

Redevelopment of Mandurah Marina, lot 11, Old Coast Road, Mandurah

Norman Hope Nominees Pty Ltd

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

**Environmental Protection Authority
Perth, Western Australia
Bulletin 692
July 1993**

THE PURPOSE OF THIS REPORT

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

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

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

APPEALS

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

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

ADDRESS

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

CLOSING DATE

Your appeal (with the \$10 fee) must reach the Minister's office no later than 5.00 pm on 13 August 1993.

Environmental Impact Assessment (EIA)

Process Timelines in weeks

Date	EIA commences from receipt of full details of proposal by proponent	Time (weeks)
14 December 1992	Proponent Document Released for Public Comment	6
25 January 1993	Public Comment Period Closed	
2 February 1993	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	1
6 May 1993	Proponent response to the issues raised received	14
30 July 1993	EPA reported to the Minister for the Environment	12

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Summary and recommendations

Norman Hope Nominees Pty Ltd proposes to redevelop and upgrade the existing facilities at the Mandurah Marina, Lot 11, Old Coast Road, Mandurah (Figure 1).

The site is 9.4 hectares in area and the current development consists of two basins and associated commercial areas. The redevelopment will extend the southern basin, upgrade the commercial area, create residential housing lots, and formalise the public foreshore reserve.

Upon referral to the Environmental Protection Authority a Consultative Environmental Review (CER) level of assessment was set to evaluate particularly the impact of the development on the hydrology and water quality of the Mandurah Channel, the associated tidal wetlands and foreshore reserves. The development site is located within the Peel-Harvey Estuary which is important locally and internationally for its environmental significance.

The CER was available for a six week public submission period which closed on 25 January 1993. Four submissions on the proposal were received from members of the public, community groups and State Government agencies. The following specific issues were raised:

- retention of (wetland) vegetation;
- foreshore reserves, public access and open space;
- design of wet pens for boats and compliance with canal guidelines;
- water quality, monitoring and management;
- drainage and waste management; and
- sewage disposal.

A detailed list of issues raised in submissions and the proponent's response to them is contained in Appendix 2 of this report.

Following consideration of the Consultative Environmental Review, submissions from Government agencies and the proponent's response to them, the Authority considers that the environmental issues related to the proposal are manageable and has concluded that the proposal is environmentally acceptable. Accordingly, the Authority recommends that:

Recommendation 1

The Environmental Protection Authority has concluded the redevelopment of the Mandurah Marina site as modified during the assessment process is environmentally acceptable.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental issues as:

- **impact on estuarine wetlands;**
- **the provision of foreshore reserves, pedestrian access and public open space;**
- **drainage and nutrient management within the site;**
- **water quality within the proposed artificial waterways and their ongoing monitoring and management;**

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the proponent's environmental commitments listed in Appendix 1 and the following recommendations. (Recommended Environmental Conditions are listed in Section 7)

Wetlands are environmentally valuable and up to 80% have been lost from the Swan Coastal Plain. There are two tidal wetlands on the site and both would be affected by the proposed development. These wetlands are environmentally significant as they are comprised of native samphire and remnant fringing vegetation and are the closest wetland areas to the mouth of the

