PORT GEOGRAPHE

INTERSTRUCT PTY LTD
NATURALISTE DEVELOPMENTS PTY LTD

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia

Bulletin 386 May 1989

ISSN 1030-0120

ISBN 0 7309 1948

CONTENTS

CONTENTS (Cont'd)

FIGURES

TABLE

APPENDICES

i. SUMMARY AND RECOMMENDATIONS

The Port Geographe proposal is a residential canal development with harbour, commercial centre, and a conservation area. The site lies on the coast immediately east of the existing Busselton built-up area, between the ocean foreshore to the north and the Vasse estuary to the south and east. The project site has a total area of 300 hectares, currently under the control of Interstruct Pty Ltd and Naturaliste Developments Pty Ltd. Approximately 114 hectares of the site is proposed to become a conservation area and be transferred to the Crown.

The Environmental Protection Authority has required the Port Geographe proposal to be assessed under Part IV of the Environmental Protection Act, in the form of an Environmental Review and Management Programme. This document was subject to a public review period of 10 weeks, and 22 submissions were received.

The Port Geographe proposal raises a number of important issues concerning the long term protection of the Vasse-Wonnerup estuary system, which the Authority believes must be resolved irrespective of the determination and outcome of this proposal.

The adjacent Vasse estuary is one of the most significant estuaries in the south west of Western Australia. It is a regionally and internationally significant waterbird habitat, for both endemic and migratory species. The Vasse-Wonnerup estuary system is also the subject of the 1975 Environmental Protection Authority's System 1 Report which recommended the protection and suitable management of the conservation values of the estuary.

The System 1 Report recognised that the estuary system was under threat from agriculture, grazing and severe eutrophication, but that its current environmental significance is essentially a result of human activities over a long period, and that it is therefore a highly modified rather than pristine estuary system.

The Authority places the highest possible value on the waterbird habitat function of the estuary system, whilst also recognising its flood compensation basin function. The estuary's current condition is to a large degree a result of certain distinct characteristics which include:-

- its high nutrient status;
- freshwater conditions resulting from winter flow from the catchments;
- seasonal drying out thus avoiding the adverse impacts of a highly eutrophic system;
- the existence of lock gates and diversion drains that contribute to its current hydrological status;
- the surplus flow currently diverted away from the estuary, that could be rediverted back into the estuary under drier climatic conditions.

Given that the System 1 recommendations have not been realised to date, largely due to the difficulties presented by private ownership of much of the estuary, and because of the highly modified nature of the estuary, the Authority can more readily consider the virtues of an environmentally responsible proposal that provides renewed opportunity to improve the management of the Vasse-Wonnerup system.

The lack of action to protect or manage the Vasse-Wonnerup estuary despite the System 1 recommendations of 1975 has meant that the estuary system has continued to be exposed to the adverse impacts of agricultural land use, and to subdivision and development pressures, and is at increasing risk of losing its waterbird habitat function due to lack of management.

In considering the Port Geographe proposal, particularly with regard to the Vasse estuary, the Environmental Protection Authority has taken account of various opportunities and constraints as guiding factors in its assessment. The principal opportunities associated with the proposal are considered to be:

. the proponent's commitment to the handover of a substantial and significant portion of the Vasse estuary to the Crown for conservation purposes at no cost to the community,

. the offer of a significant package of funding, research information, and design/management commitments by the proponent to assist in various conservation initiatives as a fundamental aspect of the proposal;

. the existence of the proposal as a catalyst to bring about a better understanding of the estuary, an increased sense of urgency of the need to take effective action to protect the system, and ultimately the implementation of comprehensive management of the estuary system;

. through the provision of adequate harbour and boating facilities, the removal of pressure to develop a harbour or marina in less environmentally acceptable locations in the Busselton/Naturaliste area;

. the provision of a major urban and high quality tourism development as an extension to the Busselton urban area, and hence assist in reducing development pressures in the Dunsborough/Naturaliste area.

The principal constraints associated with the proposal and its site, are:

. the need for the long term protection of the waterbird habitat value and carrying capacity of the Vasse-Wonnerup system;

. the need to avoid contributing to the cumulative statewide loss of wetland environments.

. the need for adequate provision to ensure either protection or safe removal and successful relocation of all endangered fauna currently occupying the site;

. the requirement for adequate provision in the design of the development to allow for the potential impacts of the Greenhouse Effect;

. development control limitations on the ocean foreshore of the site.

It is the Environmental Protection Authority's view that, within the context of the recommendations and suggestions of this assessment report, the opportunities outweigh the constraints. The Authority is also of the view that with respect to protection of the estuary system the opportunities are rapidly diminishing, whilst the constraints are mainly matters that are capable of being managed, with the possible exception of the impacts of the Greenhouse Effect. The Environmental Protection Authority is therefore keen to emphasise the potential benefits of allowing the proposal to proceed

subject to appropriate conditions, and believes that on balance these exceed the alternative arguments for not allowing the project to proceed.

Following an extensive assessment of the proposal and consideration of various key issues, including many raised in submissions, and having noted changes to the proposal in response to submissions the Environmental Protection Authority concludes that the proposal for Port Geographe (Stage 1 only) is environmentally acceptable, subject to a number of requirements. These include the setting in place of adequate management plans for all aspects of the proposal, and adherence to commitments made, before the development can proceed.

It must be stressed that while the proposal is considered environmentally acceptable subject to various recommendations, and that in the short term on-site environmental constraints can be managed or overcome, the Authority believes that in the longer term environmental problems associated with the Vasse-Wonnerup estuary will intensify and worsen with potentially serious consequences, unless there is management of the system by the Government and adjoining land owners. The Authority is therefore of the view that even if the Port Geographe proposal were not to proceed, the Government itself has an essential responsibility to ensure there is adequate management of the overall Vasse-Wonnerup estuary system put in place as soon as possible. The Port Geographe proposal offers an opportunity to take this initiative.

In conclusion the Environmental Protection Authority considers that if Government is to grant overall approval to the project, then the Government itself should consider as a matter of necessity the undertaking of a number of additional actions before formal approvals are given. These actions include:

- initiating appropriate management arrangements with adequate funding, for the publicly owned portions of the Vasse-Wonnerup estuary;

- initiating and undertaking the preparation of an integrated catchment management programme;

- considering land use control mechanisms to avoid the pressures of development on the estuary system;

- nominating the Vasse-Wonnerup system for inclusion under the Ramsar Convention;

- encouraging and providing advice on appropriate environmental management of privately owned farming land adjacent to the estuary; and

- initiating an appropriate study of the Western Ringtail Possum to assist in making future decisions that might otherwise threaten this animal.

The Authority wishes to emphasise that approval for the Port Geographe proposal as submitted does not give tacit approval to any further stages, nor any other development proposal that may arise as a result of Port Geographe going ahead.

In respect of the further stages for Port Geographe under the 'Vasse-Wonnerup Conservation Park' concept as referred to in the ERMP, the Authority considers these to be fundamentally different from Port Geographe with entirely different implications. The concept as portrayed in the ERMP indicates a far greater scale of development than the current proposal under consideration, and this alone would greatly impact upon an open, low lying,

and distinctive estuarine landscape and its essential values. However of greatest concern is the explicit reference to modification of the estuary system. For reasons stated in this assessment report, and as discussed in detail in the Environmental Protection Authority's report entitled "The Environmental condition of the Vasse-Wonnerup System and Discussion of Management Options," (1989) the notions in the future concept plan put forward by the proponent are regarded as environmentally unacceptable in their present form and nature.

The Environmental Protection Authority also draws particular attention to variously considered options for re-routing roads through the main estuary environment, including the Ford Road extension. The Authority regards any such plans as being undesirable and highly intrusive to the estuary environment. Any proposals put forward will be assessed in detail under the Environmental Protection Act.

The following recommendations are made:

RECOMMENDATION 1

The Environmental Protection Authority concludes that the Port Geographe proposal Stage 1 as described in the ERMP and subsequently revised in the proponent's response to submissions, and in the context of the overall environmental benefits provided and the opportunity the proposal provides to manage the Vasse-Wonnerup system, is environmentally acceptable, and recommends the proposal could proceed subject to the undertakings and commitments provided by the proponent (see Appendix 1), and the recommendations of this report.

RECOMMENDATION 2

The Environmental Protection Authority recommends to Government that the Vasse-Wonnerup estuary and adjacent Crown land be protected and managed for conservation purposes. In so doing the State Government should ensure:

(i) the application of appropriate mechanisms to avoid adverse development of land areas adjacent to the estuary;

(ii) nomination of the Vasse-Wonnerup system for inclusion under the Ramsar Convention so as to recognise and acknowledge the waterbird habitat value of the estuary system;

(iii) the undertaking of practical means of encouraging appropriate management practices on privately owned agricultural land adjacent to the estuary, and within the overall estuary catchment; and

(iv) the preparation of an overall estuary management plan coordinated by the Department of Conservation and Land Management.

RECOMMENDATION 3

The Environmental Protection Authority recommends that an integrated catchment management programme be developed by the Department of Agriculture, and that further studies of the Vasse-Wonnerup wetland system be conducted to determine the most appropriate method to manage the waterways and adjacent land areas.

RECOMMENDATION 4

The Environmental Protection Authority recommends that construction of the groynes and establishment of new foreshore beach profiles should not commence before the provision of:

(i) final design details with adequate supporting data; and

(ii) a suitable beach monitoring programme with adequate provision for reporting to the local authority and Department of Marine and Harbours;

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

RECOMMENDATION 5

The Environmental Protection Authority regards it as essential that there should not be any long term loss or erosion of the existing beaches east or west of the proposed foreshore works as a consequence of this project, and to that end recommends that the proponent make adequate provision for any possible restoration as part of the agreement to be concluded with the State and the Shire of Busselton.

