonal factors.

Timeshare development would be considered on the basis of a joint venture arrangement with the Management Body.

Development of freehold ownership land will not be agreed for sub-division for sale for single or multiple residential development.

Agreement will not be given to transfer to freehold any harbour, canal, boat mooring or launching facility or any area of public beach.

Adjoining or adjacent areas could be developed on long-term leasehold individual sites for the following types of activities:

(viii) Cottages/cabins for rent

(ix) Caravan parks

(x) Camping grounds

(xi) Dude Ranch — related to equestrian activities

(xii) Organisation camps (sporting or community interest groups)

- It is proposed that those worthy groups, which at present occupy "holiday camp" sites at Point Peron on leases, which will terminate commencing in 1993, will be offered the opportunity to relocate their activities to Port Kennedy.

  There are presently 15 such leases and it is estimated that per annum overnight stays of visitors to the facilities are approximately 50,000.

  Any development of this nature will be required to strictly comply with Development Guidelines.

  Similar community interest groups will be provided with the opportunity to participate in development of leasehold areas of Port Kennedy and concept planning should provide accordingly.

(xiii) Sporting facilities — training camps

- The Western Australian Sport Federation has advised that the provision of an international standard Water Sports Centre for rowing, canoeing and water ski-ing, in which the respective associations have agreed to a joint development, is currently the highest outstanding priority for International Standard Sports Facilities in Western Australia.

  The Federation is aware of the potential of Port Kennedy as being a very attractive realistic opportunity to develop such a facility.

The basic water area requirement determined by a rowing course, is a water dimension of 2200 x 135 x 3.5 metres oriented with the prevailing winds.

- The South West Metropolitan Tourism Development Plan prepared for the South West Metropolitan Local Authorities Group recommended that serious consideration be given to a large multi-purpose sports stadium in the hinterland of Cockburn, Kwinana and Rockingham as a venue for potential world standard events.

First stage development is to include free public beach facilities including barbecue/picnic, ablutions and food kiosks.

First stage development of a Resort Centre should take into account development at an appropriate time of a leasehold large deep-water boating harbour facility including public, commercial, fishing and marine repair facilities and allow adequate land area to service this facility with activities such as:

- Fueling
- Bait supply
- Fish sales
- Ship chandlering
- Waterside seafood restaurant (as tourist attraction)
- Oceanarium
- Boat Launching
- Diving requirements
- Ferry jetty/hovercraft docking
- Boat/yacht/bicycle hire
- Boatel

Stage One will be required to include establishment of the identification of Port Kennedy by way of:

- Marketing Theme
- Logo
- Main Entrance as an impressive entrance to the Centre.

Proposals will be required to demonstrate the integration of:

- Freehold and leasehold lands.
- Stage One and the balance of Port Kennedy.
- Port Kennedy with adjoining land and other proposed developments.

2.2 FURTHER STAGES

It is proposed that during the formulation and preparation for Stage One, the Management Board, with the selected Developer, will develop a Master Strategy Plan for the staging and nature of ultimate development and management of Port Kennedy Regional Recreation Centre.

2.3 DEVELOPMENT GUIDELINES

The development of all buildings, landscaping, signage and street furniture will be required to create a special "Port Kennedy" character.

Development agreements will require stringent controls of building and development standards to be maintained such that:

(i) All structures shall be designed having regard to suitable materials, finishes and colours to accord with the natural character of the locality and in keeping with those used in the rest of the development. Building materials, methods and finishes will be required to be simple and cost beneficial.

(ii) Landscaping will be required for shading and screening purposes and to enhance the character of the locality.

(iii) Vehicles, other than provision for trade and essential service vehicles, shall not intrude into areas of development. Carparks shall be located for the operation of a Port Kennedy internal free transport system between the various activities by a variety of methods such as:

- mini bus
- pony carts
- horse trails
- cycle paths
- walkways

depending on distances and volumes.

(iv) A comprehensive, co-ordinated signage system for use within the centre, distinctive to Port Kennedy will be developed.

SECTION 3

3.1 MANAGEMENT

The Government has appointed an Interim Management Committee to initiate a process for the development of the Port Kennedy Area.

The Interim Committee considers the future management of the Regional Recreational Centre of Port Kennedy of a Board of Parks and Reserves under the provisions of the Parks and Reserves Act 1895-1985 is most appropriate.

Such a Board to control development management could consist of representatives from, as Governor's appointees:—

- President
- Shire of Rockingham
- Western Australian Tourism Commission
- Developer
- Government Nominee (Western Australian Development Corporation)

It is intended that the Board will operate with an Executive Officer from offices within the civic facilities of the Resort Centre in conjunction with a Tourism Promotion Office — Centre.

It is proposed that the Board will eventually have under its control an area of approximately 4000 hectares encompassing Port Kennedy, Lark Hill and the Rockingham Lakes Regional Park.

3.2 ROADS

The Government recognises that suitable road access into the area is a prerequisite of Stage One development.

Assistance will therefore be provided to progress construction, by those authorities responsible, of sections of the Major Road Network needed for access.

The section of roadworks required will be dependent on the rate of progress of other nearby adjoining projects and the timing of Stage One development. As such, at this time definite proposals cannot be given.

3.3 SERVICES

The Government recognises that provision of services will be a prerequisite for operation of Stage One.

Headworks services to the Port Kennedy site vicinity are at present limited.

The Government will provide assistance to progress the construction of services in conjunction with adjacent residential sub-division development to accelerate their provision and avoid duplication.

3.3.1 Water

Existing water supply mains in the area are inadequate and the Government will assist the developer in discussions and negotiation with the Water Authority of Western Australia for the provision of mains service. Reticulation of water supply within the development will be the responsibility of the developer.

The southern portion of the Port Kennedy site is within the Peel Groundwater Area. A licence will be needed from the Water Authority of Western Australia to extract ground water for irrigation purposes. The licence would be subject to area required to be irrigated related to availability of supply.

3.3.2 Sewerage

It is anticipated that any development will require deep sewerage because of the high ground water table.

The Water Authority of Western Australia has advised that it proposes to have its Port Kennedy Wastewater Treatment Plant on lots 766 and 767 operating by April 1986. It will initially service the Westport Project to the north, and later the Secret Harbour Project to the south.

3.3.3 Drainage

Resulting from the high ground water table levels and the low profile of the land in relation to sea level, areas of marshland occur in inland portions of the site.

It is anticipated that sub-soil and storm water drainage will not present undue engineering design difficulties and may lend itself to creation of artificial lakes for engineering and landscaping purposes.

3.3.4 Electricity

Provision of power into the site will occur as an extension of the general Rockingham sub-station system to meet requirements as they arise.

Mains and distribution of all services will be required to be underground.

3.4 GOVERNMENT ASSISTANCE

Because the Government places strong emphasis on sporting, cultural and recreation opportunities for all sections of the community and has identified tourism as a growth area, it is committed to assistance with the development of Port Kennedy Recreation Centre.

In addition to the assistance which will be provided referred to in earlier sections, the Government will actively support a Developer in the following areas:

3.4.1 Western Australian Tourism Commission

The General Manager of the Western Australian Tourism Commission has provided the following statement of the tourism potential for the area.

"A unique opportunity exists for the integrated development of a major tourist complex at Port Kennedy.

The 700 hectare coastal site will facilitate many tourism/recreational developments to cater both for the Perth metropolitan area and visitors to and from within the State in general.

Port Kennedy is one of the few metropolitan coastal locations which boasts a northerly aspect, thereby providing a beach front which is relatively protected from the prevailing south-west breezes experienced along the west coast.

The white sands and clear water will be one of the most attractive features of Port Kennedy, which will also include other land-based sporting and recreational pursuits.

Less than one hour's drive from the centre of Perth and 30 minutes from the historic city of Fremantle, the centre for Australia's first defence of the America's Cup, Port Kennedy is well placed to be developed as a major tourist precinct providing specially designed all-year-round tourist facilities and attractions."

The Commission has a broad function and financial flexibility to attract more tourists and plan and co-ordinate the industry's development.

Because of its many varied fields of activity the Commission will provide a support role by way of input from studies, advice, and access to market research.

Finance

Under the terms of the Act, the Western Australian Tourism Commission is able to participate on financial aspects of tourism development:—

- by facilitating loans
- by guaranteeing loans
- by equity arrangements

its role being that of a facilitator in obtaining finance for tourism ventures. The Commission is able to provide assistance and guidance to intending tourism developers in assessing the feasibility of a project and with the presentation of ideas to financial institutions.

Although the main thrust of the Commission's policy is directed at assisting developers to obtain finance through private sources, cases where difficulty is experienced in obtaining such finance may be considered suitable for other forms of assistance.

Provided that a projected venture appears viable, desirable and likely to generate further tourism investment, the Commission may, subject to certain criteria, specifically assist by way of guaranteeing loans or by equity involvement in a project.

Eligibility for such financial aid is restricted to assisting with the establishment, construction, development and improvement of projects which will maintain or improve the tourism facilities of Western Australia.

Grant funding may also be made available, which is invariably restricted to shires or non-profit organisations, or for projects on either freehold or leasehold land which is vested for public purposes such as will be the case in this development.

Government Guarantees

A Government guarantee may be made available to approved applicants to borrow for their capital needs, including working capital, where the proposal has not been able to attract finance from normal sources.

Equity Participation

It is in the interest of the industry that the provision of adequate tourist accommodation facilities to a limited extent precede demand. The encouragement to provide a facility in advance of immediate demand has been shown to be extremely important in areas where demand can be expected to grow.

Therefore the Commission is available to examine offers to become involved in tourism projects on an equity participation basis. At its discretion, the Commission may:

- Make arrangements for or participate in the formation of a company of which the objectives include the development or operation of tourism facilities in Western Australia.
- Subscribe for or otherwise acquire and dispose of shares in such a company.
- Exercise any right conferred upon the Commission to appoint a director of or hold office in a company.

In examining such applications priority will be given to assisting with the establishment, construction, development and improvement of projects which will maintain or improve the tourism facilities of Western Australia in decentralised areas.

3.4.2 Other Finance Sources

The Government will provide guidance, assistance and support for the Developer and sub-lessee bodies to obtain Capital Grants from sources providing funds for community sporting and recreation facilities and tourism development.

Funds to assist in development equipping community and sporting organisations may be available from the agencies listed below:

- Department for Sport and Recreation
- Tourism Commission
- W.A. Heritage Commission
- Sports Instant Lottery Fund

3.4.3 Clearance of Squatters' Shacks

The Shire of Rockingham has undertaken to prepare and distribute to squatters notice of impending development, with advice that they are required to vacate and remove shacks.

A developer will not be required to become directly involved with the removal of squatters.

Any clearance costs over and above those recoverable from occupiers will be part of the development cost for Stage One.

Expressions of interest have been received from squatters who could be prepared to take up leasehold land. Any such development would be required to strictly adhere to Development Guidelines.

3.4.4 Unrestricted Trading

The Interim Management Committee recognises that seven day retail trading will be a strong attraction to the Resort Centre, particularly for weekend day trippers when most of the Metropolitan Area retail trading may be closed.

Whilst the Resort Centre may not contain substantial grocery retail activity, the removal of restrictions on trading will enhance the likelihood of casual visitors and the viability of businesses.

The Board of Management will make strong representation for removal of restrictive trading regulations and implementation of facilities reflecting modern business environment, particularly as related to tourist destinations.

3.4.5 Warnbro Clearance Area (Unexploded Ordnance)

In common with most of the Warnbro locality, the subject land is affected by a former artillery range. Although the land has been electronically searched and cleared of unexploded ordnance there is a small risk of remaining material. Further deep searching can be organised through the State Emergency Service at the expense of the Commonwealth Government. This is particularly important in respect of laying services such as gas lines, water mains, or deep sewerage. Matters concerning responsibility for future development are currently being addressed through a proposed amendment to the Shire of Rockingham District Town Planning Scheme.

SECTION 4

4.1 SUBMISSION REQUIREMENTS

It is expected that the study approach to prepare a submission will entail a review and analysis of:—

- All pertinent background information.
- Regional and local planning policy.
- Existing or proposed projects which will impact on the site.
- Climatic and environmental conditions.
- Relevant statutory authorities regulations and by-laws and the need for approvals.
- Site physical characteristics.
- Existing tourism infrastructure.
- Regional recreational and tourism potential.

and will require discussion and liaison with a number of Government Departments and Agencies, including:—

- Water Authority of Western Australia
- Main Roads Department
- Shire of Rockingham
- Department of Sport and Recreation
- Western Australian Tourism Commission
- Department of Conservation and Environment
- Marine and Harbour Department
- Lands and Survey Department

4.2 SITE DEVELOPMENT MASTER PLAN

Submissions shall basically be in the form of a Master Development Plan which shall contain as a minimum requirement:—

4.2.1 Descriptive Report

A report to address the following matters:—

1. Development objectives.
2. Analysis of perceived site development opportunities and constraints.
3. Development parameters and guidelines.
4. Outline of services suggested as required to be provided by the government and those by the developer.
5. Management aspects.
6. An outline of ability, sources and/or proposals to finance development of the project.
7. Suggested outline of form of Agreement including between Developer-Government and Developer-Leaseholders.
8. Proposals for marketing/theme/logo.
9. Servicing and maintenance.
10. Development stages.

SECTION 4

4.2.2 Development Plan

Drawings to show:—

1. The location of land and water use and activities, siting and building types and general landscaping proposals.
2. Road patterns and circulation routes and trails and parking areas.
3. Location and amount of freehold land required up to a maximum of 25 hectares.
4. Which developments occur in Stage One.
5. The proposed development of further stages.
6. Integration with adjoining developments.

4.2.3 Programme

Descriptive and graphic representation to show the following activities in a time scale:—

1. Environmental Reviews.
2. Design and documentation including consultation and approval periods.
3. Construction of Stage One including tendering and approval periods.