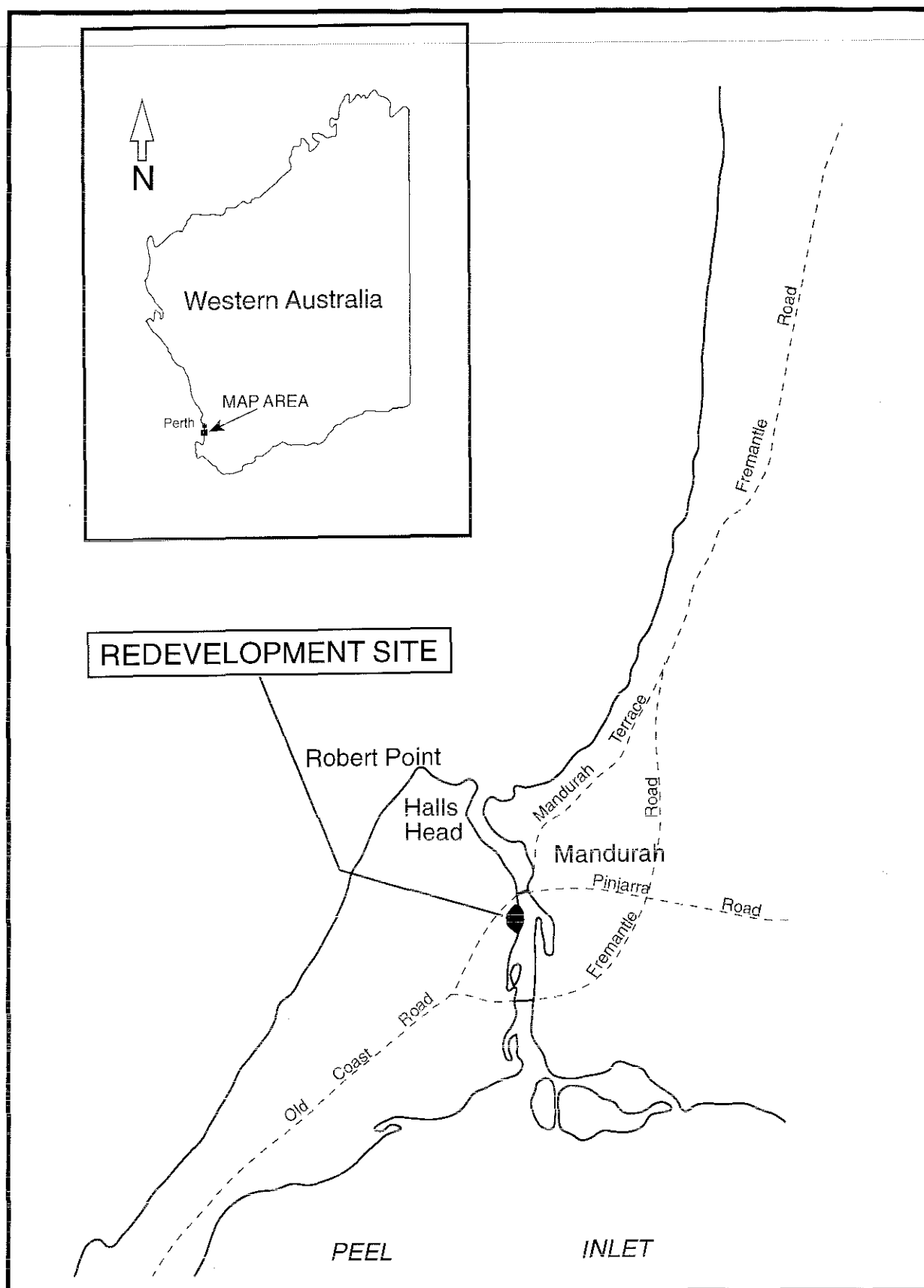


Figure 1: Location of proposed development

Mandurah Channel. In order to retain the wetland function in this area, it is important that the area of samphire functioning as a discrete unit, that is, the vegetation between the bund and the Mandurah Channel, should be retained and managed as part of the southern foreshore reserve.

Recommendation 2

The Environmental Protection Authority recommends that prior to development, the proponent should rehabilitate the wetland area between the existing bund and the Mandurah Channel to the requirements of the Environmental Protection Authority on advice from the Peel Inlet Management Authority. This area should be incorporated into the southern foreshore reserve, Reserve 37161. (see Recommended Environmental Conditions 3-2 and 3-3)

The proposal does not fully comply with planning requirements for foreshore reserves or public open space. The proposal includes the retention of a foreshore reserve to the north and south of the two basins. The headland between these reserves is the site of the existing marina and is proposed to be developed to High Water Mark for a commercial precinct. As acknowledged by the proponent in Appendix 2 (4.2), some filling of the foreshore has taken place over time. This filled area is outside the boundary of Lot 11, and hence is vacant Crown land. The commercial precinct would involve development of this Crown land.