RECOMMENDATION 6

The Environmental Protection Authority recommends that before construction commences the proponent should:

(i) provide final details of the proposed sand trap and sand bypass system, including details of adequate sand budget, timing of the operation, an accurate estimate of costs and details of funding;

(ii) prepare and implement a sand dune stabilisation and management programme;

to the satisfaction of the Environmental Protection Authority following advice from the Department of Marine and Harbours, the Department of Agriculture and the Shire of Busselton;

RECOMMENDATION 7

The Environmental Protection Authority recommends that the proponent provide details of a sediment plume monitoring and management programme to be undertaken at the time of the construction, and during subsequent dredging programmes, to monitor the effect on the seagrass meadows, and to provide for effective action should a potential problem be detected, to the satisfaction of the Environmental Protection Authority,following advice from the Department of Marine and Harbours.

RECOMMENDATION 8

The Environmental Protection Authority recommends that the proponent should submit and implement an investigation, eg dye trace or similar, following construction to verify the flushing time and efficiency of water circulation within and from the canal and harbour system, to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 9

The Environmental Protection Authority recommends that before any site works commence the proponent should provide a suitable programme for the protection of Western Ringtail Possum incorporating the suggestions contained in Section 5.4 of this Report, to the satisfaction of the Environmental Protection Authority following advice from the Department of Conservation and Land Management.

RECOMMENDATION 10

The Environmental Protection Authority recommends that the proponent should revise the layout and landscape treatment of the pasture areas to be included in the conservation area to:

(i) retain the maximum possible area and range of habitats for waterbirds;

(ii) design all artificial lakes and moats to provide high waterbird habitat value; and

(iii) incorporate appropriate design features to achieve the most effective buffer between the development and estuary in order to minimise all forms of disturbance to waterbirds, and to maintain the habitat value of the estuary;

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

RECOMMENDATION 11

The Environmental Protection Authority recommends that final proposals for development of the proposed winery complex site east of Layman Road should ensure maximum protection of the estuary foreshore and Agonis flexuosa stands. The proposals should be provided to the Environmental Protection Authority, and only implemented if found satisfactory by the Authority, following advice from the Department of Conservation and Land Management.

RECOMMENDATION 12

The Environmental Protection Authority recommends that mosquito and midge control measures undertaken by the responsible authority in the Vasse-Wonnerup locality, should specifically exclude larvicides, and should be limited to the fogging of commercial and residential areas with adulticides. Any other type of chemical control subsequently proposed should be subject to separate environmental assessment by the Environmental Protection Authority.

RECOMMENDATION 13

The Environmental Protection Authority recommends that the proponents should prepare and make available a suitable public education package concerning the midge and mosquito control programme to explain and inform future residents and owners of the purpose and extent of limitations placed on mosquito and midge control, to the satisfaction of the Environmental Protection Authority.

RECOMMENDATION 14

The Environmental Protection Authority regards it as essential that there should be no adverse impacts resulting from dewatering outside the project site, and to that end recommends that the proponent consider alternative construction techniques that do not require dewatering, and advise the Environmental Protection Authority of the preferred option.

RECOMMENDATION 15

The Environmental Protection Authority recommends that the proponent's undertaking to monitor seepage from the canals include regular visual inspection of the samphire and estuary edge.

RECOMMENDATION 16

The Environmental Protection Authority recommends that if seepage of groundwater in either direction occurs and results in adverse impacts on the estuary water quality, the proponent should undertake to seal by appropriate means as much of the canal waterway system as is necessary, at no cost to the community, and should make financial provision for such in the relevant agreement with the Waterways Manager.

RECOMMENDATION 17

The Environmental Protection Authority recommends that the land areas to be transferred to the Crown for Conservation purposes, including the estuary foreshore east of Layman Road, and the existing 'Reserve for Recreation 190', should be amalgamated into one reserve and gazetted for the purpose of "Conservation of Flora and Fauna" with vesting in the National Parks and Nature Conservation Authority, and that the Waterfowl Study Centre and its associated site should be gazetted for the purpose of "Waterfowl Study Centre" with vesting in the Executive Director of the Department of Conservation and Land Management.

RECOMMENDATION 18

The Environmental Protection Authority recommends that construction of the canal waterways, harbour and entrance breakwaters and groynes should not commence prior to the finalisation of a suitable agreement between the State (Department of Marine and Harbours), the Shire of Busselton and the proponent to cover waterways management and sand bypassing, as referred to in Section 6.0 of the ERMP, to the satisfaction of the Minister for Environment.

1. INTRODUCTION

In March 1985 a joint venture group consisting of the John Holland Group and Naturaliste Developments Pty Ltd referred to the Environmental Protection Authority a detailed Notice of Intent (NOI) for the Port Geographe Harbour Development proposal at Busselton.

The Authority required that the proposal should be assessed under Part IV of the Environmental Protection Act (1986), and that an Environmental Review Management Programme be prepared. However, the assessment did not proceed as the joint venture withdrew the proposal.

A new joint venture group was subsequently formed consisting of Interstruct Pty Ltd and Naturaliste Developments Pty Ltd. In May 1988 the group presented a revised concept proposal entitled the Vasse Wonnerup Conservation Park.

The proponents envisage a four stage development of which Stage I, Port Geographe, is the subject of this environmental assessment report.

The Port Geographe proposal as submitted comprises a reconstructed beach and beachfront holiday development, an inland harbour and village complex, an inland residential waterway system, and a reserved waterfowl conservation area.

The ERMP was released for public review for a period of 10 weeks which concluded on 9 December 1988.

Public submissions were analysed and a summary of issues was forwarded to the proponents (Appendix 1). A formal response to these was received on 7th February 1989 (Appendix 2). Some changes to the proposal were made as a result of submissions and these are listed in the proponent's response in Appendix 2. The Authority has taken into account the various revisions to the proposal in this assessment.

2. DESCRIPTION OF PROPOSAL

The Port Geographe proposal as assessed is for the development of a 300 hectare site on the eastern edge of Busselton, lying between the ocean and the Vasse Estuary. (See Figure 1.)

The proposal includes an inland harbour and marina in the northern portion, and a series of canal waterways in the southern portion. The combined water area is some 44.4 hectares. (See Figure 2.)

The land based features include a village centre, with hotel, motel, apartments and sundry commercial facilities, adjacent and to the east of the harbour. Nearby there is a chalet and retirement village. On the western side of the harbour are dryland subdivisions and waterfront apartments.

South of the existing Layman Road alignment are 68.7 hectares of residential canal estate of varying residential density, with areas of public open space the largest of which (5.3 hectares) contains a freshwater lake.

Other facilities in the development include a marina lease area, trailer parking and 4 public launching ramps, a fishermans wharf, and a winery complex. The combined land area of this portion of the development as indicated in the ERMP is 141.6 hectares.

Figure 1. General Location.

Figure 2. Proposed Layout.

A further 113 hectares of conservation area is proposed on the southern side of the site together with a 1 hectare waterfowl study centre. This is the balance of land controlled by the proponents between the developed portion and the Vasse estuary itself.

The ERMP states that the proposal is for a total of 1106 dwelling units, 538 being waterfront and land-based residential lots, 300 apartments, 168 group dwelling units, and a remaining 100 chalet and retirement units. The total anticipated lot yield has been subsequently reduced due to adjustments to the proposal (Appendix 3).

The provision of mooring pens in the proposal caters for 210 boats in the main harbour, 198 associated with the "group dwelling marina", 18 at the fishermans wharf, and approximately 70 private jetties associated with the residential lots. This provides for a combined total of 496 pens.

The proposal includes various operational aspects. These involve a sand bypass mechanism with dredge and pipeline from the west side to the east side of the harbour to maintain a normal sand budget and sediment movement along the ocean foreshore, and to maintain an open harbour entrance. The proposal also contains commitments to the establishment of and various degrees of funding for a harbour management programme, a coastal management programme, a waterfowl conservation area management programme, and an estuary management programme.

The proponents also propose a transfer of the undeveloped portion of estuary conservation area (113 hectares) to the Crown for conservation purposes.

The existing land use zoning of the Port Geographe Stage 1 site is partly urban single residential (approximately 29.46 ha), partly unspecified urban residential development (approximately 15 ha), and the remaining area to the south of Layman Road (approximately 249.02ha) being non-urban general farming.

3. EXISTING ENVIRONMENT

3.1 GENERAL

The project site occurs on a low lying strip of coastal land between the Vasse estuary system to the south and the comparativity shallow oceanic waters of Geographe Bay to the north. The eastern side of the site is contained by the Vasse estuary as it runs north towards the Wonnerup Inlet and its outlet to the sea. The western side is bounded by the eastern edge of the Busselton urban area. The site for the proposed development occurs proportionally half on an area of barrier dunes and beachridge, and to the south, half on a low area of estuarine flats. The former, which is some 500 metres wide has a relief of approximately 2 - 3 metres Australian High Datum while the latter lies entirely below the 2 metre contour.

The critical components of the existing environment are therefore the immediate offshore marine environment and beachzone, the terrestrial environment of the barrier dunes, the estuarine flats and the estuary wetland environment (see Figure 3).

Figure 3. Physical Environment.

3.2 MARINE ENVIRONMENT

The immediate marine environment to 250 metres offshore at the location of the proposed Port Geographe exhibits a range of depths between approximately 1.5 and 4 metres in association with a distinct series of scour and bar complexes running north west to south east oblique to the shoreline. Approximately the first 500 metres offshore is described in the ERMP as an unvegetated shallow subtidal sand sheet. It is considered to support a limited biota. However about 250 metres offshore occurs the first signs of seagrass, (Posidonia and Amphibolis) which with increasing distance offshore becomes dense seagrass meadows, and covers much of the sandy seabed between the 2 metre and 12 metre isobath.

The seagrass meadows are ecologically important, and known to contribute significantly to the characteristics of sediment movement in Geographe Bay. Their sedimentologic influence is to stabilise and protect the otherwise highly mobile sandy sediment upon which they are established, to significantly increase bottom roughness and thereby attenuate wave and current energy, and to contribute through carbonate - producing organisms to the supply of sediment in the system. The pattern of seagrass meadows has been changing over recent decades. Generally a decrease in cover has been noted since 1958, but in the last fourteen years there appears also to be revegetation in some areas suggesting that the decline in seagrass cover may have stabilised and now be expanding. The reasons for observed changes are not known.