4.3 LODGEMENT OF SUBMISSION

Submissions are to be delivered addressed to:—

The Chairman,
State Planning Commission,
22 St. George's Terrace,
Perth, Western Australia, 6000.

on or before the date to be advised in a letter of acceptance for a submission in response to this Brief.

4.4 QUESTIONS

During the period allowed for response to this Brief, questions, desirably in writing, should be addressed to:—

The Chairman,
State Planning Commission,
22 St. George's Terrace,
Perth, Western Australia, 6000.

marked for the attention of Mr Peter Gleed.

APPENDIX 6

System 6 Recommendations for M101 and M106

M101 CAPE PERON, SHOALWATER BAY AND WARNBRO SOUND

The recommended area is situated off the coast between Cape Peron and Port Kennedy and comprises Reserve A17070, for Recreation, Camping and Enjoyment by the Public and Purposes Ancilliary Thereto; Reserves C24204, C31893 and C31894, for Conservation of Fauna, all vested in the W.A. Wildlife Authority; and four small islands — Passage Rock, First Rock, Second Rock and another between White Rock and the mainland — being vacant Crown land (Figure 159).

Penguin Island, Reserve A17070, is the subject of a management plan being developed by the Department of Conservation and Environment together with the National Parks Authority, for the enhancement of the Island's high conservation, education and recreation values. The area is affected by the construction of the Cape Peron effluent disposal pipeline.

The waters around Cape Peron contain a variety of marine habitats ranging from sheltered seagrass meadows to more exposed limestone reefs and cliffs with tidal and sub-littoral reef platforms. The fauna and flora of the reefs exhibit well marked patterns of zonation. The range of reef and seagrass communities are of high value in the teaching of ecological principles, being close to the metropolitan area and easily accessible, in contrast to offshore islands.

Reserve C27853, at Cape Peron, is used intensively for recreational activities most of which are based on the beaches and near-shore waters. With increasing use of the recreation reserve in recent years, there has been severe diminution of rock fish inhabiting the inshore reefs. Abalone, once plentiful on reef platforms, have almost disappeared. There is a need to protect the marine life around the Reserve, with people being free to dive and view the seascape but not to remove fauna or flora, nor to damage the substrate.

Penguin Island has a similar flora to the slightly larger Carnac Island (C46).

The islands of Shoalwater Bay and Warnbro Sound and Carnac Island, are the most northerly nesting area for the little penguin. At least seven other species of birds nest here. The Sisters and Tub Rocks groups are important rookeries for the pied cormorant. Being close to the mainland the islands are convenient for research.

The recommended area constitutes open space of regional significance (see Figure 1, Chapter 4) because of its high conservation, education and recreation values and its proximity to the Perth residential areas. Important management considerations include: the protection of the marine fauna; a detailed survey of the area's marine resources; and restriction of public access to areas of high conservation value.

Recommendations:

M101.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

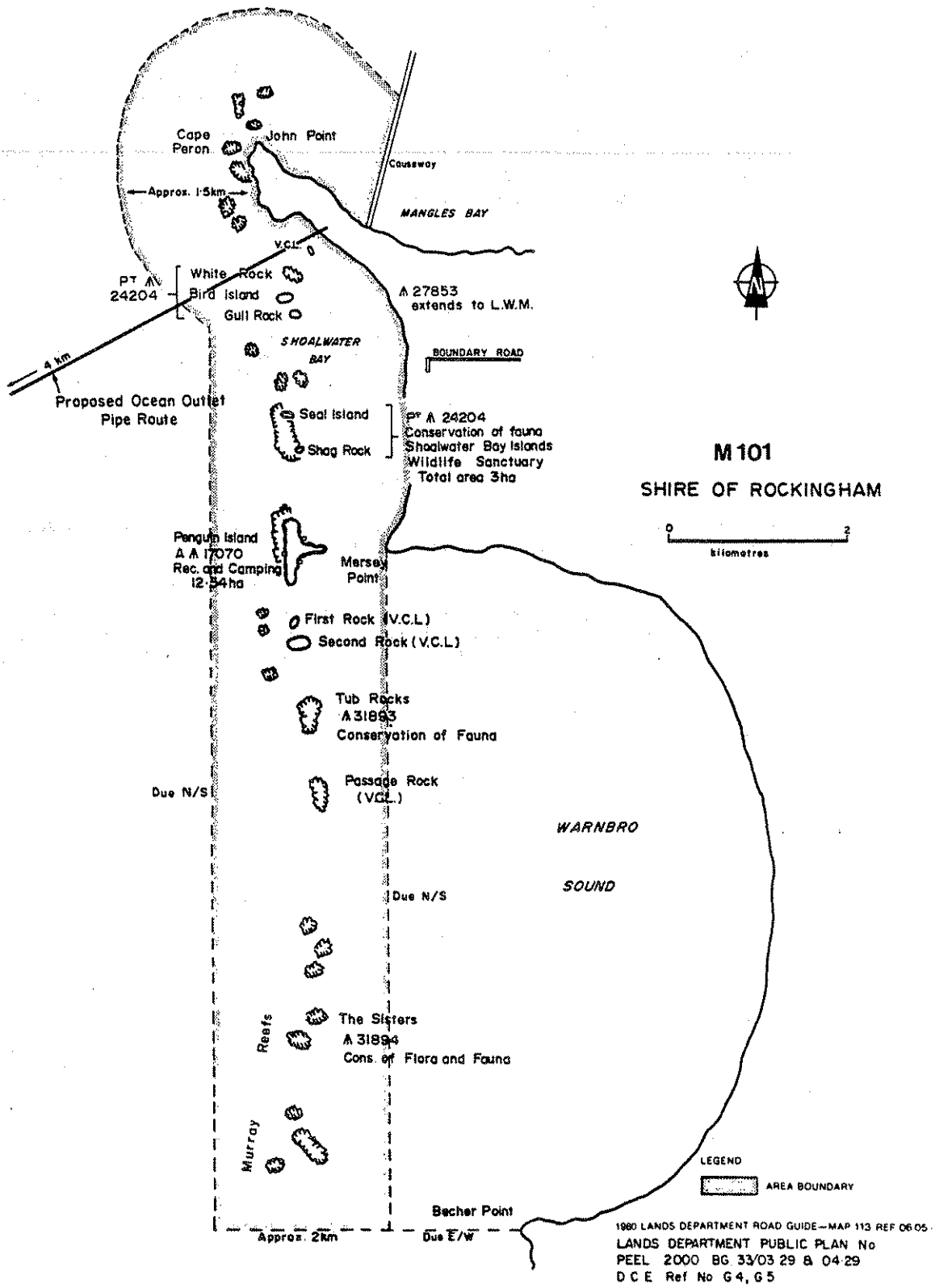
M101.2 That Reserves C24204, C31893 and C31894 be amended to Class A.

M101.3 That each area of vacant Crown land be made a Class C Reserve for the Conservation of Fauna and be vested in the W.A. Wildlife Authority.

M101.4 That a study of the area be commissioned by the Environmental Protection Authority with the aim of establishing a Marine Reserve to be managed for the purpose of conservation.

M101.5 That, subject to the implementation of M101.4, a management plan be prepared for the Marine Reserve.

M101 CAPE PERON, SHOALWATER BAY AND WARNBRO SOUND



M106 PORT KENNEDY

The recommended area is situated about 50km south of Perth and comprises Reserves C20716, for Government Requirements, not vested; C33837, for Government Requirements (Community Welfare Department), vested in the Minister for Community Welfare; vacant Crown land; and part of Peel Estate lots 1092 to 1094, privately owned freehold land (Figure 164). Part of the area is "reserved" for Parks and Recreation under the Metropolitan Region Scheme.

The MRPA has recognised the potential for recreation of Port Kennedy and has prepared a design concept for a regional recreation centre, to help cater for the anticipated future development of the district.

The southern portion of the recommended area may possibly be subject to a land swap with the Secret Harbour development which may affect its boundary alignment. The area may be affected by a proposed MWA sewage treatment plant and outlet, and a drain.

The peninsula consists of parallel, curving dunes, typical of the Coastal Plain south of Rockingham. Much of the area retains its natural vegetation, which is quite rich in species. Thickets of wattle are common and there are numerous tall shrubs typical of coastal species. There are also many perennial herbs — mostly common species, and a less frequently seen species of climbing milkwort. The area's conservation value is high, because there is little similar land available between Fremantle and Mandurah.

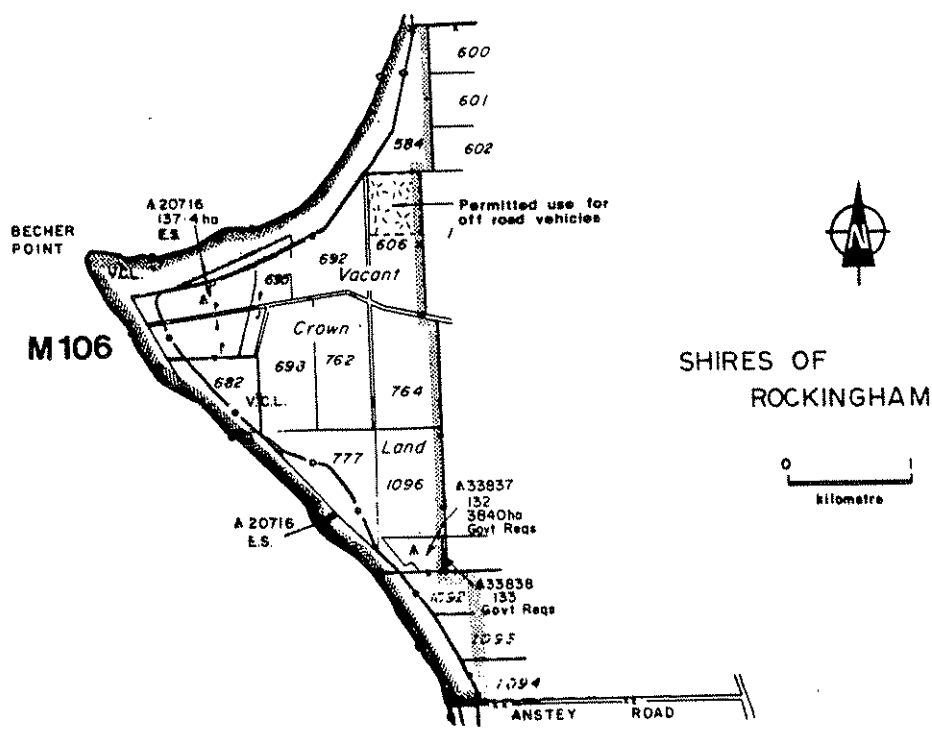
The area has obvious potential for recreation, and is already used for fishing, camping and off-road vehicles. An area of 17ha from lot 606 in the north-east has been designated for the use of off-road vehicles. There are squatters' shacks near the beach. The recreation potential could be even greater if a link is provided between Port Kennedy and the White Lakes Region Open Space (M103), and if the Secret Harbour Project is developed. This project site adjoins the southern boundary of the area and involves a proposal to dredge an area behind the primary dune to form an inland harbour connected to the ocean. Residential, commercial, tourist and recreation development would follow.

The recommended area constitutes open space of regional significance (see Figure 1, Chapter 4) because of its high conservation and recreation value and its proximity to the Perth and Mandurah residential areas. Land tenure is varied and not all the land has conservation and recreation as primary management objectives: to enhance these values the management structure requires coordination. Important management considerations include: encouraging the growth and regeneration of local indigenous flora; removing shacks and tracks from the area; and providing direct public access to the open space of regional significance at M103 (Lakes Cooloongup and Walyungup).

Recommendations:

M106.1 That our general recommendations on planning and management of Regional Parks be applied to this area (see Recommendations 15 and 16, Chapter 5).

M106.2 That the Metropolitan Region Planning Authority consider "reserving" those portions not already "reserved" for Parks and Recreation under the Metropolitan Region Scheme.



APPENDIX 7

Interim Submission - Consideration of Terrestrial Aspects

Binnie & Partners PTY LTD
CONSULTING ENGINEERS INC VIC

W.A. Manager
Allen J. Gale
267 St. George's Terrace
Perth, 6000
Australia

Telephone (09) 322 7700
Facsimile (09) 324 1472
Telex AA95665

Our Ref RJT/MS/489.1/1179
Your Ref

Date June 15, 1988

The Director
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

For the attention of Mr J Singleton

Dear Sir,

PORT KENNEDY REGIONAL RECREATION CENTRE
Consideration of Terrestrial Aspects - Interim EPA Submission

We enclose three copies of our interim submission for the above-mentioned project. The submission relates more or less exclusively to the relationship between the proposed layout and System Six requirements. Please contact the writer to arrange a meeting to discuss the contents at your earliest convenience.

Yours faithfully

R.J. Taylor

RJ Taylor
BINNIE & PARTNERS PTY LTD

Enclosure

PORT KENNEDY REGIONAL RECREATION CENTRE

CONSIDERATION OF TERRESTRIAL ASPECTS

Interim EPA Submission

1.0 PURPOSE OF INTERIM SUBMISSION

The intent of this interim submission is to define the major terrestrial environmental constraints that have been identified within the Port Kennedy site and to outline the preliminary development approach adopted. The adopted approach is based both on the original layout and the terrestrial environmental investigations undertaken by Bowman Bishaw & Associates and botanist Mr M Trudgen for the entire site.

We believe this submission will serve the useful purpose of allowing the EPA to give early comment on the proposed treatment of the site. This would allow the developer the opportunity to amend the site layout, if required, prior to submission of the draft ERMP.

As other work is still in progress, this submission has only presented the preliminary impact of the site layout on System Six M106 aspects. Discussion of other matters such as groundwater and sediment transport is not included. It is appreciated this will limit the EPA's ability to respond formally. However, we believe a meeting with the EPA's officers, following review of this submission, will be of assistance to us.