The Authority believes in the principle of public ownership of foreshore areas and of ensuring full though managed public access to the foreshore in perpetuity. The Authority has provided this same advice on previous assessments of proposals such as Eglinton Beach Resort (1991), Port Geographe (1989), Port Kennedy Regional Recreation Centre (1989) and Mindarie Keys (1985). This proposal does not provide for public access to this portion of the foreshore. The Authority does not find it acceptable that the proponent wishes to have sections of the foreshore area currently Crown land in private ownership. The Authority believes that foreshore open space should remain, and it should be in public ownership. Private ownership is considered to present a potential constraint on full public access.

Recommendation 3

The Environmental Protection Authority recommends that an adequate foreshore reserve be created between the proposed commercial precinct area and the Mandurah Channel to the requirements of the Minister for the Environment and the Minister for Planning on advice of the Environmental Protection Authority, the Peel Inlet Management Authority and the Department of Planning and Urban Development. (see Recommended Environmental Condition 3-4)

The development area should be managed to minimise physical impacts on the remnant vegetation during and after construction activities and the reserves should be separated from all lots by a landscaped buffer zone and a demarcating barrier. The buffer zone should be approximately 30 metres wide and appropriately landscaped using indigenous vegetation to minimise the visual and noise impacts of the residential development on the southern foreshore reserve. By providing a landscaped buffer zone, the proponent would enhance the viability of the wetland area and meet the requirement for provision of public open space.

Recommendation 4

The Environmental Protection Authority recommends that the proponent should incorporate a landscaped buffer zone and a demarcating barrier between the southern foreshore reserve and the residential lots in consultation with the Environmental Protection Authority and the Peel Inlet Management Authority. (see Recommended Environmental Condition 3-1)

The Environmental Protection Authority notes that the proponent has made a commitment to design and implement a Foreshore Management Plan. The proponent may incorporate the plan

into an Environmental Management Programme which should address the issues of minimising disturbance of remnant vegetation during the construction and operation of the development, ensuring adequate public access and open space and wetland management. There should be no compensating basin established within the foreshore reserve.

Recommendation 5

In order to minimise disturbance of remnant vegetation during the construction and operation of the development, the Environmental Protection Authority recommends that the proponent should address foreshore reserve management in an Environmental Management Programme developed in consultation with the Environmental Protection Authority and the Peel Inlet Management Authority. The programme should include consideration of, but not necessarily be limited to management of the:

- **wetlands area;**
- **landscaped buffer zone and public access; and**
- **foreshore reserves.**

(see Recommended Environmental Conditions 3-5 and 4-2)

The proposed development site is within the Peel-Harvey catchment area and the water quality of the canal system must be maintained to an acceptable standard in order not to contribute to existing nutrient enrichment problems. Water quality within the canals should meet water quality requirements of Policy No. DC 1.8, Procedures for Approval of Artificial Waterways and Canal Estates (Canal Estate Guidelines). The Environmental Protection Authority notes that the proponent has made a commitment to design and implement a Water Management Plan. Waterway management for the marina and canal development is needed to ensure ongoing maintenance of acceptable water quality. The proponent may incorporate the plan into an Environmental Management Programme. In accordance with the Canal Estate Guidelines (section 4.2.4), the long term Waterway Manager would be the City of Mandurah.

Recommendation 6

In order to maintain acceptable water quality in the canal system, the Environmental Protection Authority recommends that prior to construction, the proponent should, following consultation with the Peel Inlet Management Authority and the City of Mandurah, design an Environmental Management Programme to the requirements of the Environmental Protection Authority. The plan should include consideration of, but not necessarily be limited to:

- **water quality monitoring and management procedures;**
- **sediments monitoring and management procedures;**
- **sedimentation monitoring and management procedures;**
- **structural soundness and condition of entrance and water way walls monitoring and management procedures; and**
- **long term waterway management.**

(see Recommended Environmental Conditions 4-1 and 4-2)

Recommendation 7

The Environmental Protection Authority recommends that prior to granting of final approval to rezone the development site to "Canal", the proponent should finalise an agreement with the City of Mandurah for the long term management of the artificial waterways (i.e. after five years) to the requirements of the Minister for the Environment and the Minister for Planning. (see Recommended Environmental Condition 4-3)

1. Project description

Norman Hope Nominees Pty Ltd proposes to redevelop and upgrade the existing facilities at the Mandurah Marina, Lot 11, Old Coast Road, Mandurah (Figure 1).