Sedimentation and movement of material along the beach zone is influenced by a number of interacting factors, but overall tends to be dominated by sediment transport shoreward from the offshore scours and bars. There is then a tendency toward littoral movement eastward due to wave induced and westerly wind generated currents. In winter, north westerly storms and easterly breezes tend to induce a westerly littoral drift, for variable periods.

Estimated average annual movement of sand along the shore is approximately 50,000 cubic metres south-west to north-east. This can rise to approximately 80,000 cubic metres in stormy years (Riedal and Byrne, 1988).

3.3 TERRESTRIAL ENVIRONMENT - THE BARRIER DUNES AND BEACH RIDGE PLAIN

This portion of the site is comprised of linear barrier dunes extending some 500 metres in width. The terrestrial environment has been variously modified mainly due to grazing over many years, and now supports remnant stands of two main vegetation units. The first is an open heath to 1.4 metres tall dominated by Acacia sp and Scaevola sp on the shoreward area, and secondly further inland, an open scrub to low open woodland dominated by Agonis flexuosa (Peppermint Trees). This vegetation unit extends southward to the edge of the estuarine flats (Layman Road alignment).

Within this vegetation system, and dependent upon it, is known to be a population (between 40 and 50) of the Western Ringtail Possum (Pseudocheirus occidentalis). This species is diminishing in numbers and occurrence, and is gazetted "rare and otherwise in need of special protection" under the Wildlife Conservation Act 1950. Though not surveyed it is expected that other native fauna of more common occurrence would be found on the site.

3.4 VASSE ESTUARY

The estuary environment is comprised of both the seasonal waterbody of the estuary, the mudflats and samphire areas left behind in summer, together with the extensive areas of low lying estuarine flats that surround them.

The estuarine flats themselves are mainly utilised as seasonal pasture. Those associated within the project site are composed of extensive sand hummocks separated either by shallow channels, or intersposed with shallow wetlands. The development site features two distinct seasonal wetland fingers running north towards Layman Road. Both feature exposed mud bottoms in summer with zones of samphire along the margins. In addition there are small stands, or isolated remnants of Agonis flexuosa, Melaleuca sp, and some areas of sedge dispersed throughout the flats.

The estuary body is part of the Vasse-Wonnerup lagoon system that in total occupies an area of 1500 ha, having formed in the depression between the Spearwood and Quindalup dune systems. The main channel of the Vasse is only inundated in winter. The Vasse-Wonnerup system is supplied with run off discharge from 4 catchments, the Vasse, Sabina, Abba and Ludlow Rivers, although the Vasse and the Sabina are partially diverted. These have a combined catchment area of 405 square kilometres. Most of this catchment is characterised by farming (cattle mainly, some sheep and some irrigated croplands), on soils with low fertility and are prone to leaching nutrients.

The estuary system is as a result of these catchment characteristics, nutrient enriched and highly eutrophic. Because floodgates were installed at the ocean outlet during the 1930's to control flooding and prevent salt water intrusion on the low lying grazing pastures of the estuarine flats, the waters tend to be mainly fresh to brackish in winter, becoming increasingly saline to hyper-saline before drying out at the end of summer. A permanent area of water remains in the narrow section immediately west of the floodgates, and extends to approximately the site of the proposed winery complex. Severe water quality problems have been associated with this small portion of permanent water, resulting in extensive fish kills on occasions.

At this stage it is generally recognised that the estuary is saved from severe deterioration and adverse impacts stemming from the extremely high nutrient levels, due to the estuaries tendency to dry out progressively each summer, thus preventing severe manifestations of hyper-eutrophication (nutrient enrichment) such as algal blooms and deoxygenation. (EPA, 1989)

It is necessary to emphasise the value of the estuary to waterbirds, which is largely resultant upon the nutrient status of the system. Vasse-Wonnerup is the one of the most valuable water bird habitats in the south of Western Australia. Up to 33,000 water birds have been observed at one time on Vasse-Wonnerup (Appendix 4).

Only the Peel-Harvey estuary regularly supports larger numbers, to 100,000 birds. However Peel-Harvey is approximately 16 times the area at 12,100 hectares, of the Vasse-Wonnerup waterbody at 750 hectares, and hence the density of waterbirds is 5 times higher on the Vasse-Wonnerup (40 birds per hectare), than on the Peel-Harvey (8 birds per hectare).

In terms of regional significance the Vasse-Wonnerup was observed in November 1976 to support 3460 Black Swan, and the estuary supports the largest breeding colony in Western Australia with approximately 200 pairs. At various times up to the present there have been observed up to 750

pelican, 250 White-faced Heron, 240 Great Egret, 14 Glossy Ibis, 79 Sacred Ibis, 500 Straw-necked Ibis, 140 Yellow-billed Spoonbill, 2600 Shelduck, 4200 Black Duck, 13000 Grey Teal, 500 Shoveler, 4000 Coot, 5000 Black-winged Stilt, 200 Greenshank, 17 Marsh Sandpiper, 2300 Sharp-tailed Sandpiper, 1200 Curlew Sandpiper.

In terms of national significance there have been observed 4000 Avocet, the highest number for any site in Western Australia and the fourth highest nationally. Also observed have been 67 Wood Sandpiper which is the highest in southern Australia, and 49 Long-toed Stint which is the second highest regular site in Australia.

The estuary system is also of international significance. Some 21 recorded species have international protection under the J.A.M.B.A. Treaty (The Japan Australian Migratory Bird Agreement), and the Vasse-Wonnerup readily meets criteria for nomination under the RAMSAR Treaty (the Convention on Wetlands of International Importance, Especially as Waterfowl Habitat).

The estuary has a further significance. It is the only substantial coastal plain wetland that, owing to a significant degree of diversion of waters from its original surface catchment to other direct ocean outlets together with direct outflow of 92 million cubic metres flow through the floodgates, has the potential to retain its current water regime should the onset of drier climatic conditions be experienced in the south west of Australia. This could possibly be achieved by the controlled, progressive re-diversion of those waters back into the estuary, and use of the current surplus water that passes directly through the estuary system.

4. REVIEW OF SUBMISSIONS

A total of 22 public (non-Government) submissions were received, including several which represented large community groups or organisations. The majority of submissions were extensive in their scope and highly articulate. Three government submissions, and one local government submission were also received. These were extensive and technically significant submissions. Three of the total 22 public submissions were strongly supportive of the proposal, albeit with varying degrees of constructive criticism based on significant local knowledge.

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

JUSTIFICATION OF THE PROPOSAL

Many submissions concluded that the ERMP does not adequately discuss the possible alternatives for the site, particularly the low impact options, and that while the ERMP claims the economic viability of the current project is dependent on the land-take proposed, this is not substantiated.

SOCIAL AND ECONOMIC ISSUES

Some submissions expressed concern that the adverse social and economic impact on Busselton are insufficiently covered by the ERMP.

GREENHOUSE EFFECT

Several detailed submissions expressed the view that the ERMP's treatment of the greenhouse effect is inadequate, misleading, sociably irresponsible and based on a highly selective literature review. Several submissions considered that on this matter alone, the project should not be allowed to proceed.

MARINE IMPACT AND COASTAL STABILITY

Submissions pointed out that the structures and set back of the development from the ocean foreshore appear to allow little margin for error should coastal processes alter or differ from those anticipated, and that this could result in enormous long term costs of repair and management to the community.

SEA-GRASS MEADOWS

Some submissions were concerned that the ERMP fails to substantiate claims that the seagrass meadows would not be affected by construction of a harbour, and offers no discussion on the potential impact of a sedimentation plume or means of controlling it.

FISHING

The view was expressed that if the project proceeds the fish stocks in Geographe Bay will be diminished.

BOATING

Several submissions felt that the ERMP does not clearly substantiate the case for providing 400 mooring pens above the 60 estimated as required in the short term by the Department of Marine and Harbours.

WATER QUALITY OF HARBOUR AND CANALS

A number of submissions considered that the ERMP does not adequately explain measures to limit pollutants (eg TBTO based antifoulants) or siltation, and does not establish that adequate flushing of the harbour and waterways will occur.

FLOOD CONTROL

Some submissions were concerned about who will pay for required works should there be a rise in sea levels, higher storm surges and a need to raise ground levels.

GROUNDWATER

Certain submissions stated that the ERMP does not alleviate fears concerning the potential for groundwater seepage from the canals into the estuary, nor does the ERMP specify who should pay for installation of an impermeable membrane seal if this is required.

VASSE-WONNERUP ESTUARY

Many submissions considered that the proposal intrudes too far into the estuary environment, that inadequate (or non-existent) buffers are provided, that the EPA's Conservation Through Reserves Committee (1974) recommendations are overlooked by the ERMP, and that the best conservation initiatives for the estuary are not dependent on the proposal as is claimed by the document.

WATERBIRDS AND WATERBIRD HABITAT

A number of submissions believed the ERMP understates the waterbird numbers in the estuary, understates the habitat value of estuarine flats to be developed, and provides for an inadequate buffer between the development and waterbird areas.

MOSQUITOES AND MIDGES

Certain submissions considered that the ERMP underestimates the potential mosquito and midge problem. Considerable fears are expressed that once development occurs, popular pest control methods will be approved with resultant high (disastrous) impacts upon the estuarine environment.

RINGTAIL POSSUM AND OTHER FAUNA

A number of submissions responded that the measures provided by the ERMP to protect or relocate the Ringtail Possum population are token only, and that the existence of the Ringtail Possums represents a major obstacle to development of the site.

ENVIRONMENTAL MANAGEMENT

Many submissions expressed the view that the development will prove costly to maintain, resulting in major expense for the Shire and State government, and that funding levels offered for such aspects as the estuary management programme (eg $40,000) are grossly insufficient.

MOAT AND ARTIFICIAL LAKES

The concern was expressed that the artificial lake and moats proposed, will need to function adequately and must have acceptable water quality.

LAND TRANSFER

Some submissions expressed concern at various aspects of the land transfer proposals, including the status of the public open space set back along the proposed ocean foreshore alignment, which is currently a part of Geographe Bay and must be won from the marine environment.

FUTURE STAGES

Several submissions stated that the future stages for the Vasse-Wonnerup concept were entirely unacceptable, irrespective of any decision concerning Port Geographe, Stage I.