2.0 SUMMARY

The area of the Port Kennedy site is approximately 730ha. It contains no rare or endangered flora. Stage I covers 320ha and the layout is shown in Map 1. 105ha (32%) of this area will be restored where necessary and retained in conservation areas.

Previous use of the area has caused significant degradation of the environment, particularly within northern parts of the site as shown in the attached "Figure 12". Excessively frequent fire, off-road vehicle activity, trampling and rubbish disposal have caused biological impacts, which are effectively irreversible. Human impacts will inevitably increase, as urban development encroaches upon the site, and hence further degradation of the site will undoubtedly occur unless a co-ordinated management approach to the site is initiated in the near future. The Port Kennedy Regional Recreation Centre development offers both the structure and the funding to support the site's management requirements.

Map 2 shows vegetation types in the study area. The condition of vegetation within the study area has been classified in three categories (defined further in Section 7):

- Category A, showing significant changes and irreversible degradation caused by man,
- Category B, showing definite signs of impacts by man such as grazing and frequent burning, and
- Category C, showing little impact by man.

Stage I includes the following approximate areas of vegetation:

- 150ha in Category A condition,
- 70ha in Category B condition, and
- 100ha in Category C condition.

The remaining 410ha of the site is generally in better condition than the land covered in Stage I.

The Stage I layout will retain 75ha (75%) of the 100ha of vegetation in Category C condition. This area, plus a further 30ha of restored vegetation, currently in Category B condition, will be incorporated in conservation areas. Representative areas of specific conservation interest will be included within the conservation zones.

3.0 BASIS FOR THE DEVELOPMENT

3.1 General

The starting point for the development was the Development Brief for Port Kennedy Regional Recreation Centre issued in March 1986 by the Government of Western Australia and prepared by State Planning Commission (SPC). This was based on the Design Concept for the site prepared by the Metropolitan Region Planning Authority in December 1978.

Fleuris Pty Ltd were given the exclusive right to proceed with the development in October 1986 subject to satisfactory completion of feasibility studies.

In developing the site two primary constraints influence the chosen layout:

- the site is System Six area M106,
- maximum utilisation of the most attractive feature of the site, the north facing beach in Warnbro Sound. In addition, the marina location at Bridport Point is determined by bathymetry and sediment transport considerations.

3.2 Effects of No Development

The proposed development site is already undergoing some extensive degradation, particularly in the northern part of the site.

Urban developments to the north, east and south of the site (Westport and Secret Harbour), have already been given approval to proceed. These will ultimately bring approximately 22,000 people within the immediate vicinity of the site. A further area east of the site is zoned urban. These pressures will undoubtably cause further degradation of the site.

With a sandy coastal site such as Port Kennedy, uncontrolled human access presents the major environmental threat. Unless funds for management of the site are available from some source in the near future, it can be anticipated that much of the site's environmental character will be lost.

3.3 Consideration of System Six

In reviewing the development layout, it is necessary to assess how the proposal relates to the specific recommendations that have been set out for the area in the System Six "Red Book". Interpretation of these specific System Six comments regarding M106 are shown below.

System Six Comment	Remarks
(i) "The MRPA has recognised the potential for recreation of Port Kennedy and has prepared a design concept for a regional recreation centre, to help cater for the anticipated future development of the district."	(i) The 1978 MRPA proposal, presumably prepared without detailed environmental review, allocated less than 20% of the site to "Landscaped and Preservation Nodes". Our review of conservation potential of the site indicates that more of the site should be allocated to conserved areas alone.

(ii) "The peninsula consists of parallel, curving dunes, typical of the Coastal Plain south of Rockingham. Much of the area retains its natural vegetation, which is quite rich in species. Thickets of wattle are common and there are numerous tall shrubs typical of coastal species. There are also many perennial herbs - mostly common species, and a less frequently seen species of climbing milkwort. The area's conservation value is high, because there is little similar land available between Fremantle and Mandurah."	(ii) The completed investigation of the terrestrial environment, prepared for the ERMP, confirms these comments in general. The investigations have also further refined, on site, the conservation values that have been previously recognised. In addition, the areas where physical and biological degradation has occurred, have been identified.
(iii) "The area has obvious potential for recreation, and is already used for fishing, camping and off-road vehicles".	(iii) The fishing and camping is generally concentrated around Bridport Point. Off-road vehicles are responsible for considerable destruction, particularly in the northern part of the site.
(iv) "The recreation potential could be even greater if a link is provided between Port Kennedy and the White Lakes Region Open Space".	(iv) This is incorporated in the proposed ultimate development.
(v) "Land tenure is varied and not all land has conservation and recreation as primary management objectives".	(v) In the ultimate development, less than 10% of the site is allocated for low and high budget accommodation. The remainder of the proposed development will only include areas for conservation, passive and active recreation.
(vi) "..... to enhance these values the management structure requires co-ordination".	(vi) As outlined in our Referral Report, management of the site will be co-ordinated by a Management Board.

(vii) "Important management considerations include encouraging the growth and regeneration of local indigenous flora; removing shacks and tracks from the area; and providing direct public access to the open space of regional significance at M103 (Lakes Cooloongup and Walyungup)".	(vii) These three considerations are embraced by the proposed development.

Detail consideration of the System Six comments relating to M106 are therefore not considered to conflict conceptually with the proposed development.

In formulating the development layout, attention has thus been focused on maintaining compliance with System Six management recommendations in respect of the following aspects:

- the impact of the development on areas of specific conservation interest within the site,
- the broader conservation concept of System Six relating to the desirable balance between areas of conservation, passive recreation and active recreation.

Resolution of the above aspects for the entire site necessarily requires different levels of assessment.

- Stage I layout can be defined in detail in the ERMP as can the environmental impacts.
- The subsequent development stages cannot yet be sufficiently well defined to analyse impacts. Aspects such as available finance and groundwater resources will be better known after Stage I and may influence the subsequent stages. The Stage I ERMP would therefore be based on the assumption that any subsequent development would require progressive environmental impact assessment and approval from the EPA.

For the purpose of this interim submission, we believe there is merit in putting forward the outline approach to the ultimate layout. This will allow feedback from the EPA and assist in further planning.

4.0 DESCRIPTION OF PROPOSED STAGE I DEVELOPMENT ELEMENTS

The proposed development facilities are described in detail in the referral report and are summarised below:

- Marina,
- Marina resort and town centre,
- Hotel/golf club resort,
- 36 hole golf course,
- Stage I car parking. Closure of the site to vehicles is not proposed until subsequent stages are completed.

5.0 INITIAL APPROACH TO STAGE I SITE LAYOUT

The initial "broad brush" approach to the Stage I layout is based on the major environmental, engineering and planning constraints that have been identified by detailed site survey. The layout adopted is shown on Map 1.

The location of the marina at Bridport Point is determined by two engineering considerations:

- construction of normal rubble breakwaters becomes uneconomical beyond depths of approximately 5m, and

- minimisation of sediment transport problems positions the marina in Warnbro Sound as far east from Becher Point as possible.

The marina resort and town centre are necessarily located adjacent to the marina. These facilities are centred on the area of the site already badly degraded by squatters.

The hotel and golf club resort need to be located within a reasonable distance of the town centre facilities. These have been moved somewhat closer to the marina than shown in the referral report in order to approximately align the northern edge of this part of the development with the northern limit of the currently degraded squatter area.

The golf courses have been located in the northern part of the site between the foredune and the eastern boundary. Previously unmanaged human use has resulted in much of this area being badly affected by frequent fires, weed invasion, scattered rubbish and litter and erosion from numerous tracks.

Stage I carparking is planned to be located adjacent to the marina resort.

To control the impact of the Stage I development on the remainder of the site it is proposed to provide a conservation/management buffer zone from Becher Point around behind the marina as shown on Map 1.

6.0 AREAS OF CONSERVATION INTEREST

Having established the major constraints, the site layout has then been refined to reflect areas of specific conservation interest. Our studies to date have identified four main areas of conservation interest:

i) **Seasonal Wetlands.** Five major linear seasonal wetlands have been mapped on the site. Several other minor linear seasonal wetlands exist. In addition, three small roughly circular wetlands lie close to Becher Point.

The seasonal wetlands have been formed by accumulation of decaying plant materials within the dune swales. The consequent low permeability causes intermittent surface ponding of rainfall and retention of soil moisture.

The approach road has been realigned such that four of the five major linear wetlands will not fall within the Stage I area. The fifth and most northerly of the linear wetlands lies within the proposed golf course area. This seasonal wetland lies within a node of intensive off-road vehicle activity and now forms the junction of several tracks. It has been cleared and burnt and its value is further diminished by weed infestation and rubbish. However, this major wetland can be rehabilitated in part to near its indigenous state and in part developed as an ornamental lake. Similar treatment can also be given to the group of minor wetlands further east.

The three circular wetlands close to Becher Point will be included in the conservation/management buffer zone for Stage I.

ii) **The Foredune and Coastal Strip.** This comprises four major segments:

- the northerly section - this part of the foredune is typically between 6 and 15m high and crossed by a limited number of tracks. A number of well used tracks run immediately behind and to the east of the foredune. These tracks roughly define the limit of foredune in good condition resulting in a strip between 100m and 150m wide. This coastal strip will be restored and revegetated in Stage I.

- The squatter area - the foredune here is 3 to 6m high and between 100m and 200m from the shore. The foredune and the area in front contain 90 to 100 squatter's huts. The area behind the foredune is criss-crossed by numerous tracks and badly littered. Construction of holiday accommodation for Stage I is concentrated in this area.

- Becher Point - this area forms part of the conservation/ management buffer zone for Stage I.

- Southern coastline - this segment falls outside the Stage I area.

iii) **Vegetation Systems.** Three areas of the site have been identified where common plant species have established in unusual floristic associations. These have been mapped at the level of "vegetation complex" and are described as follows:

- Acacia lasiocarpa (AL) Complex. This system lies in the southern part of the site and hence is not affected by Stage I.

- Olearia axillaris, Jacksonia furcellata (OJ) Complex. This system covers about 12ha and lies behind the 6m high foredune south of Bridport Point. Much of the area is crossed by tracks and is badly littered. Our preliminary Stage I layout will conserve approximately 60% of this system within the conservation/management area buffer zone around Stage I. This area will be revegetated, restored and cleared of rubbish. Developed parts of this system will be concentrated initially in the most degraded areas.

- Olearia axillaris, Melaleuca acerosa (OaMa) Complex. This system lies behind the OJ complex as well as behind the foredune further to the north. The southern part of this complex will be revegetated, cleared of rubbish as necessary and incorporated in the conservation/ management buffer zone for Stage I. The central element of this system will be covered by the hotel and golf club resort area. The northern part of the vegetation complex will be retained within the golf course. Fairways will be located generally within the swales and the vegetation system will be restored and regenerated in between. Approximately 50% of this part of the golf course area would be natural vegetation.

  Overall about 45% of the total vegetation complex will be retained.

The approach to the latter two vegetation systems is a balance between retention of significantly sized representative areas in good condition compared to the current situation of a larger area in a degraded condition.

iv) **Curvilinear Dune Area.** This scientific reference area is located south of the foredune south of Bridport Point. Some of the area falls within the OJ, OaMa vegetation complexes and hence within the conservation/ management buffer zone for Stage I. However, it is not very distinctive from the ground, as the dunes are typically only 0.5 to 1.5m high. Where not included in the conservation buffer zone the more prominent dunes can be adapted as landscape features. We consider some remodelling of this area for access roads behind the marina resort would be acceptable.

7.0 BROADER CONSERVATION ASPECTS

Map 2 shows the condition of vegetation on the site. The categories shown on the map are defined as follows:

Category A - Significant changes made by influence of man, may have significant amounts of weeds including some of the more aggressive ones.

Category B - Has definite signs of impacts by man (such as grazing) leading to some (but not substantial) changes. Weeds present but not aggressive.

Category C - Shows no evidence of impact by man or shows signs of reversible impacts such as increased fire frequency, few tracks and little rubbish.

It will be appreciated that the dividing line between the above categories is not distinct except where existing tracks have acted as fire breaks or have channelled human use.

The Stage I development covers about 320ha including the buffer zone. Of this approximately 100ha (32%) is in Category C condition as defined above. The 100ha is confined to the area running parallel to the Warnbro Sound coast and hence will also be the area used for passive recreation by the great majority of Western Australians.

Approximately 75ha (75%) of the 100ha will be restored as necessary and retained in conservation areas. The development at the marina site will include a number of water sports facilities which will complement the passive recreation areas.

After removing tracks and rubbish, and revegetating areas south of Bridport Point and within the golf course (vegetation systems OJ and OaMa) an additional 30ha will be restored to near original condition.

Thus for Stage I a total of approximately 105ha out of 320ha will be retained as conservation areas.

Following discussions with the EPA on this submission and the general acceptability of the outlined approach, further detailed layout work and on-site ground truthing of specific areas will, if necessary, assess and define the impacts more precisely.

8.0 LAYOUT OF SUBSEQUENT STAGES

The total site area is approximately 730ha and consists of vegetation areas in the following conditions:

- 170ha in Category A condition,
- 220ha in Category B condition,
- 340ha in Category C condition.

As much of the vegetation in Category C condition is adjacent to the coast, development of the site for recreational use cannot

avoid having an impact on this vegetation. However, the preservation of approximately 60% (205ha) of the vegetation in Category C condition is envisaged either within conservation areas or within the golf courses. This represents 28% of the overall site.

In addition, approximately 60ha will be allocated for restoration and preservation of representative areas of the unusual vegetation systems and ephemeral wetlands.

Overall, approximately 35 to 40% of the site will incorporate restored or conserved indigenous vegetation.