The site is 9.4 hectares (ha) in area and the current development consists of two basins and associated commercial areas. The redevelopment will extend the southern basin, upgrade the commercial area, create residential housing lots, and formalise the public foreshore reserve.

The southern basin will be enlarged from 7000m² to 11,000m² in area, with a slightly sloping bed steadily deepening towards the entrance to the Mandurah Channel. The level of the basin bed will be set above that of the channel to ensure that poor quality water will not be trapped within the development.

The commercial precinct will comprise boat hire and repair facilities, chandlery, a tavern and restaurant, refuelling facilities and a selection of small commercial tenancies. The residential area will comprise a 41 dwelling unit housing lot and a 13 unit group housing lot, both at R40 density, and a conventional subdivision of 56 lots. The existing foreshore reserves flank the development on either side of the proposed commercial precinct.

2. Existing environment

The site is located on the west bank of the Mandurah Channel, immediately south east of the Old Traffic bridge, and is within the Peel-Harvey estuarine system. The water quality in the Channel is variable depending on the seasonal changes in the water quality of the Estuary.

The biological environment of the proposed redevelopment area consists of three ecosystems. The estuarine ecosystem consists of basin areas dominated by macroalgae, and shallow areas that are either covered in seagrass or unvegetated. The terrestrial ecosystem has been extensively modified by filling and clearing, although *Casuarina obesa* and *Eucalyptus rudis* occur. The tidal/wetland ecosystem is represented by two areas of wetlands. Field surveys identified thirteen species of native samphire and remnant fringing vegetation which were divided into five vegetation assemblages. Both of these wetland areas have been modified by previous activities such as stormwater compensation and human disturbance.