A more detailed summary of issues is provided in Appendix 2. The proponent's response to issues raised is contained in Appendix 3.

5. ENVIRONMENTAL ASSESSMENT

The following sections provide a detailed assessment of the Port Geographe proposal (Stage I). The Environmental Protection Authority has not only taken into account all aspects of the project itself, but has also given careful consideration to several broader environmental concerns, especially those associated with the adjacent Vasse-Wonnerup estuary, Western Ringtail Possums and the Greenhouse Effect.

Consequent upon consideration of all major issues, the comprehensive assessment of the proposal, and judgement of it against the various opportunities and requirements outlined below, the following overall recommendation is made.

RECOMMENDATION 1

The Environmental Protection Authority concludes that the Port Geographe proposal Stage 1 as described in the ERMP and subsequently revised in the proponent's response to submissions is 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 report.

5.1 AN OVERVIEW

5.1.1 THE REGIONAL CONTEXT

The Port Geographe proposal is one of the largest residential/tourism development proposals in Western Australia outside the Perth Metropolitan area. It is likely to be one of the first of a range of large scale tourism related developments around the state, especially in coastal locations.

The Swan Coastal Plain coastline offers both opportunities and constraints for such developments. Opportunities exist due to the proximity of the major population centres, together with high quality beaches and immediate offshore marine environment with an excellent summer climate.

However, there are numerous and fundamental constraints which must be considered. These include:

- a fundamentally unstable and high energy coastline, that in geological terms is subject to considerable short term movement of the shoreline;
- a low lying coastline that over a considerable length is highly erodable and features large sediment movement;
- the occurrence of estuaries and lagoons that have particularly stringent requirements in order to maintain their environmental quality and to avoid costly environmental impacts; and
- climatic change which could potentially affect coastal locations significantly.

Forward structure planning and provision of detailed land use policy guidelines for such locations on the Western Australian coastline have progressed slowly.

5.1.2 THE VASSE-WONNERUP ESTUARY SYSTEM AND ITS CATCHMENT

The Port Geographe proposal has raised many important issues concerning the future of the Vasse-Wonnerup estuary system. These in turn require consideration of the entire catchment of the estuary system.

Like the Peel-Harvey Estuary, the Vasse-Wonnerup estuary system is of great environmental value, yet it is now subject to the consequences of decades of sometimes inappropriate farming practice and uncoordinated catchment management. The estuary system is severely nutrient enriched, and while this

partly explains the estuary's existing high waterbird habitat value, the estuary is in danger of severe environmental deterioration with attendant problems and cost implications to the community, unless much neededmanagement of the system is undertaken.

The following table indicating the range of annual volumetric nutrient loadings of various key estuaries in the south-west of Western Australia, shows that the Vasse-Wonnerup system has nutrient loads far in excess of any other estuary.

The conclusion reached in the technical report "The Environmental Condition of the Vasse-Wonnerup Wetland System, and Discussion of Management Options" (EPA 1989), is that the Vasse-Wonnerup must dry out seasonally to avoid the impacts of massive eutrophication and that for a variety of reasons, including the need to influence nutrient inputs, active management of the system is essential.

Table 1. Ranges of annual volumetric nutrient loadings for some south-west Western Australian estuaries and their associated symptoms of nutrient enrichment.

ESTUARY	VOLUMETRIC NUTRIENT LOADING		SYMPTOMS
	Phosphorus (g/m^3pa)	Nitrogen (g/m^3pa)	
PEEL INLET	0.3 - 1.9	3.6 - 19.8	Excessive macroalgal growth limited green and blue green algal blooms.
HARVEY ESTUARY	0.4 - 1.6	5.0 - 9.8	Dense green and blue-green algal blooms.
PRINCESS ROYAL HARBOUR	0.2 - 0.5	0.3 - 1.0	Excessive macroalgal growth, losses of seagrass.
OYSTER HARBOUR	0.06 - 0.9	2.1 - 6.6	Excessive macroalgal growth, losses of seagrass.
WILSON INLET	0.06 - 0.2	0.5 - 3.9	Excessive seagrass growth of epiphytic algae.
LESCHENAULT INLET	1.1	14.7	Excessive macroalgal growth.
SWAN ESTUARY	0.4 - 0.5	3.9 - 4.6	Limited microalgal and macroalgal growth.
VASSE LAGOON (1987)	1.2	9.7	Green and blue-green algal blooms and fish deaths caused by deoxygenation of the water.
(1988)	6.5	49.5	
WONNERUP LAGOON (1987)	0.8	20.6	Green and blue-green algal blooms.
(1988)	10.1	73.2	

The estuary is also at risk due to the lack of formal initiatives to protect the estuary despite the Environmental Protection Authority's System 1 Recommendations, and the lack of such actions as designation as a major park, or RAMSAR nomination. In addition there is the lack of formal policies or comprehensive management plans for the estuary system.

These deficiencies have resulted in an apparently very low community appreciation or understanding of the value of the Vasse-Wonnerup estuary system and the wildlife function it performs.

It is essential that positive government action is now taken. This should initially include a limit to future development and subdivision adjacent to the Vasse-Wonnerup estuary until comprehensive management plans, administrative arrangements and requisite funding are put in place.

There is also the need to undertake a comprehensive investigation of the future potential of the estuary as wildlife habitat system, and to initiate and implement an integrated catchment management programme.

RECOMMENDATION 2

The Environmental Protection Authority recommends to government that the Vasse-Wonnerup estuary and adjacent Crown land be protected and managed for conservation purposes. In so doing the State Government should ensure:

(i) the application of appropriate mechanisms to avoid adverse development of land areas adjacent to the estuary;

(ii) nomination of the Vasse-Wonnerup system for inclusion under the Ramsar Convention so as to recognise and acknowledge the waterbird and habitat value of the estuary system;

(iii) the undertaking of practical means of encouraging appropriate management practices on privately owned agricultural land adjacent to the estuary, and within the overall estuary catchment; and

(iv) the preparation of an overall estuary management plan coordinated by the Department of Conservation and Land Management.

RECOMMENDATION 3

The Environmental Protection Authority further recommends that an integrated catchment management programme be developed by the Department of Agriculture, and that further studies of the Vasse-Wonnerup wetland system be conducted to determine the most appropriate method to manage the waterways and adjacent land areas.

5.1.3 ISSUES AND OPPORTUNITIES ASSOCIATED WITH PORT GEOGRAPHE

The Port Geographe proposal features a site with certain limitations as previously outlined (Section 3.1). The coastline is erodable and subject to movement, the site is especially low lying (as is all of Busselton), and it is constrained by the existence of a major estuary on two sides. The scale of the project is such that the development as proposed will intrude to some degree on both the ocean environment to the north, and the estuary environment to the south. The acceptability or otherwise of this proposal

therefore rests to a large extent on the appropriateness of the design, the adequacy of available technology, and the commitment to effective ongoing management requirements while recognising the constraints of the location.

In undertaking this assessment of the Port Geographe proposal, the Environmental Protection Authority has given particular attention to a number of key issues, which include:

. the protection of offshore seagrass meadows;

. the inherent instability of the existing ocean foreshore, and protection of adjacent beaches;

. adequate flushing and water quality of the proposed waterways;

. adequate elevation (Australian High Datum) of the development to allow for the impacts of sea level rise consequent upon the Greenhouse Effect;

. the protection of the adjacent groundwater 'lens' from saline intrusion;

. the prevention of seepage of saline water via groundwater, from the canal waterways to the estuary, or vice versa;

. the existence of Western Ringtail Possums on the site, and the need to adequately protect them;

. the existing characteristics, recognised values, and international significance of the Vasse-Wonnerup estuary system, as originally enunciated by the Environmental Protection Authority's Conservation Through Reserves Committee recommendations for System 1, 1974, and the retention of these characteristics and values;

. the need for management of the estuary and its catchment, to prevent adverse impacts resultant upon the high nutrient status of the system, and to preserve the existing values of the estuary;

. the extremely high midge population associated with the estuary environment, and the need to minimise their impact on adjacent developments whilst retaining their ecological function within the estuary environment; and

. the need to minimise all forms of disturbance or adverse conditions on waterbirds and their habitats within the adjacent estuary environment.

As a result of the detailed assessment undertaken and explained in the following sections, the Environmental Protection Authority has taken into account a number of opportunities and requirements in considering the Port Geographe proposal, as follows:

(i) the opportunity for transfer to Crown land for conservation purposes of a significant portion of the Vasse estuary that is currently in private ownership, while allowing the proponent to develop the balance of the site;

(ii) the provision by the proponent of a substantial package of funding and research information, together with various design and management commitments, to assist in the management of the development and various conservation aspects of the proposal;

(iii) through the existence of the proposal, the provision of a necessary catalyst to bring about the subsequent development and implementation of urgently needed, comprehensive management of the Vasse-Wonnerup Estuary System; and hence

(iv) the establishment of appropriate administrative arrangements and actions to achieve the long term protection of the overall waterbird habitat value and carrying capacity of the Vasse-Wonnerup Estuary System; yet

(v) ensuring adequate provision is made to either protect or safely capture Western Ringtail Possums currently occupying the site, and ensuring their successful reintroduction to suitable habitats within the development, or translocation to new habitats elsewhere, as a responsible action in preventing further risk to the survival of the species.

Consequent upon consideration of all the major issues, the comprehensive assessment of the proposal which follows, and judgement of it against the opportunities and requirements outlined above, the Environmental Protection Authority has been able to conclude that the Port Geographe proposal Stage I is environmentally acceptable, subject to all undertakings and commitments given, and subject to all recommendations contained in this assessment report.

The following sections provide the detailed environmental assessment of the Port Geographe proposal.

5.2 COASTAL AND MARINE ASPECTS

5.2.1 SHORELINE STABILITY AND SAND MOVEMENT

The shoreline east of the existing Guerin Street groyne is currently receding at up to 5 metres per year, while in the vicinity of Bignell Street it is accreting at around 5 metres per year. The shoreline around the site of the proposed eastern groyne is relatively stable. This erosion pattern is partly attributable to the presence of the Guerin Street groyne.