410ha of the site lies outside Stage I. This area is generally in better condition than Stage I and consists of the following areas of vegetation:

- 20ha in Category A condition,
- 150ha in Category B condition, and
- 240ha in Category C condition.

After allowance for the Stage I layout and the overall site objectives defined above, the layout for subsequent stages will work within the following constraints:

- Conservation of 130ha (54%) of vegetation in Category C condition. Any development would, where possible, be centred on already degraded areas.

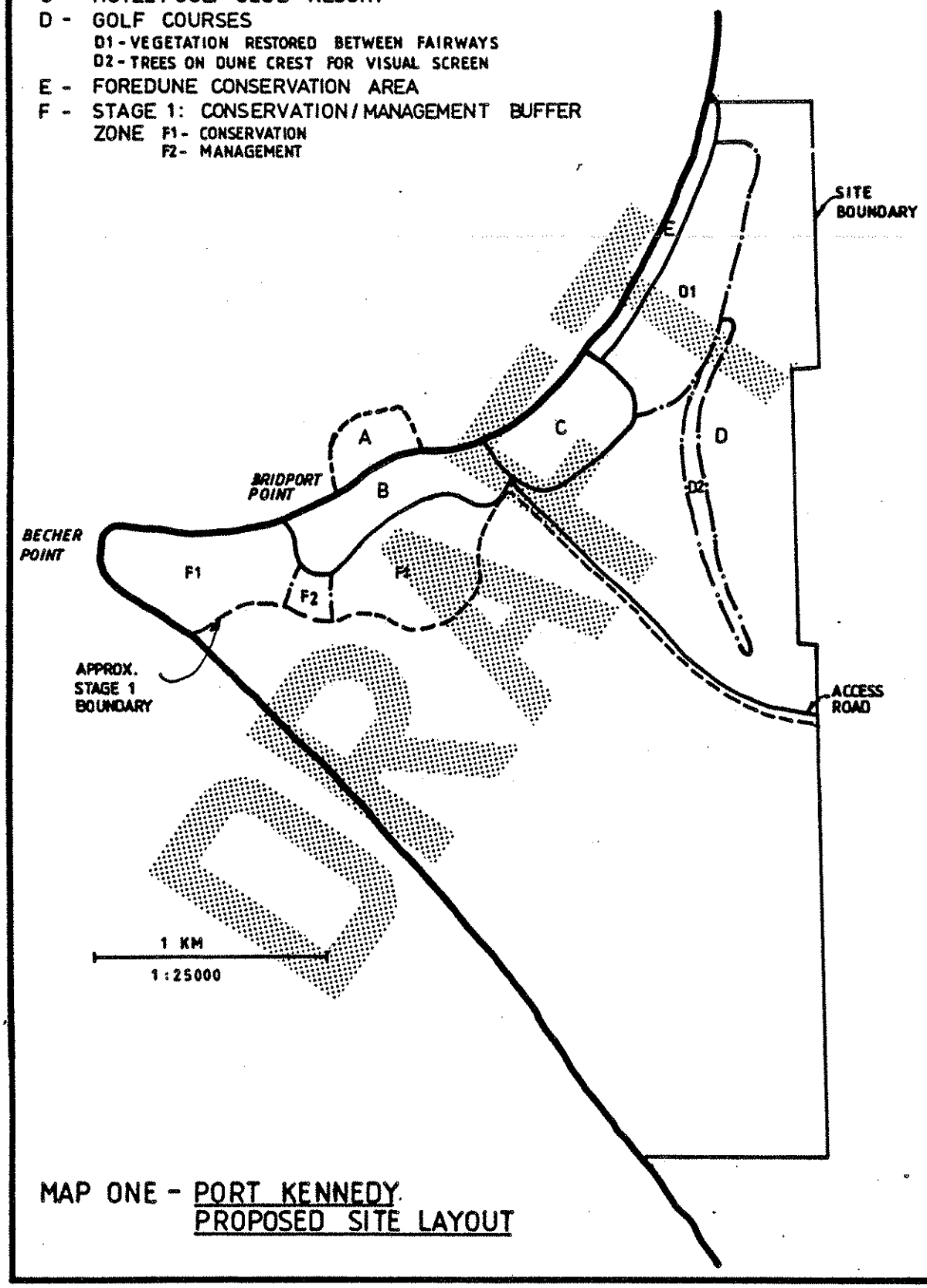
- Restoration and revegetation of about 30ha of vegetation in Category B condition for inclusion in conservation areas.

- Preservation of the majority of the Acacia lasiocarpa complex.

- Incorporation of about 50% (4km) of the major seasonal linear wetlands in the conservation areas.

KEY

A - MARINA
B - MARINA RESORT / TOWN CENTRE
C - HOTEL / GOLF CLUB RESORT
D - GOLF COURSES
D1 - VEGETATION RESTORED BETWEEN FAIRWAYS
D2 - TREES ON DUNE CREST FOR VISUAL SCREEN
E - FOREDUNE CONSERVATION AREA
F - STAGE 1: CONSERVATION / MANAGEMENT BUFFER ZONE F1 - CONSERVATION
F2 - MANAGEMENT



MAP ONE - PORT KENNEDY
PROPOSED SITE LAYOUT

STRAND AND STABILISING DUNES

AC *Arctotheca calendula*, **Cakile maritima* open herbland
Sl *Spinifex longifolius* hummock grassland (with *Tetragonia decumbens*)
Oa_1 *Olearia axillaris* open shrubland to open heath
Oa_2 *Olearia axillaris* closed heath to closed scrub

Q4 DUNES

SO_{1a} *Scaevola crassifolia*, *Olearia axillaris* low open heath to closed heath to open scrub
SO_{1b} *Scaevola crassifolia*, *Olearia axillaris* low open heath to closed heath to open scrub

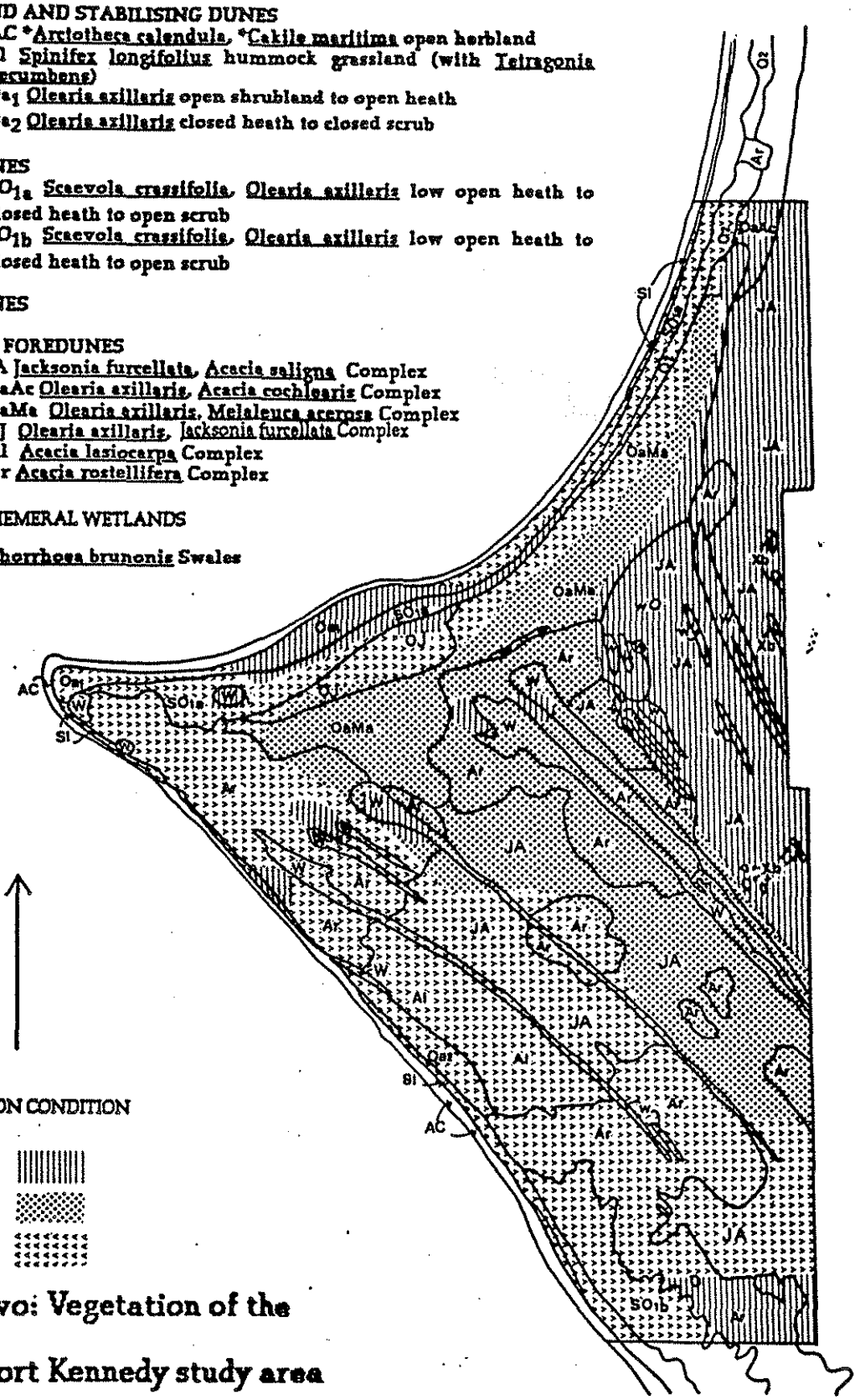
Q2 DUNES

RELICT FOREDUNES

JA *Jacksonia furcellata*, *Acacia saligna* Complex
OaAc *Olearia axillaris*, *Acacia cochlearis* Complex
OaMa *Olearia axillaris*, *Melaleuca acerosa* Complex
OJ *Olearia axillaris*, *Jacksonia furcellata* Complex
Al *Acacia lasiocarpa* Complex
Ar *Acacia rostellifera* Complex

(W) EPHEMERAL WETLANDS

Xb *Xanthorrhoea brunonis* Swales

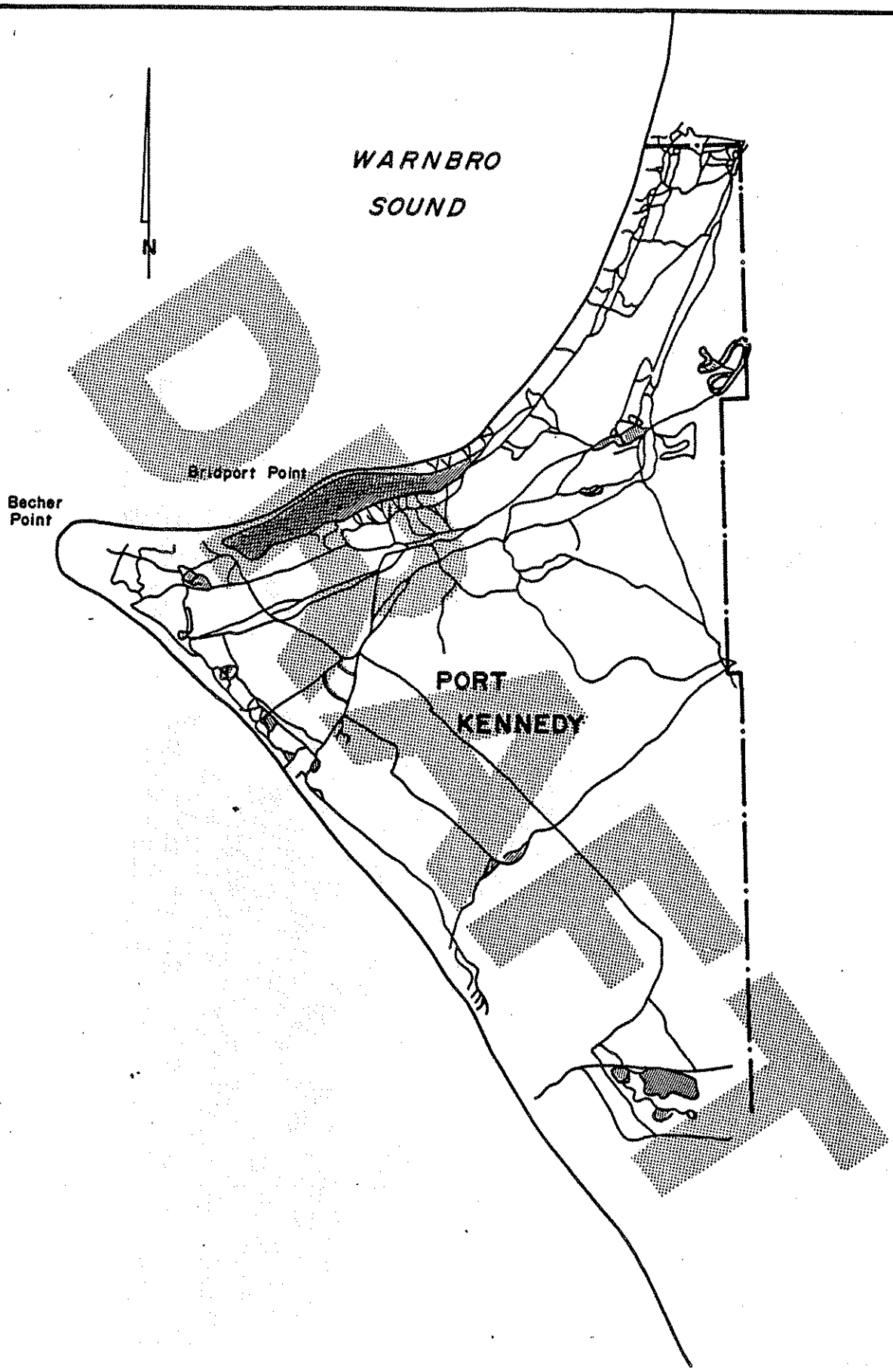


VEGETATION CONDITION

Category: A
B
C

Map two: Vegetation of the Port Kennedy study area

1km



PORT KENNEDY FIG 12

AREAS OF PHYSICAL DISTURBANCE

0 500 1000metres

BOWMAN BISHAW AND ASSOCIATES

APPENDIX 8

Stage II Development Philosphy

PORT KENNEDY JOINT VENTURE

294 Rokeby Road, Subiaco, Western Australia, 6008

Joint Venturers:
Western Australian Development Corporation
Fleuris Pty. Ltd.