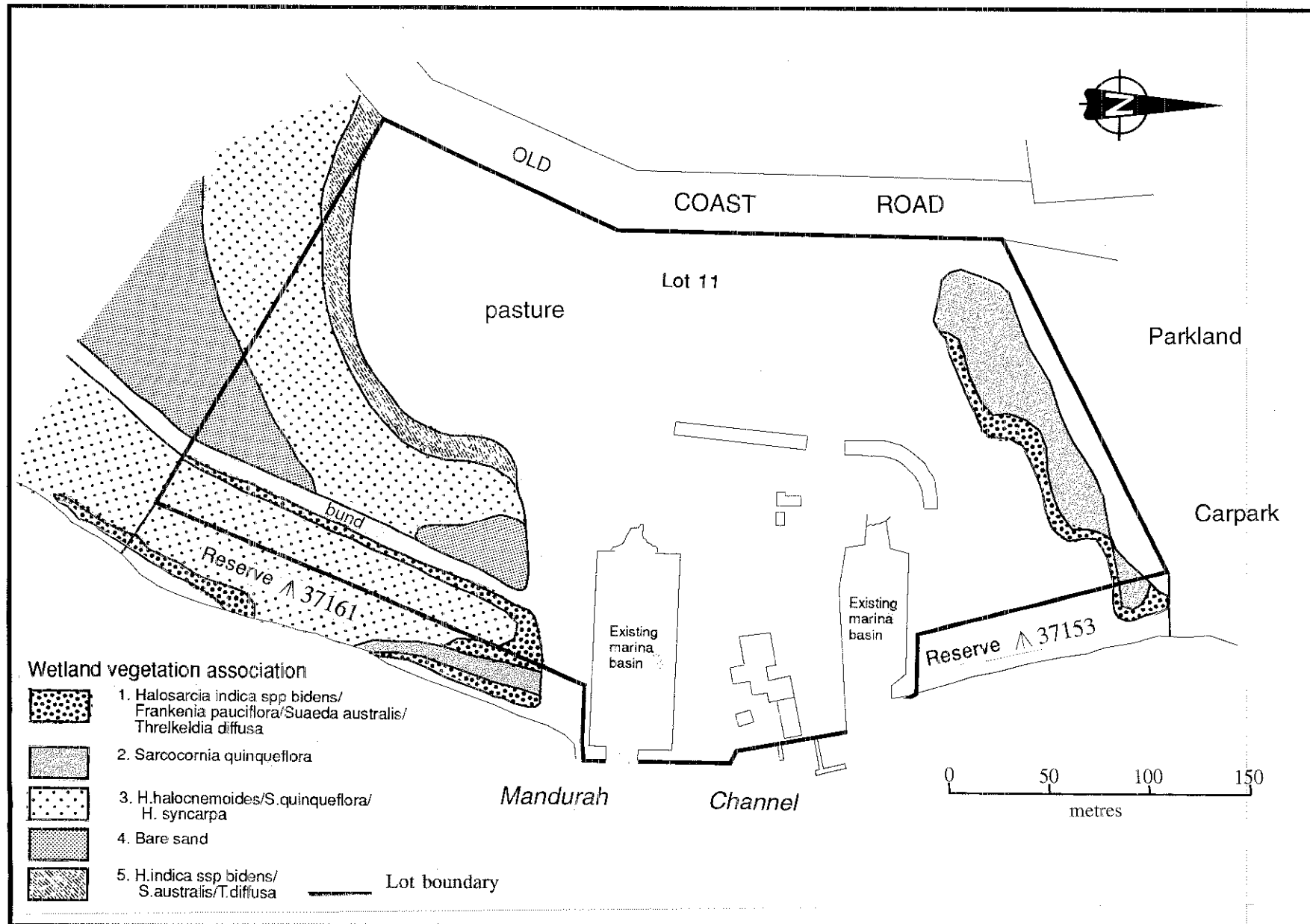
3. Planning context

Lot 11 is zoned "Future Urban" under the City of Mandurah District Zoning Scheme No 1A. The proponent has applied for Lot 11 to be rezoned to "Tourist" and has also applied for Lot 11 to be rezoned to "Canal". Following environmental assessment of the proposal and approval by Council of the rezoning amendment, the Department of Planning and Urban Development (DPUD) would then rezone Lot 11 and assess the subdivision proposal. The proponent states that the proposal meets the requirements of the Canal Estate Guidelines, Policy No. DC 1.8, Procedures for Approval of Artificial Waterways and Canal Estates (Canal Estate Guidelines), which are applied to land zoned "Canal".

Management of the Mandurah Channel is the responsibility of the Peel Inlet Management Authority (PIMA) in co-operation with other State and local government authorities and the public. The Peel Inlet Management Programme, 1992 recommended that any development on this site should "redevelop Mandurah Marina to ensure public access to the foreshore, the provision of a public ferry terminal and the establishment of a public sewage pump out facility" (Waterways Commission, 1992). The Management Programme also makes specific recommendations for foreshore reserves as part of any rezoning or subdivision, an integrated Bike Plan for the area and a Foreshore Management Plan to protect and rehabilitate samphire marshlands.

There are two existing 30 metre foreshore reserves on the development site which are located on either side of the proposed commercial precinct (Figure 2). These reserves, Reserve 37161

Figure 2: Map of vegetation and existing foreshore reserves



and Reserve 37153, would be included in the proposed Peel Regional Park. The commercial precinct as originally proposed does not include a foreshore reserve and therefore, the proposal does not comply with standard planning requirements for provision of foreshore reserves along developments for public access.

4. Public Review

The Consultative Environmental Review was available for a six week public submission period which closed on 25 January 1993. Four submissions on the proposal were received from members of the public, community groups and State Government agencies. The following specific issues were raised:

- retention of (wetland) vegetation;
- foreshore reserves, public access and open space;
- design of wet pens for boats and compliance with canal guidelines;
- water quality, monitoring and management;
- drainage and waste management; and
- sewage disposal.