As previously indicated (Section 3.2) there is a west to east littoral drift of around 50,000 cubic metres per year in this location. It is inevitable that construction of a harbour entrance and associated beach stabilisation works will have a major impact on shoreline alignment and littoral movement in the area.

Advice received from the Department of Marine and Harbours indicates that while the chosen alignments of the foreshore in relation to the proposed structures appear reasonable, the ERMP does not supply sufficient detailed guidance to support them. It is also advised that in the Department's view:

- construction of the eastern groyne will cause rapid erosion of the shoreline immediately adjacent and to the east of the groyne;

- during extreme storm events up to 60 cubic metres of sand per metre of beach will be moved offshore, to be returned during milder weather but leaving a net loss in sand budget principally past the eastern groyne; and

- the entrance channel and groynes will prohibit natural renourishment from the west of the beach between the entrance and the eastern groyne.

The Department of Marine and Harbours concluded that the beach area between the two groynes will be subject to varying rates of accretion and erosion, and will require renourishment from time to time to replace sand lost. The Department further concluded that the 150,000 cubic metres to be placed on the beach adjacent to the eastern groyne will move east in less than three years, and it will therefore not provide the five year buffer claimed in the ERMP (Section 5.3.1.4).

Additional aspects related to foreshore stability include the proposed 50 metre wide 'public open space' between the harbour entrance and eastern groyne, and the degree of protection and safety of proposed structures on the ocean frontage (motel and cluster housing). The above comments indicate that the public open space 'beach zone' will inevitably be subject to seasonal instability, and possible erosion of up to 20 metres requiring periodic artificial renourishment. The safety of the proposed structures is considered adequate west of the east groyne, but could be vulnerable to the east of this groyne if beach renourishment is allowed to lapse.

The Authority concludes that overall foreshore stability should be achievable with the proposal. Nevertheless:

(i) the proposal is indicative only, and further analysis and the refinement of design construction details is required before the acceptability of the proposed foreshore works can be fully established;

(ii) irrespective of final design and analysis continual monitoring of the beach profile at selective points will be required; and

(iii) there should be provision by the proponent to ensure that adequate beach renourishment is undertaken whenever required.

RECOMMENDATION 4

The Environmental Protection Authority recommends that construction of the groynes and establishment of new foreshore beach profiles should not commence before the provision of:

(i) final design details with adequate supporting data; and

(ii) a suitable beach monitoring programme with adequate provision for reporting to the local authority and Department of Marine and Harbours;

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

RECOMMENDATION 5

The Environmental Protection Authority regards it as essential that there should not be any long term loss or erosion of the existing beaches east or west of the proposed foreshore works as a consequence of this project, and to that end recommends that the proponent make adequate provision for any possible restoration as part of the agreement to be concluded with the State and the Shire of Busselton.

5.2.2 SAND TRAP AND SAND BYPASS

Solutions to foreshore stability, as well as the workability of the harbour entrance, rely to a degree on the effectiveness of the sand trap and sand bypass mechanism proposed.

The sand trap is expected by the proponent to have a capacity of up to 5 years, with sand bypassing commencing after 3 years. The ERMP advocates the sand bypass being a dredging operation, operated through tender and contract.

The Department of Marine and Harbours consider the total capacity of the sand trap to be about 200,000 cubic metres, and that at given rates of sediment transfer it will be filled in less than the 5 years claimed in the ERMP (Section 5.3.1.4).

As previously mentioned, it is thought that beach renourishment east of the eastern groyne will require at least 150,000 cubic metres more frequently than the 5 years advocated in the ERMP. It is possible that renourishment will be required in at least 3 year periods. If this is so the sand budget figures indicated provide little or no margin for error. A shortfall would then place in jeopardy the security of beaches east of the project area, and the safety of proposed developments closest to the ocean foreshore.

However, the Environmental Protection Authority is aware that details of the sand trap mechanism and sand bypass operation are yet to be finalised. Accordingly, it is necessary for final details to be reviewed and accepted by the Environmental Protection Authority, on the advice of the Department of Marine and Harbours, prior to any approval being given to proceed with construction. The final proposals will need to establish an adequate sand budget in the worst scenario, including both extraordinary isolated events (severe storm), and recurrent events (series of winter storms, and most recent worst predictions for rise in sea level), and an acceptable mode of sand bypass operation.

A potential problem could arise from the unstable sand areas along the shoreline of the proposal and possibly further afield, particularly in the sand trap west of the entrance, between the entrance and the east groyne, and in the sand dump east of the east groyne. While the ERMP did not discuss such aspects in depth, the proponent has responded to the issue of foredune stability (Appendix 3).

The Authority considers that, providing other previously discussed aspects of foreshore stability are adequately addressed, appropriate foreshore, landscape design and proven dune stabilisation management techniques should be sufficient to control any potential problem.

RECOMMENDATION 6

The Environmental Protection Authority recommends that before construction commences the proponent should:

(i) provide final details of the proposed sand trap and sand bypass system, including details of adequate sand budget, timing of the operation, an accurate estimate of costs and details of funding; and

(ii) prepare and implement a sand dune stabilisation and management programme;

to the satisfaction of the Environmental Protection Authority following advice from the Department of Marine andHarbours, the Department of Agriculture, and the Shire of Busselton.

5.2.3 SEAGRASS PROTECTION

The protection of the seagrass meadows in the vicinity of the project site has been raised in submissions as a major issue of concern. The Authority is mindful of published technical material concerning the previous Port Geographe proposal, which pointed to a potential threat to the seagrass meadows. (Walker et al 1987). As the proponent points out in the response to submissions (see Appendix 3) the previous proposal was for an 'external' harbour,seaward of the existing shoreline. The current proposal has a harbour entrance which intrudes only slightly into Geographe Bay.

In addition the seagrass meadows commence between 200 to 500 metres from the existing shoreline. From available studies, including the study by Riedal and Byrne 1988, the Authority concludes that while observable changes have been occurring suggesting an overall decline in seagrass since 1958, the Authority accepts the ERMP's position that such changes in Geographe Bay are due to macro or regional influences, and that the Port Geographe proposal is unlikely to have any significant effect on those factors.

The Environmental Protection Authority does not consider that the Port Geographe development represents any direct threat to the seagrass meadows providing construction is carried out in an acceptable and safe manner, and providing that no harmful sediment plume from either construction or dredging is allowed to extend to the seagrass meadows.

The additional boating pressure that the proposal will introduce to the immediate marine environment is of more concern, especially that associated with increased anchor drag of boats in general, and in particular that associated with larger boats waiting to cross the sand bars at high tide.

RECOMMENDATION 7

The Environmental Protection Authority recommends that the proponent provide details of a sediment plume monitoring and management programme to be undertaken at the time of the construction, and during subsequent dredging programmes, to monitor the effect on the seagrass meadows, and to provide effective action should a potential problem be detected, to the satisfaction of the Environmental Protection Authority, following advice from the Department of Marine and Harbours.

5.3 HARBOUR AND WATERWAY ASPECTS

5.3.1 HARBOUR ENTRANCE AND DEPTH

It has been confirmed by the proponent that the depth of the harbour and harbour entrance will be at approximately 4.3 metres AHD, while the navigable depth across the sand bar opposite the harbour entrance is to remain at approximately 3.3 metres AHD. The secondary waterways, or 'inner' canal fingers, are to be excavated to a depth of RL - 2.7 m AHD.

Though offshore depths are shallower than the proposed depth of the harbour immediately outside to the harbour entrance is the same. It can therefore be said that the entrance channel and harbour basin will not be dredged deeper than the immediately adjacent waters of Geographe Bay.

The proponent has confirmed that there is no intention to dredge an outer entry channel through the offshore bars to deeper water, and that larger vessels will be able to enter the harbour at high tide. Navigable depth over offshore bars will therefore be limited to approximately 2.5 metres below Chart Datum.

5.3.2 FLUSHING OF WATERWAYS AND HARBOUR

Questions concerning the adequate flushing of the artificial waterways arise with a project of this scale. The ERMP provides a summary of technical information supporting the proponent's conclusion that with suitable control of the main sources of contaminants (antifoulage coatings, accidental fuel spills, bilge water releases, groundwater discharges and surface run off), the waterway system will be adequately flushed, and maintain acceptable water quality.

Flushing will be dependent on two main water exchange mechanisms, involving wind induced currents over both the canal and harbour waters, and tidal exchange. It is the proponents view that flushing times of between 20 and 30 days are required to maintain adequate water quality in the canals and adjacent ocean waters. The proponent's calculations indicate that under the worst conditions, all of the water within the development should be able to exchange with ocean water within approximately 6 days. Tidal exchange, which will have little direct influence on the canal waterways, is calculated to be able to effectively flush all water from the inner harbour alone on an approximate 8 day cycle.

The Environmental Protection Authority has analysed the proponent's figures and findings, and using a variety of calculations concludes that the flushing estimates by the proponent are reasonable. (See Appendix 5 entitled "Comments on Flushing Characteristics of Port Geographe"). Concerns were expressed to the proponent that the harbour might operate as a semi-enclosed basin due to its proposed depth being greater than offshore depths. However it is now clarified that there is bathymetric continuity with immediate ocean depths outside the entrance, and on the basis of recorded ambient currents of 3 cm/sec, all water in the 'basin' should exchange with the surrounding ocean in approximately 5 hours. During storm events with currents of 16 cm/sec it would take only 1 to 2 hours.

The Authority concludes that there will need to be an ongoing monitoring programme of water quality, and preferably a suitable investigation to establish the operating flushing characteristics and time of the canal and harbour system. A dye tracing investigation similar to that conducted at the Hillary's marina is suggested.

Nevertheless the Environmental Protection Authority advises that the future harbour management body should maintain bathymetric continuity between the harbour and immediate ocean waters outside the entrance.

RECOMMENDATION 8

The Environmental Protection Authority recommends that the proponent should submit and implement an investigation, eg dye trace or similar, following construction to verify the flushing time and efficiency of water circulation within and from the canal and harbour system, to the satisfaction of the Environmental Protection Authority.

5.3.3 WATER QUALITY

Water quality is mainly governed by the flushing characteristics of the system, and as stated in the above section this aspect is considered satisfactory subject to a number of conditions.