Telephone: + (619) 382 3027
388 1244
Facsimile: + (619) 388 1386

8th August, 1989

The Chief Executive Officer
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attention : Mr. J. Singleton

Dear Sir,

PORT KENNEDY REGIONAL PUBLIC RECREATION CENTRE
OVERVIEW OF STAGE II DEVELOPMENT PHILOSOPHY

Subsequent to the meeting between Environmental Protection Authority officials and Pt Kennedy Joint Venture representatives, held on-site on the 1st August 1989, we are pleased to provide further advice regarding the approach that will be taken in the planning of Stage II of this development proposal. As was discussed at the meeting, at the present time there are constraints to the formulation and submission of a firm, detailed development proposal. These primarily relate to the availability of environmental, financial, economic and engineering information for the Stage II area, upon which planning will need to be based.

However, we also recognise the EPA's requirement for an understanding of the basic approach that will be taken in formulation of further development proposals and are pleased to outline our development philosophy at this time.

We wish to state at the outset, that we are well advised of the environmental values of land within the Stage II area and are fully committed to the philosophy that the objectives of the System Six Study's management recommendations be achievable in concert with development. Further discussion provided below under more specific headings should be viewed within this context.

1. General Approach

As for the planning of Stage I, identification of environmental constraints will be the first and foremost component of the planning process. We are clear in our understanding of the conservation significance of this land both in a site specific sense, and as part of a broader system of reserves within

System Six.

We have compiled sufficient environmental data for the Stage II area to enable those areas which have conservation value and those aspects which are environmentally relevant to be identified.

These are as follows :

(i) The succession of relict beach ridges and associated vegetation located between the coast and Lake Walyugup.

(ii) The seasonal wetlands.

(iii) The foredune and primary dune coastal areas.

(iv) Areas of vegetation that have conservation value in terms of either species composition or condition.

(i) Relict Beach Ridge Sequence and Associated Vegetation

The incorporation of a tract of land to function as a landform conservation area for the relict beach ridge plain, located between the coast and Lake Walyugup has been integral to the conceptual framework of the development concept since earliest submission to the SPC. The location and boundaries of this area will need to be determined on the basis of :-

(a) identification of a transect that is properly representative of the beach ridge plain landform;

(b) occurrence of vegetation worthy of conservation;

(c) incorporation of seasonal wetland areas;

(d) integration with development proposals for peripheral land.

(ii) Seasonal Wetlands

Of the five major linear wetlands located within the overall site, four are located within the Stage II area. If development in the proximity of these wetlands was ultimately to be contemplated, attention would be necessarily directed towards previously degraded areas that exist in the vicinity of existing squatters areas. It is clear that any such development would need to incorporate appropriate management devices to ensure adjacent areas in good biological condition remain in a viable condition.

(iii) The Foredune and Primary Dune Coastal Areas

The presence of coastal vegetation complexes in good condition and the recent erosional history of the site's southern coastline are recognized as major constraints to development within this zone.

(iv) Vegetation

Vegetation condition will be a further primary guide to development planning within the Stage II area.

In the planning of Stage I of the proposal, vegetation that either was in good condition or comprised unusual species or combinations of species was considered to have high conservation value and emphasis to conservation of these areas was incorporated in the proposed site layout. This approach will be maintained in planning of Stage II. For example, one complex of known high conservation value, the *Acacia lasiocarpa (A.L.)* complex is located within the Stage II area. Retention of this vegetation complex in a managed conservation area would be a primary objective of Stage II planning.

SUMMARY

Our preliminary, broad scope review of possible Stage II planning, indicates that more than 50% of the Stage II area is worthy of incorporation within managed conservation areas. Further environmental constraints may be identified by future detailed investigation and by the monitoring of the indirect effects of development and operation of Stage I. These constraints will be fully accounted for by future planning.

Subject to further detailed assessment of the conservation values of the stage II area, the proponents plan to incorporate low-intensity development to meet local demand for access to this type of recreational facility and in particular to cater for the lower socio-economic groups within the community.

At this stage the proponents envisage discrete developments located according to site suitability and separated by managed conservation areas.

Yours faithfully,

GARY SHEEHAN
Director

APPENDIX 9

Correspondence - Clarification on Further Matters Arising

PORT KENNEDY JOINT VENTURE

294 Rokeby Road, Subiaco, Western Australia, 6008

Joint Venturers:
Western Australian Development Corporation
Fleuris Pty. Ltd.

Telephone: + (619) 382 3027
388 1244
Facsimile: + (619) 388 1386

22 August 1989

The Chief Executive Officer
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attention : Mr J Singleton

Dear Sir

PORT KENNEDY ERMP
EPA ASSESSMENT

Following verbal advice by EPA officers we understand that the EPA are seeking further clarification and commitments relating to the following matters.

i) establishment of the proposed Marine Park is regarded as important to manage impacts caused by general increasing public use of the Murray Reefs and Warnbro Sound - of which Port Kennedy will be a component.

ii) the suitability of the site proposed for the Marina as a potential site for long term monitoring of climatic change as well as the possible long term impact of the Marina on the stability of Becher Point.

iii) The site's geomorphology and scientific significance.

These three aspects are addressed below.

1. <u>Establishment of the Proposed Marine Park</u>

1.1 In the ERMP the Proponent provided a commitment (commitment No. 15) to contribute an equitable portion of funds towards a proposed regional marine study. Although this matter was first discussed more than a year ago the scope and objectives of the study have not been defined further and hence the Proponent does not consider that further commitments can be made in this regard at this stage.

PORT KENNEDY

However the Proponent recognizes that specific obligations derive from the following.

i) Establishment of the Marine Park would provide long term security for the marine environment adjacent to the development.

ii) Increased public use of the Marine Park will include use by guests and visitors to the development. Accordingly, the Proponent acknowledges a responsibility to contribute directly to the Government's costs associated with establishing the Marine Park.

The Proponent therefore offers to contribute $50,000 to a regional baseline study of the marine ecology within the proposed Marine Park. The offered sum is based upon consideration of both the anticipated overall cost of the baseline study and the likely contribution of the development to impacts caused by generally increasing public use of the Marine Park. It is proposed that these funds will be provided on the basis of $20,000 per year for two years and $10,000 for a third year, starting from commencement of construction works. These sums will be provided for use on studies, the scope of which shall be as agreed by the Proponent, EPA and CALM.

1.2 Further to commitment No. 11 the Proponent confirms that 30m² of office space will be provided in the development for ongoing use by regulatory authorities responsible for administering the Marine Park. The capital value of this office space is estimated at $35,000.

1.3 Further to commitment No. 14 the Proponent will make all monitoring results available to EPA and CALM to assist in Management of the Marine Park.

The Proponent advises that the above statements have been made on the basis of currently available information. In recognition of the fact that these requirements may change as the matter is better defined the Proponent accepts that final resolution of this issue will be made as part of the Project Agreement and that the above statements shall form the basis for negotiations connected with the Project Agreement.

2. Coastal Engineering

2.1 Coastal Engineering Significance

The use of this area as a possible site to monitor the impact of sea level rise was suggested. In a geological time frame of several hundred years the site may provide information on historic imparts of sea level rise and changes in climate; in a shorter time frame we do not believe this to be the case.

The rate of littoral transport along the ocean coast is difficult to estimate accurately, mainly because the bulk of sand moving north into the Becher Point area spreads out over wide areas of the nearby sand banks in thin layers. Even using survey information dating back to the 1880's it was difficult to calculate the nett gain in sediment to within a factor of two. The longshore transport has been estimated to be between 50,000 and 100,000m^3/year nett.

Given that it is very difficult to accurately gauge sediment transport over a 100 year period it would be even more difficult to monitor over shorter time scales.

The long term sand accretion in the lee of Becher Point is able to be more accurately assessed, although it is believed that significant short term perturbations occur as the sand moves around the point in slugs.

In summary it is not believed that the site has any special merit for the monitoring of littoral transport or the impacts of sea level rise over a timescale of 50 to 100 years. Even if it were, the construction of the marina in the lee of Becher Point would be unlikely to impact on that monitoring.

2.2 Stability of Becher Point

Becher Point is dominated by the supply of long shore sediment from the south. The construction of the harbour in its lee should have no detrimental impact on its stability at all. If anything the steady build up on sand to the east of Becher Point should improve its stability.

The impact of wave reflection from the harbour walls has been raised as an issue, particularly in respect of the impact on Becher Point. Any wave impacting on the breakwater should be reflected away from Becher Point and therefore have no influence on its stability.

As with any breakwater or groyne on the coastline there can be localised erosion or accretion due to storm events. Sand buffer zones will be provided at the start of construction on either side of the marina to handle these short term changes.

As discussed in the ERMP there may be the need to bypass sand from west to east of the harbour on a long term basis. The need for this will be monitored and by-passing will be undertaken as part of the management plan for the development.

3. <u>Geomorphological Significance</u>

Comments made regarding the geomorphological significance of the site, within a paper prepared at EPA's request by Dr. Ian Eliot, UWA Department of Geography, have been reviewed

by the project consultants. A meeting was held on 21 August 1989 between Dr. Eliot, representatives of the EPA, and the project consultants in which it was concluded and agreed that :

i) The proposal to develop the site as planned did not present a risk to maintenance of important scientific information contained within the coastal dune structures.

ii) Excavations conducted for marina construction purposes would provide an opportunity to recover sediment samples and make appropriate measurements of pedological, sedimentological and stratigraphic characteristics for research purposes. This opportunity may not be available without the proposed construction activities associated with the project.

We are agreeable to assisting geomorphological research within the area adjacent to the marina, and would be pleased to co-ordinate the site investigations that have been suggested. We are advised that a series of trench excavations following strategically chosen transects would be involved. Further opportunities to obtain useful data may be provided by the construction of trenches required for servicing the site.

4. Revised Commitments

In view of the above the following amended commitments are proposed in lieu of those contained in the ERMP Section 13.

Commitment No. 11

Subject to resolution of requirements with the relevant Government Departments, the Proponent shall incorporate, in the final design, 30m² office space for use by an inspector or ranger from each of the Fisheries, Marine & Harbours and Education Departments and the Department of Conservation and Land Management.

Commitment No. 12

Prior to commencing construction, the Proponent shall initiate monitoring of the shoreline at the marina site. Ongoing monitoring and management of sediment transport and sand bypassing shall be undertaken by the Proponent as described in Section 12.3.

In addition, the Proponent shall co-ordinate the excavation of a number of trenches adjacent to the marina prior to construction in conjunction with investigations undertaken by a recognised expert in the field of geomorphology.

Commitment No. 14

Following completion of construction the Proponent shall monitor the marina and harbour water quality as described in Section 12.5. If monitoring reveals problems the Proponent shall undertake further assessment, testing and remedial measures as resolved with the Environmental Protection Authority and the Department of Marine & Harbours. The Proponent shall provide sand buffer zones on either side of the marina to prevent localised erosion occurring during the initial construction and operation phase. The Proponent shall provide as part of the detailed design calculations, the reflected wave patterns from the finalised marina breakwater to confirm the impact of the stability of Becher Point will be minimal.

Commitment No. 15

The Proponent shall provide $50,000 for baseline studies of the marine environment at the rate of $20,000 per annum for two years and $10,000 during the third year from commencement of construction.

We trust the additional commitments discussed above adequately address the matters raised by the EPA. Should the EPA have any further queries please contact the writer.

Yours faithfully,

G. Sheehan
PORT KENNEDY JOINT VENTURE

APPENDIX 10

Pollutant Loadings - Letter from Bowman Bishaw and Goreham

Binnie & Partners PTY LTD
CONSULTING ENGINEERS INC VIC

W.A. Manager
Allen J. Gale
267 St. George's Terrace
Perth, 6000. Australia

All mail to:
PO Box 7050, Cloisters Square
Perth, WA. 6000

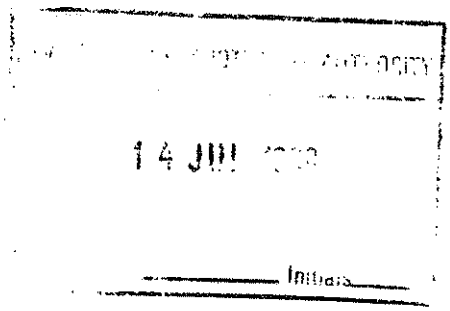
Telephone (09) 322 7700
Facsimile (09) 324 1472

Our Ref RJT/MS/489.1/1705

Your Ref

13 July, 1989

The Director
Environmental Protection Authority
1 Mount Street
PERTH WA 6000



For the attention of Mr J Singleton

Dear Sir,

PORT KENNEDY ERMP

Further to our meeting on 8 June 1989, we enclose further information on dredging and potential contamination of the marina.

i) Dredging

Increase in turbidity is discussed in Section 11.9.3 of the ERMP. We advise the principal potential source of turbidity is from disposal of dredged spoil. It is proposed at Port Kennedy to dispose of the spoil on land, with sufficient bunding to prevent ingress of turbid water into the marine environment. The turbidity generated by the dredging operation itself is anticipated to have a relatively small impact, similar to that resulting from the breakwater construction.

ii) Potential Marina Contamination

This aspect is addressed in the accompanying letter from Bowman Bishaw Gorham (reference MA8134).