Other issues raised in the submissions included:

- alternative uses for the site;
- residential development and Old Coast Road; and
- landscape design and construction methods.

A detailed list of issues raised in submissions and the proponent's response to them is contained in Appendix 2 of this report.

5. Environmental Impacts

Following consideration of the Consultative Environmental Review, submissions and the proponent's response to them, the Authority believes that the potential environmental impacts could be managed adequately.

Recommendation 1

The Environmental Protection Authority has concluded the redevelopment of the Mandurah Marina site as modified during the assessment process is environmentally acceptable.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental issues as:

- **impact on estuarine wetlands;**
- **the provision of foreshore reserves, pedestrian access and public open space;**
- **drainage and nutrient management within the site;**
- **water quality within the proposed artificial waterways and their ongoing monitoring and management;**

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the proponent's environmental commitments listed in Appendix 1 and the following recommendations. (Recommended Environmental Conditions are listed in Section 7)

5.1 Estuarine wetlands

The proposed development would cause the loss of 2.24 ha of samphire wetland. The area to be filled would include the tidal drainage basin at the northern end of the site and a portion of the southern samphire area (Figure 2). The northernmost wetland is surrounded by a park, pasture, a major road and the Mandurah Channel. The wetland has been used for stormwater discharge and there has been some weed invasion. Despite the pressures of the surrounding land uses, this wetland has a high species diversity of samphire, provides valuable wildlife habitat and is the area closest to the channel entrance of these samphire species in the Mandurah townsite.

The southern wetland is also a reasonably healthy tidal samphire wetland, although it is divided by a bund which has restricted tidal influence. The wetland vegetation in this area, included in Reserve 37161 and the adjoining portion of Lot 11, could be improved by restoring tidal flow and diverting fresh water drainage. Retaining as large an area as possible of samphire would enhance the viability of the tidal wetland and contribute to conservation of the waterway margins.

The proponent states that these wetlands are degraded and filling them does not result in unacceptable environmental impacts, because these assemblages are well represented on the shores of the Peel Inlet and therefore these small areas do not have significant conservation value.

Wetlands are environmentally valuable and up to 80% have been lost from the Swan Coastal Plain. There are few areas of samphire vegetation remaining in the Mandurah region and the two tidal wetlands on the development site are, despite the pressures from surrounding landuse, fairly robust ecosystems and strategically valuable wetlands. The wetlands are environmentally significant as they are comprised of native samphire and remnant fringing vegetation and are the closest wetland areas to the mouth of the Mandurah Channel. The proponent should explore the possibilities of redesigning the proposal to conserve the northern wetland area which would retain the valuable wetland function. The Authority recognises, however, that the proposed development would increase the pressures on the wetland and could be difficult to manage.

Following advice from the Peel Inlet Management Authority, the Environmental Protection Authority considers that protection of the southern wetland is environmentally important. The Environmental Protection Authority is aware that some of this area is within the proposed development. In order to protect this vegetation, however, it is important that the area of samphire functioning as a discrete unit, that is, the vegetation between the bund and the Mandurah Channel, should be retained and managed as part of the southern foreshore reserve. Expanding the southern foreshore reserve to the existing bund, approximately 50 metres from High Water Mark, would be especially important if the wetland function to the north was lost. Proposals for the control of weed species into the wetland areas should be submitted to the Peel Inlet Management Authority for review.

Recommendation 2

The Environmental Protection Authority recommends that prior to development, the proponent should rehabilitate the wetland area between the existing bund and the Mandurah Channel to the requirements of the Environmental Protection Authority on advice from the Peel Inlet Management Authority. This area should be incorporated into the southern foreshore reserve, Reserve 37161. (see Recommended Environmental Conditions 3-2 and 3-3)

5.2 Foreshore reserves, public access and open space

The proposal as originally proposed does not fully comply with planning requirements for foreshore reserves or public open space.

The purpose of foreshore reserves adjoining natural waterways is to maintain the integrity of the natural waterway and is of regional significance rather than just local significance. The proposal includes the retention of foreshore reserves to the north and south of the two basins.