Water quality is however also dependent on pollution sources and the presence of various contaminants. The ERMP addresses the matter of potential pollution sources and control of contaminants, and makes numerous provisions and commitments to ensure adequate water quality.

Apart from commitments with respect to appropriate design and construction, as indicated in the report (eg two separate trappings systems for stormwater drainage, using gullies and downstream manholes, deep sewerage throughout etc), there are numerous commitments to undertake various management and monitoring programmes to ensure acceptable water quality (ERMP Section 6.1, Port Geographe Management Programme. See Appendix 6).

On the basis of the predicted flushing of Port Geographe together with the commitments provided in the ERMP, the Environmental Protection Authority considers that the water quality of the harbour and waterway system can be maintained at acceptable levels.

5.4 WESTERN RINGTAIL POSSUM

A total area of 75 hectares of Peppermint woodland on the site is expected to be affected, of which some 51 hectares would be lost as a result of development. The loss of a large proportion of pre-existing native vegetation on the site is virtually inevitable with this type of development.

The Peppermint woodlands on the site are relatively dense in parts and are known to be a significant habitat of the Western Ringtail Possum, (Pseudocheirus occidentalis). The Western Ringtail Possum is gazetted under the Wildlife Conservation Act as "rare and otherwise in need of special protection". A survey of the area undertaken in February 1989 by the proponent suggests an estimated population of 15 to 20 individuals in the 'development area', and a population of 25 to35 individuals in the area north of Layman Road. The proponent argues that on the basis of this survey, together with information from local residents, it can be concluded that the Western Ringtail Possum is not scarce in this locality. They are found widely in Busselton, even in highly disturbed locations.

The Environmental Protection Authority is concerned about the Western Ringtail Possum and its current status. A difficulty presented in reaching conclusions on the long term survival of the animal is the limited knowledge of the Western Ringtail Possum. There is no published information on the population biology of the Western Ringtail Possum, though it is known to be quite different in many important respects from the well documented Eastern Ringtail Possum (Pseudocheirus perigrinus).

Evidence presented to the Environmental Protection Authority by the Western Australian Museum has indicated the following relevant information:

- the Western Ringtail Possum appears to breed only once a year, and has a single young unlike the Eastern Ringtail Possum (Pseudocheirus perigrinus) which breeds twice a year and has a mean of two young, and a mean annual production of 3 young;

- the Western Ringtail Possum occurs mainly in Peppermint and paperbark (Melaleuca sp) with or without associated eucalypts;

- there is no evidence concerning the effectiveness of translocation programmes for possums in general;

- detailed habitat requirements and food preferences of the Western Ringtail Possum are not known;

- there are many areas of previously suitable habitat within the known range of Western Ringtail Possums where they are now absent;

- there is no evidence either way as to whether the populations of Western Ringtail Possums form one or several genetic units, hence assertions that the loss of a particular area will have no impact on the survival of the species cannot be substantiated; and

- continual erosion and loss of the Western Ringtail Possum habitat will eventually reduce the viability of local populations and threaten the survival of the species.

A puzzling observation is the fact that the Western Ringtail Possums are found in good numbers in urban habitats from Albany to Busselton. Many residents in Busselton consider them a nuisance, though it has been pointed out the Western Ringtail Possum is easily confused with the Brush Tail Possum. Additional enquiries made to Busselton residents known to be familiar with the Western Ringtail Possum, and who are members of the South West F.A.W.N.A. organisation (Fostering and Assistance for Wildlife Needing Aid) tend to indicate that Ringtail Possums are surviving in urban locations where there are dense-enough stands of old Peppermints to allow the animals to move about over their territories without coming down to ground level, where they are immediately at high risk from family pets and other predators.

The same enquiries suggest that the Western Ringtail Possum can adapt to various advantages provided in this type of urban environment, including additional food sources (rose shoots and grapes), dense growth of creepers and shrubs at the mid and lower canopy level, (unlike much of the rural peppermint woodlands which may be subject to grazing and frequently have an open and sparse understorey), and the absence of feral cats and foxes. The suggestion was also made that rural 'burning off', particularly hot burns, appear to be disastrous for Western Ringtail Possums. Peppermints take a long time to recover from fire unlike many other indigenous tree species, and Western Ringtail Possums are left with devastated habitats. Due to their considerable territorial fidelity they would have nowhere to go.

Although these observations are not supported by scientific survey, a general feeling for the conditions that are allowing the species to survive in a changing environment is being gained. Anecdotal information also suggests that a very high degree of husbandry and intensive care is required to successfully relocate Western Ringtail Possums to a new territory, even to nearby locations.

In the meantime, despite a severe lack of data and knowledge of the Western Ringtail Possum, the Environmental Protection Authority must draw conclusions on the proposal which include consideration of the future of this population of Western Ringtail Possums.

On the basis of the information to hand, there is insufficient reason to prevent the Port Geographe proposal from continuing. On the other hand the ordinary urban development that might otherwise have occurred, would probably have allowed at least some of the existing population to have survived and adapted, particularly with a reasonable degree of retention of the original stock of Peppermints.

The Environmental Protection Authority is of the view that the status of the Western Ringtail Possum under the Wildlife Conservation Act must be taken seriously, and that all necessary action should be taken to avoid the destruction of any Western Ringtail Possums occupying the site, and to ensure the long term survival of as many of the population as possible. At the request of the Authority the proponent has provided further commitments to protect the Western Ringtail Possum on that site (Appendix 7).

The Environmental Protection Authority nevertheless concludes that the proponent should, in addition to the actions outlined, investigate a combination of options, as follows:

(i) the retention of all mature Agonis flexuosa where possible throughout the site, by making appropriate adjustments to detailed landscape design and the positioning of major buildings and structures. In particular it should be possible to achieve considerable retention in the dry land subdivision west of the harbour, in the POS area proposed south of Layman Road adjacent to the canal waterway, and beside the lower waters of the Vasse estuary in the vicinity of the proposed winery complex and chalets. This latter area is considered an important opportunity;

(ii) the deliberate use of Agonis flexuosa as a 'theme' planting in the landscaping for the development, with particular reference to street plantings, and open space areas. The species is not only highly appropriate to the area, but will also help integrate the development visually with the rest of Busselton and the surrounding area;

(iii) a concentrated planting of Agonis flexuosa adjacent to the southern perimeter road as part of the necessary buffer to the estuary environment;

(iv) at the time of development, capture of all Ringtail Possums possible and their retention in captivity until, (dependent on subsequent investigation and consultation with various parties);

- managed release in suitable revegetated and landscape portions of the development.

- managed translocation outside the development at locations advised by the Department of Conservation and Land Management, the WA Musuem and local wildlife organisations such as FAWNA.

- retention in captivity either in suitable enclosures as part of the proposed wildlife study centre, or as a last resort only, at reputable wildlife parks or zoo's elsewhere;

(v) consultation on all of the above with suitable organisations and individuals, especially CALM, the WA Museum and FAWNA.

RECOMMENDATION 9

The Environmental Protection Authority recommends that before any site works commence the proponent should provide a suitable programme for the protection of Western Ringtail Possum incorporating the suggestion

RECOMMENDATION 9

The Environmental Protection Authority recommends that before any site works commence the proponent should provide a suitable programme for the protection of Western Ringtail Possum incorporating the suggestions contained in Section 5.4 of this Report, to the satisfaction of the Environmental Protection Authority following advice from the Department of Conservation and Land Management.

The Environmental Protection Authority recognises that these recommended actions are merely an interim solution in the face of one proposal. As further development occurs in coastal locations in the south west of the State, the peppermint woodland habitat of the Western Ringtail Possum is going to be further threatened, and similar conflicts will arise.

The Authority therefore considers it essential that Government place a high priority on an adequate research programme of the Western Ringtail Possum. As it stands, the lack of information on the species will continue to prevent effective decision making and will result in the habitat of Pseudocheirus occidentalis being gradually eroded because no one development proposal can be shown to be detrimental to the survival of the species.

Advice from the Western Australia Museum is that to overcome this deficiency a broad based study into the basic biology of Pseudocheirus occidentalis is required, covering the following aspects:

- to examine the degree of genetic variability over the range of the species to provide the basic information on whether conservation decisions need to consider the species over its entire range or sub-sets of its range to maintain genetic diversity;

- to determine the basic population biology of the species (numbers, density, breeding success, number of young, growth rates and sex ratio) and the degree of between year variation in population parameters;

- to determine the habitat requirements (vegetation structure and composition) and food preferences; and

- to determine the social structure of populations.

5.5 VASSE-WONNERUP ESTUARY

As previously stated in Section 3.4 of this report the Environmental Protection Authority considers the maintenance of the Vasse-Wonnerup Estuary as a waterbird habitat of regional, national and international significance as paramount. The Authority is therefore particularly concerned with the potential impacts of the proposed development on the estuary, and conversely, is also concerned with potential impacts of the estuary environment on the proposal itself.

A detailed description and explanation of various aspects of estuary environment is also contained in the Environmental Protection Authority's Report entitled 'The Environmental Status and Discussion of Management Options for the Vasse-Wonnerup Wetland System', 1989.

5.5.1 WATERBIRD HABITAT

The likely impact of the existing proposal on the waterbird habitat value of the estuary is at least twofold.

First, there would be a degree of direct loss of existing waterbird habitat, and secondly there would be some order of disturbance on the remaining habitat due to the close proximity of the development introducing noise, lights, some pollutants, domestic animals, and people.

The proponent recognises these potential impacts and, following discussions with the Department of Conservation and Land Management has made adjustments to the proposal layout, and has undertaken to increase the width and effectiveness of the buffer zone between the development and the estuary (see Figure 4). This includes an increased set back in portions by amending the alignment of Layman Road, the possible reduction of the width of Layman Road to single carriageway status to achieve an additional 7 metres of landscape buffer zone, appropriate mounding and landscaping, and protective fencing.

These undertakings should be viewed with the overall package of commitments provided by the proponent which also include hand over of land for conservation purposes, contributions towards the establishment of a wildlife study centre and estuary management programme, together with considerable expenditure to date on the waterbird surveys, midge and mosquito studies, and modelling of potential groundwater seepage into the estuary. The proponent argues that these in combination represent a considerable commitment and offer to safeguard the estuary and to introduce active management of the system where previously there has been none.