We trust the information provided adequately addresses the questions raised at the meeting. Should you require further elaboration please contact the writer.

Yours faithfully,

for
AJ Gale
BINNIE & PARTNERS PTY LTD

027796 INFO

Enclosure

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

P.O. Box 404
Subiaco 6008
294-296 Rokeby Road
Subiaco, Perth, W.A.
Telephone (09) 382 1859
Facsimile (09) 382 7362

Marcel Bowman B.Sc. (Hons)
Michael Bishaw B.Sc. (Hons)
Richard A. Gorham B.Sc. (Hons)

Our Ref: MA8134

11th July 1989

The Chairman
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attention: Mr. Jim Singleton

Dear Sir,

Potential for Contamination Within the Proposed Marina at Port Kennedy Regional Recreational Centre

Pursuant to your request we are pleased to provide herein a review of the potential for metal and hydrocarbon contamination within the marina at Port Kennedy Regional Recreation Centre.

The proposed marina development at Port Kennedy includes provision of 130 boat moorings in fixed pens and an additional 250 boat moorings along the island frontage. Boat repair facilities would be a boat lifter and hardstand area for maintenance and repair of boats occupying the marina. There would also be boat refuelling facilities.

The potential inputs of contaminants to the proposed marina would be minimised by appropriate environmental design and management. All facilities within the development would be deep sewered, and stormwater drainage from hardstand areas would be directed away from the marina.

Fuel storage facilities in the marina would be above ground and contained within a sealed bund capable of holding the entire tank contents, with refuelling hoses having manually operated nozzle valves and automatic shut-off. The discharge of sewage, hydrocarbons or litter from boats into the marina would be prohibited, with appropriate signs to inform all users. Waste disposal facilities, including rubbish bins, oil recycling bins and sewered public toilets would be provided around the marina. A sewage pump out facility would be provided for boats equipped with holding tanks.

Monitoring studies in marinas elsewhere have shown that the primary sources of heavy metals to marina waters include the following:

1. Stormwater runoff from boat maintenance areas can introduce flakes and dust of paints stripped from boats. Mercury, tin and copper are common constituents in antifouling paints, while chromium, lead and zinc are constituents of paint primers. Cadmium is also used as a pigment in some marine paints. However, appropriate drainage design to direct stormwater runoff away from the marina, and incorporation of silt traps to reduce the suspended solids load, would minimise contributions from this source at Port Kennedy.

2. Continuous leaching of antifouling paints and sacrificial anodes (zinc or aluminium) from boats moored in the marina have a direct although minor contribution.

3. Exhaust from outboard motors contribute lead to the water column.

The potential sources of petroleum hydrocarbons to a marina include exhausts from marine engines, spillage at a fuel dock, urban stormwater drainage, discharge of bilge water and run-off from car parking areas.

The Australian Environment Council* studied four marinas near Brisbane to determine, inter alia, the nature, extent and sources of petroleum hydrocarbon and heavy metal pollution. Specific findings of the study, with relevant comments pertaining to the proposed marina at Port Kennedy, were as follows:

- Sedimentary levels of total chromium, nickel and cadmium were not statistically different form those in the parent water body.

- Sedimentary levels of total copper, lead and zinc, and at one marina mercury, were significantly elevated in the marinas. Metal levels were highest in marinas with the highest boating density or where boat maintenance areas drained directly into the marina. It is noted that the proposed peak boat density at Port Kennedy would be approximately 30 boats per hectare of water area, which is substantially less than at the four marinas studied here (range of 45 to 80 boats/ha). Also, drainage from hardstand areas at Port Kennedy would be directed away from the marina.

- Copper, zinc and lead were accumulated significantly by oysters transplanted into the marinas. This was considered to be due to a combination of point sources (drainage, fuel dock and maintenance area drains) and non-point sources (motor exhaust and leaching of marine paint).

- There was no significant increase in total hydrocarbon concentrations in the water or sediments of the marinas, although a significantly higher proportion

* Australian Environment Council. 1988. Impact of Marinas on Water Quality. AEC Report No. 24.

of the total hydrocarbon levels were petroleum hydrocarbons. Fuel docks were identified as a point source of elevated petroleum hydrocarbons. Concentrations in water also showed localised effects due to bilge discharges from vessels.

It was concluded overall that, while accumulation of metals and petroleum hydrocarbons in sediments and biota had been demonstrated, the levels were not considered indicative of any significant water pollution. There was no evidence of ecological impact due to heavy metals or petroleum hydrocarbons in any of the four marinas that were investigated.

Environmental monitoring studies in Western Australian marinas have established an extensive data base of sedimentary heavy metal levels inside marinas (V. Talbot, E.P.A., Pers. Comm., 1989). In those marinas oriented primarily towards recreational boating (e.g. Hillarys, Ocean Reef, Americas Cup Harbour), the sedimentary levels of heavy metals are not significantly different from those in the adjacent open-water environment. In comparison, there has been significant accumulation of heavy metals in the sediments of marinas and harbours with substantial commercial activities or repair facilities, such as Geraldton Fisherman's Harbour, Geraldton Harbour, Fremantle Harbour, Fremantle Fishing Boat Harbour and Success Harbour. Each of these latter examples have shown elevated copper, lead and zinc levels, and individual harbours have also variously shown significant sedimentary accumulation of chromium, cobalt, nickel, iron, manganese, titanium and vanadium.

It is concluded that it is unlikely that there would be ecologically significant heavy metal or petroleum hydrocarbon contamination of the water, sediments or biota in the proposed Port Kennedy marina. Activities in the marina would be essentially similar to those at Hillarys Boat Harbour, which has not experienced any significant level of contamination. However, the proponent is committed to monitoring sediment concentrations of heavy metals within and outside of the marina. The results would be compared with the established data base for other marinas and harbours in Western Australia and with the scientific literature, in order to determine whether there is possible cause for ecological concern. As indicated in ERMP Commitment No. 14, if this monitoring evidences cause for concern then detailed studies would be initiated, in conjunction with the Environmental Protection Authority and the Department of Marine and Harbours.

I trust that the foregoing review fulfils your request for additional information, but would be pleased to answer any further enquiries you may have.

Yours faithfully,

Richard Gorham

R. A. Gorham

APPENDIX 11

Correspondence - Department of Marine and Harbours

RB/5W3/2315/84

Mr R Brindley

Director
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

ATT: MR R SIPPE

RE: PORT KENNEDY REGIONAL RECREATION CENTRE - ERMP

Further to your letter dated 19 January 1989 seeking comments on the Port Kennedy Regional Recreation Centre ERMP.

The documents have been examined and I advise as follows:

1. It is considered that the situation with the entrance channel should be more clearly defined. In this regard your attention is drawn to the following:-

   . Figure 5 of Volume 2 indicates an entrance between 3.25 and 4.25 metres deep for the full width between the breakwaters.

   . Figure 1.2 of Volume 3, Coastal Engineering Study indicates a depth of less than 1.25 metres between the breakwaters.

   . The draft project agreement provides for an undertaking to maintain the entrance at not less than 30 metres.

   . The entrance is not clearly defined in relation to existing bathymetry.

   . The assessment of water exchange in the harbour was based on an entrance channel 60 metres wide and 3.25 metres deep.

   In view of the shallow inshore bathymetry in this location it is recommended that a plan be prepared detailing the extent of the entrance channel and the bathymetry at the entrance. The stability of the channel should then be reviewed by the proponent.

2. The length of the spur on the eastern breakwater can only be determined after the bathymetry at the entrance has been verified.

3. The volume of sand to be bypassed for a 3.0 metre deep entrance channel was not determined. This issue should be addressed since the resulting maintenance costs could be excessive.

4. It has been proposed that on completion of the statutory approvals process, a Management Board will be formally constituted to administer the sites ongoing development and management obligations. The Management Board will have seven members with five representatives of State and Local Authority Departments and two representatives of the Joint Venture.

   It is recognised that the marina is a minor component of the development and the formation of a Board is desirable to ensure that the broad interests of the State are protected. However once the statutory approvals have been obtained the responsibility for administering design and construction approvals including maintenance should rest with existing authorities.

   In this regard your attention is drawn to the 1986 Cabinet decision which gave responsibility for marina projects to the Minister for Transport, who would use the Department of Marine and Harbours to manage and administer such projects. This is supported by the recommendations of the Working Party on Artificial Waterways which has representation from the State Planning Commission, Department of Local Government, Waterways Commission, Environmental Protection Authority and the Department of Marine and Harbours.

   It is difficult to see how the detailed needs of health, building, traffic and servicing matters could be realised without the full resources of an active and supportive local authority. An assured source of funding must be identified to enable long term maintenance funds to be accumulated. These issues have so far been inadequately addressed.

I confirm that the comments of the Department may be referred to other parties and published in full in any final environmental assessment report.

M J PAUL
DIRECTOR ENGINEERING

24 January 1989

(c24arb2.st)

DE
Recommended for signature
and canvas
24/1

APPENDIX 12

Comments concerning Coverage of Site Geomorphology and Significance in the ERMP for the Port Kennedy Development Proposal

COMMENTS CONCERNING COVERAGE OF SITE GEOMORPHOLOGY AND SIGNIFICANCE IN THE ERMP FOR THE PORT KENNEDY DEVELOPMENT PROPOSAL

June, 1989

IAN ELIOT

Department of Geography, University of Western Australia,
Nedlands, Western Australia, 6009.

SUMMARY

Comments made in this report are made notwithstanding that the Environmental Protection Authority guidelines are not intended to be either prescriptive or exhaustive; that EPA advice in no way diminishes the provisions of the Environmental Protection Act, which places full responsibility on the proponent to furnish all relevant information necessary to determine the environmental status of a proposal; and that there are temporal, financial and technologic constraints on the preparation of environmental review and management proposals which prescribe the matters of relevance to the proponent.

1.1 The Brief

1.1.1 The structure and content of the ERMP suggest that a fully-trained geomorphologist was not included in the study team and in that context, that the Brief may not have been sufficiently explicit to direct thorough geomorphological research.

1.1.2 The Guidelines are very broad. They encompass geomorphologic and sedimentologic processes that occur at time scales well in excess of the planning horizons recognised by the State Planning Commission (1987), and well beyond the engineering life of the planned development. Whether the policy of setting such broad guidelines is sound should be reviewed by the Environmental Protection Authority.

1.1.3 The range of data collected and presented could be constrained if the EPA, or an appropriate governmental agency, nominated the level of reliability and the scale of the investigations it is commissioning as well as limiting the issues that might be canvassed.

1.2 The Report

1.2.1 The geomorphologic components of the ERMP are essentially descriptive rather than interpretive. Some attempts to develop causal explanation have been entertained but they lack the rigour that would be expected in contemporary geomorphologic interpretation.

1.2.2 The regional and international significance of the Holocene dune assemblage between Mandurah Road and the coast, together with the inner continental shelf region, is well established in the scientific literature. The literature represents a detailed examination of radiometric dating and stratigraphic interpretation that is unmatched for much of the Australian coast.

1.2.3 A major task of the Port Kennedy ERMP was to establish the relevance of these findings to construction and maintenance of a marina and its associated terrestrial infrastructure. The task involves questions regarding the applicability of coarse geologic (sedimentologic) models to local landform stability and shoreline movement. This does not appear to have been recognised in the ERMP.

1.2.4 Broad descriptions of the landform, topographic and soil characteristics of the Port Kennedy site are competent. They identify the main geomorphic units and highlight the area of 'curvilinear' dunes for special consideration. The units mapped are discussed in the context of literature which establishes type-descriptions of dune morphology in the region.

1.2.5 Descriptions of dune formation and landform stability are superficial. The discussion entertains tenuous argument and no attempt has been made to relate the morphology of the site to processes described in other parts of the appendices. This strategy simply avoids issue driven investigation that would tie any discussion to the regional and international significance of the site.

1.2.6 The Port Kennedy site is of particular scientific importance because of its potential to yield information concerning variation in coastal storminess, storm surge and sea-level variation over the past 300 years. It makes the site one of much greater national and international significance than is indicated in the ERMP.

1.2.7 Implementation of the proposal to construct a marina in the middle of the site does not protect and maintain the integrity of Becher Point as an area of considerable regional and international significance. However, it is also possible that the major scientific questions, eg. those concerning variation in the prevailing direction and volume of littoral drift around Becher Point during the past 300 years, could be explored while the excavation for the marina and hotel are in progress. Such arguments warranted consideration in the ERMP, especially in sections oulining proposals for management and monitoring.

1.2.7 Although the international significance of the coastal plain of Rockingham as a source of palaeoclimatic and sea level information is well established in the scientific literature, the practical applications of the Holocene sedimentation models developed have not been critically or constructively examined in the ERMP. Again, they are broadly described in Appendix C but not thoroughly interpreted.

1.2.8 Consideration of geomorphic change associated with changing weather conditions and sea-level fluctuation suggests a very different scenario from that considered in the ERMP. It brings into question the reliability of littoral drift estimates reported in the ERMP in two contexts; in terms of the present day variability of littoral transport, and as a problem likely to occur with onset of any greenhouse effect on the atmosphere.

CONTENTS

2.0 BRIEF FOR ASSESSMENT OF THE ERMP REPORT FOR THE PORT KENNEDY RECREATION CENTRE

The Brief for this report is to:

"(i) assess the adequacy of the Port Kennedy ERMP in terms of its coverage of, and reponse to, the coastal terrain and geomorphology of the site, whilst

(ii) taking into account the available published work on the area, which makes a case for the regional and international significance of the site."

EPA Reference: 110/81 M106 V2
28 February, 1989.