The headland between these reserves is the site of the existing marina and is proposed to be developed to High Water Mark for a commercial precinct. As acknowledged by the proponent in Appendix 2 (4.2), some filling of the foreshore has taken place over time. This filled area is outside the boundary of Lot 11, and hence is vacant Crown land. The commercial precinct would involve development of this Crown land. The precinct would need to accord with the Local Retail Strategy for the City of Mandurah.

The proposal does not include the standard 10% area set aside for Public Open Space. The proponent has sought to make the open space requirements in the form of a cash in lieu payment to the Council.

The issue of lack of public open space within the development, and lack of pedestrian access along the foreshore and around the marina was raised in some submissions. The Authority notes that provision of these facilities is inadequate, and the development should conform to standard requirements for public access along the foreshore.

The Authority believes in the principle of public ownership of foreshore areas and of ensuring full though managed public access to the foreshore in perpetuity. The Authority has provided this same advice on previous assessments of proposals such as Eglinton Beach Resort (1991), Port Geographe (1989), Port Kennedy Regional Recreation Centre (1989) and Mindarie Keys (1985). This proposal does not provide for public access to this portion of the foreshore. The Authority does not find it acceptable that the proponent wishes to have sections of the foreshore area currently Crown land in private ownership. The Authority believes that foreshore open space should remain, and it should be in public ownership. Private ownership is considered to present a potential constraint on full public access.

Recommendation 3

The Environmental Protection Authority recommends that an adequate foreshore reserve be created between the proposed commercial precinct area and the Mandurah Channel to the requirements of the Minister for the Environment and the Minister for Planning on advice of the Environmental Protection Authority, the Peel Inlet Management Authority and the Department of Planning and Urban Development. (see Recommended Environmental Condition 3-4)

The development area should be managed to minimise physical impacts on the remnant vegetation during and after construction activities and the reserves should be separated from all lots by a landscaped buffer zone and a demarcating barrier. The buffer zone should be approximately 30 metres wide and appropriately landscaped using indigenous vegetation to minimise the visual and noise impacts of the residential development on the southern foreshore reserve. The landscaped area would also buffer residents from any midges and mosquitoes breeding in the wetland. A raised pedestrian/bicycle board walk built along the boundary of the southern foreshore reserve would enhance the samphire wetland along the southern foreshore reserve as well as delineate the reserve from the development. A dog proof fence would further protect the conservation values of the wetland. By providing a landscaped buffer in this area, the proponent would enhance the viability of the southern wetland area and meet the requirement for provision of public open space.

Recommendation 4

The Environmental Protection Authority recommends that the proponent should incorporate a landscaped buffer zone and a demarcating barrier between the southern foreshore reserve and the residential lots in consultation with the Environmental Protection Authority and the Peel Inlet Management Authority. (see Recommended Environmental Condition 3-1)

The Consultative Environmental Review pointed out that although there are no known specific sites of ethnographic or archaeological significance on the proposed development site, the

Mandurah area has significant Aboriginal heritage value. During the public review period, it was suggested that the proponent could name and signpost the area consistent with the aims of Aboriginal people in the Mandurah area to preserve their culture and to educate both the Aboriginal and non-Aboriginal communities regarding Aboriginal heritage in the region. There is a possibility that an Aboriginal heritage trail will be established in the Mandurah area and these signs could then be readily incorporated into the trail.

The proponent has made a commitment to develop a Foreshore Management Plan. The Foreshore Management Plan should provide further details of how the proponent would manage the foreshore reserves, public access and open space.

Recommendation 5

In order to minimise disturbance of remnant vegetation during the construction and operation of the development, the Environmental Protection Authority recommends that the proponent should address foreshore reserve management in an Environmental Management Programme developed in consultation with the Environmental Protection Authority and the Peel Inlet Management Authority. The programme should include consideration of, but not necessarily be limited to management of the:

- **wetlands area;**
- **landscaped buffer zone and public access; and**
- **foreshore reserves.**

(see Recommended Environmental Conditions 3-5 and 4-2)

5.3 Drainage and nutrient management

Nutrient enrichment is a major threat to the Peel-Harvey estuarine system and there are a number of policies in place addressing this issue, including the moratorium on drainage and clearing in the Peel-Harvey region. The drainage and waste management methods of the proposed development include construction of one or more compensation basins and are in accordance with the moratorium.