The Environmental Protection Authority is mindful of this and can point to lack of action to establish and implement appropriate management of the Vasse-Wonnerup estuary, which was recommended by the Environmental Protection Authority in 1975.

The Authority is of the view that while aspects of disturbance and proximity of adjacent development can to a degree be overcome by design and management, loss of wetland habitat due to development can not. There is limited scope for compromise of specific portion of wildlife habitat because the broader picture reveals that the total stock of natural wildlife habitats is decreasing continuously, and particularly so in the case of wetland habitats.

The Authority considers that the overall waterbird habitat carrying capacity of the Vasse-Wonnerup estuary should not decrease. This means that if a critical part of the habitat is to be removed or diminished by development, then the developer should reinstate an equivalent area of habitat elsewhere or should offer suitable compensation for the loss, preferably in a form that will assist in the management or improvement in some other way, of the overall resource.

In the case of the Port Geographe proposal two wetland re-entrants, or "fingers", are to be lost in the modified layout, (see Figure 4). The eastern wetland was to have been partially retained in the original layout (see Figure 2).

The Environmental Protection Authority has been advised that each of these wetlands is, in terms of waterbird usage (feeding, loafing and nesting), important as a wetland in its own right. However it is also apparent that use of them by waterbirds is principally confined to the wetter winter and spring months before they dry out, when there is the largest area of

Figure 4. Revised Layout.

standing water and inundation on the estuary and when alternative feeding and nesting grounds are most available. The Authority therefore considers that the capacity of these existing portions of the wetlands is not crucial, but suggests that the proponent evaluate the current design layout to restore as much of the eastern wetland as possible, and that there is potentially a sufficient land area on the western side of the development, to reinstate a significant area of wetland. If the proponent also ensures that all the artificial wetlands and moats to be created are designed to have a high waterbird value, then these combined actions should result in only a limited overall loss to the habitat but not the capacity of the estuary.

RECOMMENDATION 10

The Environmental Protection Authority recommends that the proponent should revise the layout and landscape treatment of the pasture areas to be included in the conservation area to:

(i) retain the maximum possible area and range of habitats for waterbirds;

(ii) design all artificial lakes and moats to provide high waterbird habitat value; and

(iii) incorporate appropriate design features to achieve the most effective buffer between the development and estuary in order to minimise all forms of disturbance to waterbirds, and to maintain the habitat value of the estuary,

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

5.5.2 EGRET HABITAT

Attention has been drawn by several submissions to the possible importance of a portion of the lower waters of the Vasse Estuary in the vicinity of the proposed winery complex, as a habitat of the Great Egret (Egretta alba). At the Department of Conservation and Land Management's request the proponent has undertaken a further survey of this location. So far only low numbers have been recorded suggesting, in the proponent's view that their appearance as flocks is an ephemeral event-related activity and that other locations in the estuary system may be as, or more important.

The proponent has indicated that plans for the adjacent foreshore were conceptual only, and that when plans are developed they will take account of the need of foreshore protection. The west bank of this portion of the Vasse estuary is important, as previously discussed, due to the stands of Agonis flexuosa, and its value as Western Ringtail Possum habitat. The Authority believes that preservation of essential characteristics of this site together with appropriate use is required. This would enable both concerns for the Ringtail Possum, and the Great Egret to be addressed in final proposals for the site.

RECOMMENDATION 11

The Environmental Protection Authority recommends that final proposals for development of the proposed winery complex site east of Layman Road should ensure maximum protection of the estuary foreshore and Agonis flexuosa

stand. The proposals should be provided to the Environmental Protection Authority, and only implemented if found satisfactory by the Authority following advice from the Department of Conservation and Land Management.

5.5.3 MIDGES AND MOSQUITOS

The existing and potential mosquito problem arising from the estuary environment, is not considered high providing the estuary remains mainly freshwater in character. There are nevertheless two dominant species present, of which one (Aedes camptorhynchus) bites humans. Highest numbers have been recorded in late spring and early summer, and adequate control measures will be required.

The potential midge nuisance problem associated with the proposal is by contrast, considered extremely high. The proponent has undertaken a study of both the mosquito (see Appendix 8 - Mosquito Study Summary) and midge populations (Appendix 9) of the estuary environment. The 'Interim Report on Midges' indicates that of four Chironomidae species recorded in the estuary, three are a known pest species in the Perth region. These are Chironomus australis, Polypedilum nubifer and Tanytarsus fuscithorax. Larvae of the species that is most annoying to humans, P. nubifer, were recorded in densities well above those considered to result in nuisance swarms of adult midges in the Perth region. (2000 larvae/metre^2). Of the four sampling sites, one yielded a mean of 20,917 larvae/metre^2 recorded on 29 December 1988. This is extremely high, and exceeds the highest ever recorded in the Perth region, which was 18,500 larvae/metre^2 at North Lake, a lake with severe midge nuisance problems.

The Environmental Protection Authority notes that these results were obtained at what might be only a start to the midge season. Midge problems in the Perth region can extend on into March. It is therefore essential that further survey and sampling is undertaken if a realistic assessment of the problem is to be achieved, and if effective management is to be attempted.

The high midge population reflects the very high nutrient status of the wetland system, which is substantiated by several studies, including the Environmental Protection Authority's study of the Vasse-Wonnerup system, (EPA 1989). Ironically it is this very high nutrient status further reflected in high insect and zooplankton populations, including the Chironomidae, that gives the estuary system its very high waterbird carrying capacity. In so far as a high value is placed on the estuary as a waterbird habitat, the Authority and the Department of Conservation and Land Management both consider high midge populations as an essential characteristic of the Vasse-Wonnerup estuary environment.

Nevertheless, the Environmental Protection Authority recognises that it is preferable for the midges to remain in the estuary and not intrude upon adjacent developments. The Department of Conservation and Land Management's view is that no development should be allowed in close proximity to midge-producing wetlands, and the Department draws attention to the City of Cockburn's recent policy of 1 km set back for all development from wetland floodplains. The Authority notes however that both the Department of Conservation and Land Management and the proponent have put forward a number of approaches to assist in the control of midges for the development proposal as it stands that avoid the costly and unacceptable practice of chemical control in the estuary environment itself. These

include attention to various aspects of design and layout to prevent or limit the movement of midges into the proposed residential areas, for example:

- maximising practical development set backs;
- establishing a suitably landscaped buffer, featuring sufficient height of earth mounds and density of appropriate plant species;
- appropriate street and outside domestic or other lighting directed away and screened from the estuary;
- appropriately orientated housing and structures (ie away from the estuary); and
- control and possibly reduction of nutrient input into the estuary.

For a number of reasons, it is extremely important that chemical spraying (eg larvicides such as Abate), in the estuary environment itself, be prohibited. Firstly, the larvae are a valuable food source for waterbirds. Secondly, chemical spraying in shallow waters may pose a serious risk of massive bird kills. Thirdly, application is not only difficult and costly, but owing to the means of spraying may result in extremely high disturbance at a time of high waterbird activity. The results of chemical spraying in the estuary would therefore most likely be highly destructive, and in the long term would fail to control the midge population anyway, due to the inevitible development of resistence to the chemical used.

Despite the proposed actions, it is possible that adult midges will also need to be controlled in the developed areas. As with mosquito control, this should be confined to fogging with adulticides only, and should only take place within the development.

RECOMMENDATION 12

The Environmental Protection Authority recommends that mosquito and midge control measures undertaken by the responsible authority in the Vasse-Wonnerup locality, should specifically exclude larvicides, and should be limited to the fogging of commercial and residential areas with suitable adulticides. Any other type of chemical control subsequently proposed should be subject to separate environmental assessment by the Environmental Protection Authority.

RECOMMENDATION 13

The Environmental Protection Authority recommends that the proponents should prepare and make available a suitable public education package concerning the midge and mosquito control programme to explain and inform future residents and owners of the purpose and extent of limitations placed on mosquito and midge control, to the satisfaction of the Environmental Protection Authority.

5.5.4 MOATS AND ARTIFICIAL WATERWAYS

The proposal features a number of constructed or artificial moats and waterways. As described in the ERMP these would function to visually enhance the development setting with open water areas, to provide (potentially) further waterbird habitat, to act as barriers and inhibit the movement of people and domestic animals (cats and dogs) into the main conservation areas, and to be a source of further fill for the project.

These waterbodies should at all times contain water of acceptable water quality, and not be a source of annoyance or nuisance (eg odour, midges) or management burden to the community.

The Environmental Protection Authority considers that adequate information about the precise morphology and function of these wetlands has not been provided. However, issues and requirements raised in this assessment will require the proponent to reconsider to some degree their proposed layout and purpose. All water bodies created should not only function adequately, but should be designed to achieve two essential objectives. Firstly, to provide additional viable waterbird habitat, and secondly, achieve a maximum degree of buffer between the development and the main estuary body. It is noted that the proponent has undertaken to liaise with the EPA and the Department of Conservation and Land Management in finalising the design and function of the artificial wetlands and moat. This should include details of the proposed method of construction.

5.6 GROUNDWATER AND SURFACE RUN OFF

The proposed development will have a significant impact on the relatively limited and shallow freshwater lense of groundwater that occurs between the ocean and the estuary. Concerns have been expressed to the Authority as to the impacts of dewatering, loss of groundwater to existing users, and potential for groundwater seepage between the proposed waterways and the estuary.

5.6.1 DEWATERING IMPACTS

The ERMP states that dewatering will not create lasting groundwater problems. The proponent has also undertaken to accept full responsibility for claims by land owners whose groundwater supplies are deleteriously affected by the project.

The Environmental Protection Authority has received advice from the Water Authority of WA to the effect that dewatering will result in some saline intrusion into the groundwater body, and some existing users could be affected. (See Appendix 10). On the basis of this and advice from the Geological Survey of Western Australia that the impacts of dewatering will be transitory with groundwater conditions normalising after the construction period, the Environmental Protection Authority has concluded that dewatering and the creation of waterways should not pose a major threat to the groundwater lense, or users of it. Nevertheless the Authority believes that alternate technology and methods of construction are available and which can be used to avoid the potential impacts of dewatering.