3.0 PERSPECTIVES

3.1 Geomorphological and Geological Investigation

Stephens (1986) has presented a case for the application of geological research to problems of coastal management. He has argued that

" ... for coastal management studies, one needs to encompass several closely related disciplines to identify causes and trends in coastal change (Gordon et al, 1978; Gordon and Lord, 1981; Patterson and Ford, 1981; Chapman et al, 1982; Beach Protection Authority, 1984). Five approaches are useful in coastal planning. These use:

1. Historical data, which include sequential aerial photographs, charts, maps, and historical records.

2. Process data, which include observation, measurement and calculation of present rates of sediment transport and deposition to produce a modern sediment budget.

3. Botanical data, which include mapping of vegetation patterns marginal to the shoreline in terms of the stage of vegetative succession reached.

4. Pedological data, which include mapping of soil patterns marginal to the shoreline in terms of the degree of soil profile development.

5. Geological data, which include integration of sedimentological and stratigraphic data to produce a detailed history of past sediment budgets.

The five approaches are used in a complementary manner. The philosophy is that if all approaches indicate similar conclusions, then the conclusions have a high chance of being correct."

(Stephens, 1986: 19).

This is essentially the strategy adopted in the ERMP for Port Kennedy. As it is stated above, the strategy tacitly avoids reference to morphologic data, which was included in a similar list compiled by Thom (1965), and included mapping and interpretation of coastal landforms. In the ERMP, the extent to

which each approach raises and answers questions related to the management of the site; the detail and organisation of primary environmental data in each instance; and perhaps most importantly, the degree to which the various approaches are drawn together and interpreted, incorporate the case for regional and international significance. That case is implicit rather than explicit in the ERMP because of the manner in which the guidelines are specified.

There is a wide disparity between geomorphologic and geologic explanation, although the two modes of explanation employ similar techniques and sources of information. The disparity is illustrated by comparing current textbooks used in each discipline. For example, Carter (1988) and Boggs (1987) are introductions to coastal geomorphology and sedimentary geology respectively. Geomorphology, by definition, places greater emphasis on landform interpretation and contemporary environmental processes than may be required in sedimentology.

In contrast to modern geomorpologic investigation, the geomorphologic components of the ERMP are essentially descriptive rather than interpretive. The morphologic surveys reported in the ERMP are founded on a very substantial volume of geological and pedological information and they do not entertain causal argument. Other approaches to explanation have been entertained but they have not been developed in the context of the process studies carried out for the ERMP. Hence, they lack the rigour that would be expected in contemporary geomorphologic interpretation. In this respect, assessment of the adequacy of the ERMP, in terms of its coverage of the geomorphology of the Port Kennedy site and the degree to which the coverage includes a case for the regional and international significance of the site, will be made in terms of the different geomorphologic descriptions and arguments that are entrained in the ERMP.

3.2 Guidelines for the ERMP

Comments made in this report are made notwithstanding that the Environmental Protection Authority guidelines are not intended to be either prescriptive or exhaustive; that EPA advice in no way diminishes the provisions of the Environmental Protection Act, which places full responsibility on the proponent to furnish all relevant information necessary to determine the environmental status of a proposal; and that there are temporal, financial and technologic constraints on the preparation of environmental review and management proposals which prescribe the matters of relevance to the proponent.

The geomorphologic components of the Guidelines for the ERMP (Port Kennedy ERMP, 1988, II:109 - 114.) include the following points from the Preamble (pp 109):

"1. The referral document indicates the intention to use information and conclusions established by the Westport and Secret Harbour ERMP's. While this is acceptable, and can avoid unnecessary duplication of research undertaken, the ERMP should ensure that existing data is meaningful and interpreted sufficiently to apply to the Port Kennedy proposal.

2. The status of the System 6 Report and the recommendations for the Port Kennedy area (M106) should be addressed with care.

   The System 6 Report indicates that the Port Kennedy area has important environmental values associated with the parallel dune system and their associated ecology. The referral document appears to largely ignore this fact. The proposal should reflect the intent and objectives of the System 6 recommendations."

The reference to the System 6 Report is obscure, although it may have focussed attention on an unusual sequence of curvilinear dunes occurring near Bridport Point. The System 6 Report states:

> "The peninsula (Becher Point) consists of parallel curving dunes, typical of the Coastal Plain south of Rockingham. Much of the area retains its natural vegetation, which is quite rich in species. ... The area's conservation value is high, because there is little similar land available between Fremantle and Mandurah."
>
> (Department of Conservation and Environment, 1983: 300).

Other matters of relevance to assessment of the geomorphology of the Port Kennedy site are addressed as follows:

> "This ERMP should provide an overall description of the environment and an appraisal of physical and ecological systems likely to be affected by the proposal. It should concentrate on the significant aspects of the environment likely to be impacted by the development (ie in particular the processes sustaining the system). Only the processes, habitats, resources and potential resources which could be influenced should be defined. Detailed inventories should be placed in appendices to the ERMP.
>
> Wherever possible in the discussion of physical and biological processes that are essential determinants in the maintenance of habitats and resources, conceptual and where possible, quantitative models or diagrams should illustrate and synthesize the interactions between the processes."
>
> (Port Kennedy ERMP, 1988, II:111).

Discussion of the physical and biological process was explicitly requested to include consideration of the following:

1. landform and soils;
2. geomorphic stability;
3. climate, climatic change and meteorology of Port Kennedy;
4. coastal and marine geomorphology and processes;
5. coastal zone stability; and
6. oceanography and littoral drift.

Under Item 7 of the Guidelines, those concerning assessment of environmental impacts, the Guidelines specifically establish an objective to

> " ... synthesize all information and predict potential impacts upon the environment." (Port Kennedy ERMP, 1988, II:113).

It goes on to point out that the ERMP should include but not be limited by consideration ofthe following:

1. oceanography;
2. frequency of storm events;
3. coastal processes (in particular gross and net sediment movements) and shoreline migration;
4. anchor damage on seagrass meadows;
5. flushing times and water quality in the marina water body and any other enclosed water body (ie ornamental lakes or artificial wetlands);
6. land surface stability, with particular reference to foredunes;
7. landscape (impact on the Safety Bay and adjacent landscapes); and
8. local and regional significance of foreshores.

In the context of the Brief, the geomorphological investigations completed in the ERMP could reasonably be expected to:

1. provide an account of local foredune development;
2. determine the geomorphic stability of landforms, particularly the parallel and curvilinear dune sequence, at a variety of time scales appropriate to the ERMP proposal and including accepted planning horizons;
3. identify the temporal and spatial components of shoreline variability in the vicinity of Becher and Bridport Point that are directly relevant to prognoses of shoreline movement within a 50 to 100 year planning horizon;
4. relate shoreline and dune stability to recent climate change, particularly change affecting variation in storminess and sea-level fluctuation; and
5. comment on any regional and international significance of the geomorpologic arguments developed above.

This is not a list of ideal investigations. It is a list of expectations based on direction from the Brief for the ERMP and founded in contemporary geomorphologic research rather than physiographic description. It is a list based on knowledge of the literature available at the time the ERMP was commissioned and which has been acknowledged by the proponents in their desire to reference the Westport and Secret Harbour ERMP reports. As Geary and Lord (1981) have pointed out, the degree to which coastal investigations may be ideal is a function of the detail of the investigation and is determined by economic considerations. That is not an issue in this context. However, it is important in terms of whether arguments represented in the ERMP adequately address the brief and adequately establish a geomorphologic case for the regional and international significance of the site. None of the topics listed for investigation have been adequately considered in the ERMP. Indeed, the structure and content of the ERMP suggest that a fully-trained geomorphologist was not included in the study team and, in that context, that the Brief may not have been sufficiently explicit to direct thorough geomorphological research.

The Guidelines are very broad. They encompass geomorphologic and sedimentologic processes that occur at time scales well in excess of the planning horizons recognised by the State Planning Commission (1987) and well beyond the engineering life of the planned development. No constraint has been placed on the temporal or spatial scales of geomorphic change occurring near Port Kennedy, except in so far as it can be interpreted sufficiently to apply to the site. Whether the policy of setting such broad guidelines is sound, given the necessary temporal and economic constraints of ERMP projects, is a moot point that should be reviewed by the Environmental Protection Authority. These

comments are particularly apposite in the context of the collection and collation of sedimentologic data (eg radiometric dating, stratigraphic interpretation) used to describe changes in landform and shoreline configuration. The distinction between directed and undirected research is apparent when the arguments developed in Appendices A, D and F are compared with those from Appendices C and G.

Different types of geomorphologic and geologic data, encompassed by the various approaches to coastal investigation listed by Thom (1965) and Stephens (1986), represent very disparate levels of reliability, where reliability is defined in a probablistic context. It is possible to make a sufficient argument for the inclusion of a wide variety of information in an ERMP document. However, the range of data collected and presented usefully might be constrained if the EPA, or an appropriate governmental agency, nominated the level of reliability and the scale of the investigations it is commissioning.

3.3 The Regional and International Significance of the Site

The regional and international significance of the Holocene dune assemblage between Mandurah Road and the coast, together with the inner continental shelf region, is well established in the scientific literature. The literature is referenced in Vol. II, Section 16 and Vol. III, Appendix C of the ERMP, and through those references to a much wider body of international literature. It was established from environmental studies completed for the Westport and Secret Harbour ERMP's, as well as in research supported by the University of Western Australia (Searle and Woods, 1986: Semeniuk and Searle, 1986; Searle et al, 1988). The literature represents a detailed examination of radiometric dating and stratigraphic interpretation that is unmatched for much of the Australian coast. It highlights many of the unique attributes of the coastal plain and its importance as a scientific site for interpretation of sea level and climate change. In particular, Semeniuk and Searle (1986) and Searle et al (1988) note that the coastal plain is significant regionally and is of global importance for several reasons, including the following:

1. It is the largest accumulation of Holocene sand in the region of the inner Rottnest Shelf coast. As a consequence, it encompasses a very substantial record of sea level, palaeoclimatic and environmental change over the past 7000 years. Thorough interrogation of this record has practical ramifications for coastal planning and management in Western Australia.
2. The sedimentary record provides an unusual example of Holocene sedimentation in a bathymetrically complex region. The stratigraphic model developed from the area now provides a type example of Holocene sedimentation and stratigraphic evolution.
3. The conjunction of simple stratigraphy, a wealth of carbonate-rich sediment with <u>in situ</u> skeletal material, and definitive geomorphic trends provides a very good record of sea level variation over the past 7000 years.
4. The depositional history of the beach ridge sequence comprising the coastal plain has important ramifications for an understanding of climate change over the past 7000 years and could provide an index to predict future climatic trends.
5. Semeniuk and Searle (1986) have investigated sedimentary records from two other depositional sites, Whifords and Leschenault, for comparison with the detailed record from Rockingham. As a result of their comparison they consider that the Southwest Coast of Western Australia can not be considered tectonically stable, as has been assumed previously. Their

results, together with interpretation of recent sea-level records (Wallace, 1988), have opened a debate which will prove to be of major significance for coastal research and coastal planning.

A major task of the Port Kennedy ERMP was to establish the relevance of these findings to construction and maintenance of a marina and its associated terrestrial infrastructure. The problem raises questions regarding the applicability of coarse geologic (sedimentologic) models to local landform stability and shoreline movement. They do not appear to have been considered in the ERMP.

4.0 DESCRIPTION OF THE GEOMORPHOLOGY OF PORT KENNEDY

The general landform, topographic and soil characteristics of the Port Kennedy site are outlined on pages C14 - C21; the processes of dune building are detailed on page C30; and the regional significance of the site is considered on pages C45 - C46 of Volume III of the ERMP. The broad description is competent. It identifies the main geomorphic units and highlights the area of `curvilinear' dunes for special consideration. The units mapped are discussed in the context of literature which establishes type-descriptions of dune morphology in the region.

In other respects, the descriptions of dune formation and landform stability are superficial. The discussion entertains tenuous argument and no attempt has been made to relate the morphology of the site to processes described in other parts of the appendices. This strategy simply avoids issue driven investigation that would tie any discussion to the regional and international significance of the site. The shortcomings may occur because the section describing the coastal landforms generally lacks purpose, and because deficiencies in baseline data (eg detailed records of shoreline movement) apparently mitigated against rigorous assessment of the site. Further, no substantive attempt was made to relate any of the observations to the wider body of geomorphologic literature describing accretion and erosion on sandy capes, called cusps in the ERMP (eg Zenkovich, 1969; El Ashry, 1967); models of foredune development (Bird, 1969; Hesp, 1984); identification of systematic patterns and sequences of shoreline movement (Tanner, 1978; Dolan et al, 1983; Aubrey, 1983; Miller, 1983); dynamic equilibrium of sandy beaches (Chapman et al, 1982; Dean and Maurmeyer, 1983); changes in configuration of the coast due to meso-scale variation in weather (Kuhn and Shephard, 1983; Davis, 1985) and sea-level (Bruun, 1987; Clarke and Eliot, 1983; Komar and Enfield, 1987); or changes in the plan form of beaches which may result from alteration of the effective length of the beach by shifting the headland position (Silvester et al, 1980; Hsu et al, 1987, 1988). One may quibble with the selection of references given in example but all of these topics are of direct relevance to detailed interpretation of the geomorphology of the Port Kennedy site and to impacts that construction of the marina may have on the coastline in the vicinity of Becher Point. In some instances they have merited comment in the report but they have not been explored in any depth.

4.1 Dunes and Shorelines

The important attribute of the beach ridges and foredunes at Becher Point, including the `curvilinear' dunes, is that the individual ridges are tied to abandoned strandlines (shorelines) that indicate switching of sediment deposition between the northern and southern shores of the salient. They share this attribute with similar beach ridge sequences at Jurien Bay and Cervantes

where the sandy capes also separate beaches in markedly different energy environments. The shoreline variations that are represented on Figure 5.2 of Appendix A, which shows a cellular pattern of erosion and deposition superimposed on a gross progradational trend, are preserved in the beach ridges between Becher Point and Bridport Point east, particularly including the curvilinear dunes. The detailed stratigraphic record of cut and fill, of stabilisation and progradation, could be calibrated against shoreline movements determined from the historical record and related to variation in the direction of wave incidence. In this respect the site is of particular scientific importance because of its potential to yield information concerning variation in coastal storminess and storm surge over the past 300 years. It makes the site one of much greater national and international significance than is indicated in the ERMP.