RECOMMENDATION 14

The Environmental Protection Authority regards it as essential that there should be no adverse impacts resulting from dewatering outside the project site, and to that end recommends that the proponent consider alternative construction techniques that do not require dewatering, and advise the Environmental Protection Authority of the preferred option.

5.6.2 GROUNDWATER SEEPAGE

Due to the proximity of the proposed canals to the estuary a possibility exists that seepage of groundwater may occur from the estuary to the canal system, especially during the period of construction and dewatering, and also from the proposed canals to the estuary, especially during summer when the estuary water levels drop to their lowest (up to - 0.4 AHD maximum).

The degree of risk has been further assessed by the proponent (ERMP Appendix 11) and the conclusions reached are that in either case, while existing seepage rates may be increased during and following development respectively, they are not considered to be significant. In the latter case, of seepage from the proposed canals to the estuary, an increase of about 160 cubic metres per day or less is calculated. Though this will increase the quantity of salts reaching the estuary body, it is concluded that these will have no environmental impact of consequence as the remnant waters in the estuary are highly saline in any case at that time of year. These salts are flushed by incoming winter runoff, and hence the general salinity of water in the Vasse estuary is not expected to be affected. In the meantime, a degree of uncertainty remains,especially the potential for "piping" where seepage may follow any potential line of weakness or least resistance beneath the ground surface. This would probably not be detected by monitoring bores, and would require regular visual inspection along the estuary edge to detect localised seeps or pooling.

RECOMMENDATION 15

The Environmental Protection Authority recommends that the proponent's undertaking to monitor seepage from the canals include regular visual inspection of the samphire and estuary edge.

RECOMMENDATION 16

The Environmental Protection Authority recommends that if seepage of groundwater in either direction occurs and results in adverse impacts on the estuary water quality, the proponent should undertake to seal by appropriate means as much of the canal waterway system as is necessary, at no cost to the community, and should make financial provision for such in the relevant agreement with the Waterways Manager.

5.6.3 SURFACE RUN-OFF

Surface run-off from the urban portions of the development will inevitably contain a variable level of sediment, contaminants and nutrients. It is imperative that no surface run off enter into the estuary, and that surface run-off entering the canal and harbour waterway system be suitably trapped to remove all contaminants possible. This requirement should include the disposal of surface run off from Layman Road in particular. The Authority notes that these requirements are provided for in commitments made in the the ERMP. Nevertheless, the proponent should consider all opportunities for the disposal of surface runoff by means of in situ recharge to groundwater by appropriate design techniques.

5.7 SERVICING

A number of services in a development of this size have the potential to cause various impacts. These include those resulting from sewerage and waste disposal, reticulation, and irrigation of both domestic gardens and public areas. There is however no reason to believe that any of the servicing provisions referred to in the ERMP will present problems or adverse impacts if properly installed and operated.

5.8 LAND TENURE AND LAND EXCHANGES

A number of land exchanges are proposed in the ERMP (Figure 5) including alterations in tenure. It is considered that a number of modifications to those proposed will be required.

Figure 5. Land Exchanges (note: layout revision in Figure 5).

The final alignments of road reserves (eg Layman Road) will be determined at the detailed design stage. The Layman Road Reserve extension across the estuary to Webster Road, is not now part of the proposal being assessed (see Figure 4).

In the case of Location 1440, north of the portion proposed to be transferred to the Crown for conservation, the Environmental Protection Authority considers that a further portion in the location as indicated in Figure 6. should also become Crown land for conservation purposes, due to the need for protection of the edge of the estuary and the remaining stands of Agonis. However the Authority accepts that the final alignment will depend on further investigations to be undertaken by the proponent.

Figure 6. Northern Portion of Location 1440 - Protection of Estuary Shoreline.

The proposed Waterfowl Study Centre and related commitments are strongly supported by the Environmental Protection Authority. Nevertheless the Authority believes that the Waterfowl Study Centre should be included within the proposed Conservation Reserve. The Authority has no objections to the State Planning Commission considering the public use areas in the final design of the Waterfowl Study Centre as part of the effective P.O.S. contribution, but believes administratively it should be part of the Conservation Reserve.

There is also indicated on Figure 3.2 (Land Transfer) in the ERMP a 'Reserve for Recreation 190' running along the foreshore of the Vasse estuary. In reality this alignment is not compatible with the existing terrain, and the Environmental Protection Authority believes the Reserve vesting to be anomalous and inappropriate.

RECOMMENDATION 17

The Environmental Protection Authority recommends that the land areas to be transferred to the Crown for Conservation purposes, including the estuary foreshore east of Layman Road, and the existing 'Reserve for Recreation 190', should be amalgamated into one reserve and gazetted for the purpose of "Conservation of Flora and Fauna" with vesting in the National Parks and Nature Conservation Authority, and that the Waterfowl Study Centre and its associated site should be gazetted for the purpose of "Waterfowl Study Centre" with vesting in the Executive Director of the Department of Conservation and Land Management.

5.9 AGREEMENTS

The ERMP points to the need for an agreement with State agencies and the local authority to cover various aspects of the proposal. This agreement should be finalised between the State Government (DMH), the Busselton Shire and the proponent to cover waterways management and the sand bypass, before the project can be allowed to proceed.

The Environmental Protection Authority has been aware of ongoing negotiations between the relevant parties. On the 16 March 1989 the Environmental Protection Authority was advised that on the basis of legal advice, the Shire of Busselton had rejected the current proposal of utilizing the Council's rating system to fund the sand bypassing and waterway maintenance costs for the Port Geographe development. A Council resolution to this effect was adopted at a special meeting of Council on 24 February 1989.

A representative of the Shire of Busselton has also indicated that council holds further reservations concerning the cost implications of the project.

Council considers that additional costs associated with the ongoing maintenance of harbour walls and beach stabilization for example, are essentially unknown.

On the basis of the advice received the Authority understands that there is as yet no agreement for the levy of rates within the development for the proposed management trust fund.

RECOMMENDATION 18

The Environmental Protection Authority recommends that construction of the canal waterways, harbour and entrance breakwaters and groynes should not commence prior to the finalization of a suitable agreement between the State (Department of Marine and Harbours), the Shire of Busselton and the proponent to cover waterways management and sand bypassing, as referred to in Section 6.0 of the ERMP to the satisfaction of the Minister for Environment.

5.10 GREENHOUSE EFFECT

The Greenhouse Effect is a matter that must be addressed by the proponents of all development proposals in coastal locations and on low lying land. 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 the appropriate design of structures and coastal works a difficult matter.

In the face of this uncertainty, the Environmental Protection Authority has sought an appropriate response to the current range of predictions on sea level rise and weather changes. In the case of the Port Geographe proposal, modifications have been made from the previous 1985 proposal to allow for a rise of 300 mm, in addition to all other factors considered. As a consequence Port Geographe is to be constructed to a floor level of + 2.8 m AHD, which is higher than rest of Busselton at 2 m - 2.5 m AHD.

As the proponent points out, it would be possible to undertake further works to build up land and strengthen coastal structures (groynes and harbour entrance) if this were later required. In the meantime the Environmental Protection Authority, on the advice of the Department of Marine and Harbours, considers sufficient allowance for the predicted short term impacts resulting from the Greenhouse Effect has been provided and supports the initiative of the proponent in anticipating new sea levels.

6. CONCLUSION

The Port Geographe proposal is a large scale and complex land development project set in a challenging site with a number of limitations. There are also a number of important issues concerning this development. The Environmental Protection Authority has considered these issues, and judged the proposal against a number of opportunities and requirements as outlined in this assessment report. The Authority has taken into account the professional and flexible approach of the proponent, the extensive commitments and undertakings given, and the willingness of the proponent to respond to the various issues raised.

The Environmental Protection Authority finds the proposal environmentally acceptable, subject to all commitments and undertakings provided by the proponent, and recommendations in this assessment report, being implemented at the appropriate time.

However, in conjunction with this finding, the Authority is of the view that the environmental condition of the adjacent Vasse-Wonnerup estuary requires urgent action by Government, and that if Port Geographe is to proceed Government should see this as both an opportunity and a necessity to set in place adequate management arrangements for the overall estuary system.

7. REFERENCES

Environmental Protection Authority, "The Environmental condition of the Vasse-Wonnerup Wetland System, and Discussion of Management Options", Technical Series 31, May 1989.

Riedal and Byrne Pty Ltd, "Port Geographe-Coastal Processes Study," June 1988. Report prepared for the Department of Marine and Harbours, WA.

Walker D J, Lukatelich R I and McComb AJ, "Impact of Proposed Development on Benthic Marine Community of Geographe Bay," University of Western Australia 1987.

Figure 1. General Location.

Figure 2. Proposed Layout.

Figure 3. Physical Environment

offshore marine environment
beachzone
barrier dunes
estuarine flats
estuarine flats
estuary environment

Figure 4. Revised Layout.

Figure 5. Land Exchanges (note: layout revision in Figure 4).

Figure 6. Northern Portion of Location 1440 - Protection Estuary Shoreline

APPENDIX 1

SUMMARY OF COMMITMENTS

APPENDIX 2

SUMMARY OF ISSUES RAISED IN SUBMISSIONS

APPENDIX 3

PROPONENTS RESPONSE TO ISSUES RAISED

APPENDIX 4

SUMMARY OF IMPORTANCE OF VASSE-WANNERUP WETLANDS TO WATERBIRDS

APPENDIX 5

COMMENTS ON FLUSHING CHARACTERISTICS OF PORT GEOGRAPHE

APPENDIX 6

ENVIRONMENTAL MANAGEMENT PROGRAMMES

APPENDIX 7

WESTERN RINGTAIL POSSUM COMMITMENTS

APPENDIX 8

MOSQUITO STUDY SUMMARY

APPENDIX 9

MIDGE STUDY

APPENDIX 10

ADVICE FROM THE WATER AUTHORITY OF WESTERN AUSTRALIA

APPENDIX 11

SEEPAGE MODELLING