At a local level, variation in the rates of erosion on the southern side of Becher Point and deposition along the northern shoreline suggest that there has been substantial variation in the rate of littoral drift into Warnbro Sound from the southern beaches. It is not known how present day estimates of littoral drift compare with what has occurred at the site in very recent geologic time. This should be apparent from the available meteorological information as well as from the stratigraphic record. A principal question that might have been asked in the ERMP concerns the degree to which the representative year, November, 1984 to October, 1985, represents conditions likely to be experienced at the site over an established planning horizon.

The extent to which implementation of the proposals in the ERMP report protect and maintain the integrity of Becher Point as an area of considerable regional and international significance is related to declaration of a conservation zone that preserves the landforms together with the processes affecting them. This does not appear to be satisfied by the proposal to construct a marina in the middle of the site. However, it is also possible that the major scientific and social questions, eg. those concerning variation in storminess in Southwestern Australia over the past 300 years, could be explored while the excavation for the marina and hotel are in progress. Such arguments warranted consideration in the ERMP, especially in sections oulining proposals for management and monitoring.

4.2 Climate Change, Sea-level Fluctuation and Shoreline Movement

The international significance of the coastal plain of Rockingham as a source of palaeoclimatic and sea level information is well established in the scientific literature, as has been pointed out by Searle et al (1988). The importance of this in the context of the ERMP is that potential coastal responses to predicted sea level fluctuation in the region can be assessed in the context of sedimentation during different phases of the Holocene, over the past 7000 years, and for the past few hundred years in particular. The point that morphostratigraphic studies of coastal sand barriers and their associated wetlands might yield such information has been the major rationale for sedimentologic and geomorphologic research over the past two decades (Leatherman, 1979; Thom, 1984; Nummendal et al, 1987). Surprisingly, the practical applications of Holocene sedimentation models developed from the Rockingham coastal plain have not been critically or constructively examined in the ERMP. Again, they are broadly described in Appendix C but not thoroughly interpreted in the context of development at Port Kennedy.

The context for a more thorough review is provided by regional variability of coastal storm activity and sea-level fluctuation. Any increase in storm intensity and/or sea-level will result in increased wave activity and a change in the rate of littoral transport. This can be estimated in wave hindcasting models, such as that used in Appendix A. Where predicted sea level changes are within the limits of what has occurred in recent geologic time, and the effects of the past changes are preserved in the sedimentary record, it is feasible that the predicted changes will have an analogue in the sedimentary record. For example, it has been argued that the rate and pattern of shoreline change during the past 7000 years may be used as an analogue for changes likely to occur in response to predicted climate change associated with the greenhouse effect (Thom and Roy, 1988). It should also provide an appreciation of more recent variation in shoreline responses to fluctuations in sea-level and weather conditions.

Techniques for investigating shoreline movements occurring in a planning horizon of 50 to 100 years are now well established in the international literature (Miller, 1983; Aubrey, 1985) and the link between short term fluctuation in beach groundwater and sea levels with shoreline movement is well established for Western Australia (Clarke and Eliot, 1983, 1987) and elsewhere (Komar and Enfield, 1987; Gordon, 1988). Komar and Enfield (1987) consider that the research from Western Australia provides the clearest correlation between short-term sea-level fluctuation and shoreline movement. That research indicates that a 1 cm rise in sea-level results in approximately 100 cm of shoreline retreat on sandy beaches. The field observations reported by Clarke and Eliot (1983) refer to sea-level fluctuations with periods greater than 6 months, including fluctuations associated with annual variation in barometric pressure. They are close to the ratio between sea-level rise and shoreline retreat reported by Bruun (1987).

Consideration of geomorphic change associated with changing weather conditions and sea-level fluctuation suggest a very different scenario from that considered in the ERMP. It brings into question the reliability of littoral drift estimates reported in the ERMP in two contexts; in terms of the present day variability of littoral transport, and as a problem likely to occur with onset of any greenhouse effect on the atmosphere. In the first instance, it would be relevant to consider the range of littoral transport rates occurring historically. The coast of Southwestern Australia has enjoyed comparatively calmer weather conditions over the past decade than in the late 1950's and 1960's, for example. Does this mean that estimates of littoral transport are likely to be underestimates for design purposes? In the second instance, and accepting Porter's figures for projected sea-level rise (Port Kennedy ERMP, 1988, II: 46), somewhere between 480,000 and 16,000,000 cubic metres sediment will be released to the inshore zone between Mandurah and Becher Point during the next 40 years. The figure would be much higher than this if calculations were based on sea-level changes predicted by Barth and Titus (1984). If the sea-level change is accompanied by increased littoral transport as a result of increased wave activity along the coast, as might reasonably be anticipated to occur with alteration of water depth over the offshore reefs, then the estimates of littoral transport reported in the ERMP have a high probability of being gross underestimates of what may occur in the immediate future. The potential for design error would be reduced if the geomorphology of the site was utilised as a check against other estimates of the coastal sediment budget. The procedure for doing this was successfully applied to a coastal management study in New South Wales by Gordon et al, 1978. The methodology does not appear to have been considered in the ERMP for Port Kennedy.

5.0 AN OVERVIEW

Modern geomorphologic research is largely issue oriented. Causal explanations in geomorphology are sought through an understanding of contemporary hydrodynamics and physical processes as well as through morphostratigraphic interpretation. This was not the approach that was adopted in the ERMP and it may not have been the approach intended by the officers of the EPA who commissioned the investigations. If the latter was the case then the classification and description of the landforms of the site, which are competently done, may well satisfy what was intended in the brief. In general,the strategy adopted was to provide a broad description of landforms and geology on and around Becher Point. This strategy is not conducive to the identification and solution of existing and potential environmental problems associated with the site. Neither is it an effective strategy to demonstrate the regional and international significance of the site. The latter rests on the presence of a unique combination of coastal processes and landforms at Becher point, and its potential to yield information concerning variation in coastal storminess, storm surge and sea-level change over the past 300 years. Such areas are rare. They provide important analogues for changes likely to occur in response to predicted climate change, such as that likely to be associated with the greenhouse effect. In this respect, the ERMP does not adequately cover the geomorphology of the site at Port Kennedy.

6.0 REFERENCES

Aubrey, D.G., 1983. Beach changes on coasts with different wave climates, in ***Sandy Beaches as Ecosystems***, edited by A. McLachlan and T. Erasmus, Dr W.Junk, The Hague, PP 63 - 86.

Barth, M.G. and Titus, J.G., 1984. ***Greenhouse Effect and Sea Level Rise***, van Nostrand - Reinhold, New York, 325 pp.

Beach Protection Authority (BPA), Queensland, 1984. ***Mulgrave Shire Northern Beaches***, Beach Protection Authority, Queensland State Government, 366 pp.

Bird, E.C.F., 1969. ***Coasts***, ANU Press, Canberra.

Boggs, S., 1987. ***Principles of Sedimentology and Stratigraphy***, Merrill, London.

Bruun, P., 1987. Sea level rise effects on shoreline position.***Proceedings, American Society of Civil Engineers, Journal of the Waterways, Port and coastal Engineering***, 113: 550 - 553.

Carter, R.W.G., 1988. ***Coastal Environments: An Introduction to the Physical, Ecological and Cultural Systems of Coastlines***, Academic Press, London.

Chapman, D.M., Geary, M., Roy, P.S. and Thom, B.G., 1982. ***Coastal Evolution and Coastal Erosion in New South Wales***, A report Prepared for the Coastal Council of New South Wales, Government Printer, Sydney.

Clarke, D.J. and Eliot, I.G., 1983. Mean sea-level variations and beach width fluctuations at Scarborough, Western Australia. ***Marine Geology***, 51: 251 - 267.

Clarke, D.J. and Eliot, I.G., 1987. Groundwater level changes in a coastal dune, sea-level fluctuations and shoreline movement on a sandy beach. ***Marine Geology***, 77: 319 - 326.

Davis Jnr., R.A., 1985. Beach and nearshore zone. Chapter 6 in ***Coastal Sedimentary Environments***, edited by R.A. Davis Jnr., Springer - Verlag, New York, pp 379 - 444.

Deane, R.G. and Maurmeyer, E.M., 1983. Models for beach profile response. Chapter 7 in ***CRC Handbook of Coastal Processes and Erosion***, edited by P.D. Komar, CRC Press, Boca Raton, Florida, pp 151 - 166.

Dolan, R. and Hayden, B., 1983. Patterns and prediction of shoreline change, Chapter 6 in ***CRC Handbook of Coastal Processes and Erosion***, edited by P.D. Komar, CRC Press, Boca Raton, Florida, pp 123 - 150.

El-Ashry, M.R. and Wanless, H.R., 1967. Shoreline features and their changes. ***Photogrammetric Engineering***, 33: 184 - 189.

Geary, M.G. and Lord, D.B., 1981. Development in the coastal hazard zone. ***Proceedings, 5th Australian Conference on Coastal and Ocean Engineering (Perth)***, Institute of Engineers, Australia, National Conference Publication No. 81/16, pp 183 - 187.

Gordon, A.D., 1988. A tentative but tantalizing link between sea-level rise and coastal recession in New South Wales, Australia. In ***Greenhouse: Planning for Climate Change***, edited by G.I. Pearman, CSIRO Division of Atmospheric Research, Melbourne, pp 121 - 134.

Gordon. A.D., Lord, D.B. and Nolan, M.W., 1978. ***Byron Bay - Hastings Point Erosion Study***, department of Public Works of New South Wales, Coastal Engineering Branch, Report No. PWD 78026.

Hesp, P., 1984. Formation of sand 'beach ridges' and foredunes. ***Search***, 15: 289 - 291.

Hsu, J.R-C., Silvester, R. and Xia, Y.M., 1987. New characteristics of equilibrium shaped bays. ***Proceedings, 8th Australian Conference on Coastal and Ocean Engineering***, Institute of Engineers, Australia, pp 140 - 144.

Hsu, J.R-C., Silvester, R. and Xia, Y.M., 1988. Generalities on static equilibrium bays. ***Coastal Engineering***, 12: 353 - 369.

Komar, P.D. and Enfield, D.B., 1987. Short-tern sea-level changes and coastal erosion. In ***Sea-level Fluctuation and Coastal Evolution***, edited by D. Nummendal, O.H. Pilkey and J.D. Howard. Society of Economic Paleontologists and Mineralogists, Special Publication No. 17, pp 17 - 28.

Kuhn, G. and Shephard, F.P., 1983. Beach processes and sea cliff erosion in San Diego County, California, Chapter 13 in ***CRC Handbook of Coastal Processes and Erosion***, edited by P.D. Komar, CRC Press, Boca Raton, Florida, pp 267 - 284.

Leatherman, S.P., 1979. ***Barrier Islands: From the Gulf of Saint Lawrence to the Gulf of Mexico***, Academic Press, New York.

Miller, M.C., 1983. Beach changes at Holden Beach, North Carolina. ***Miscellaneous Report No. 83-5***, Coastal Engineering Research Center, U.S. Army Corps of Engineers, Washington, 65 pp.

Nummendal, D., Pilkey, O.H. and Howard, J.D., 1987. ***Sea-level Fluctuation and Coastal Evolution***, Society of Economic Paleontologists and Mineralogists, Special Publication No. 17, Tulsa, Oklahoma.

Patterson, D.C. and Ford, L.R., 1981. Capricorn Coast Beaches. ***Proceedings, 17th International Conference on Coastal Engineering***, American Society of Civil Engineers, New York, 2: 1649 - 1668.

Searle, D.J. and Woods, P.J., 1986. Detailed documentation of a Holocene sea-level record in the Perth Region, Southern Western Australia. ***Quaternary Research***, 26: 299 - 308.

Searle, D.J., Semeniuk, V. and Woods, P.J., 1988. Geomorphology, stratigraphy and Holocene history of the Rockingham - Becher Plain, South-western Australia. ***Journal of the Royal Society of Western Australia***, 70(4): 89 - 109.

Semeniuk, V. and Searle, D.J., 1986. Variability of Holocene sealevel history along the Southwestern Coast of Australia - evidence for the effect of significant local tectonism. ***Marine Geology***, 72: 47 - 58.

Silvester, R., Tsuchiya, Y. and Shibano, T., 1980. Zeta bays, pocket beaches and headland control. ***Proceedings, 17th International Conference on Coastal Engineering***, American Society of Civil Engineers, New York, 2: 1306 - 1319.

Stephens, A.W., 1986. ***Geological Approaches to Beach Management***. Geological Survey of Queensland, Record No. 1986/13.

Tanner, W.F., 1978. ***Standards for Measuring Shoreline Changes***, Report of a workshop published jointly by Coastal Research and the Department of Geology, Florida State University, Tallahassee, Florida.

Thom, B.G., 1965. Late Quaternary coastal morphology of the Port Stephens - Myall Lakes area New south Wales, ***Journal of the Royal Society of New South Wales***, 93: 23 - 36.

Thom, B.G., 1984. ***Coastal Geomorphology in Australia***, Academic Press, Sydney.

Thom, B.G. and Roy, P.S., 1988. sea-level rise and climate: lessons from the Holocene. In ***Greenhouse: Planning for Climate Change***, edited by G.I. Pearman, CSIRO Division of Atmospheric Research, Melbourne, pp 177 - 188.

Zenkovich, V.P., 1969. ***Processes of Coastal Development***, Oliver and Boyd, Edinburgh.