In response to submissions, the proponent provided further details on the proposed management of drainage and nutrient impacts of the proposal (Appendix 2). Direct discharge to waterways is not acceptable. Infiltration basins within the confines of the development would be constructed to allow the retention of a 1 in 10 year storm event on-site for a period of three to four days prior to its release to the waterway development. There should be no compensating basins established within the foreshore reserves. Stormwater from 1 in 5 year storms should be disposed of on-site with discharge entering the compensation basins, not the waterways. A separate and self-contained drainage system would be constructed for the boat repair area. These issues would be further addressed in the amendment for artificial Waterways Management as required by the Canal Estate Guidelines.

To facilitate control of nutrient inflow to the Peel-Harvey catchment the proponent would undertake a nutrient management program. According to this program, nutrient stripping soil amendment would be incorporated in stormwater infiltration basins on the development; all runoff would be directed from development lots via roadways and the formal stormwater drainage system to the infiltration basin or basins; landowners and residents would be advised about nutrient minimisation techniques; and native planting treatments would be adopted on the development.

5.4 Artificial waterways

5.4.1 Canal water quality

The proposed development waterways are designed with a slightly sloping bed that steadily deepens towards the entrance to the Mandurah Channel. The level of the basin bed will be set above that of the channel to ensure that poor quality water will not be trapped within the development. The proponent conducted a flushing study that indicated the flushing of the redeveloped basin would be sufficient to ensure effective exchange between the basin and the channel. The proponent has made a commitment to monitor water quality and sedimentation monthly for the first year and then quarterly for the following four years.

The proponent should establish baseline monitoring of sediments and water quality to determine the level of background contaminants and to ensure that a new marina and boat pens did not pollute. In the response to submissions, the proponent stated that turbidity during construction would be minimised by constructing a bund across the mouth of the present inlet and all water discharged from dewatering would be routed through a settling basin before overflowing to the main channel. Removal of the bund would involve relatively minor excavation works that would be conducted in a manner designed to minimise turbidity.

Recommendation 6

In order to maintain acceptable water quality in the canal system, the Environmental Protection Authority recommends that prior to construction, the proponent should, following consultation with the Peel Inlet Management Authority and the City of Mandurah, design an Environmental Management Programme to the requirements of the Environmental Protection Authority. The plan should include consideration of, but not necessarily be limited to:

- **water quality monitoring and management procedures;**
- **sediments monitoring and management procedures;**
- **sedimentation monitoring and management procedures;**
- **structural soundness and condition of entrance and water way walls monitoring and management procedures; and**
- **long term waterway management.**

(see Recommended Environmental Conditions 4-1 and 4-2)

5.4.2 Waterways management

The proponent has made a commitment to prepare a Waterway Management Plan in consultation with the Environmental Protection Authority and the Peel Inlet Management Authority, following approval to rezone the land. Results of this monitoring should be submitted on a regular basis to the Authority, and a summary report prepared after the first five years of operation.

Prior to the marina becoming operational, the Authority will require the proponent to forward plans for sewage service facilities for boats using the Marina.

The Environmental Protection Authority notes that detailed responsibility for the long term management of the marina and the canal has not been determined although in accordance with Canal Estate Guidelines (section 4.2.4) the long term Waterway Manager would be the City of Mandurah. The Canal Estate Guidelines require that prior to granting of final approval to rezone Lot 11 to "Canal", the proponent must finalise an agreement with the City of Mandurah for the long term management of the artificial waterways.

Recommendation 7

The Environmental Protection Authority recommends that prior to granting of final approval to rezone the development site to "Canal", the proponent should finalise an agreement with the City of Mandurah for the long term management of the artificial waterways (i.e. after five years) to the requirements of the Minister for the Environment and the Minister for Planning. (see Recommended Environmental Condition 4-3)

6. Conclusion

The Environmental Protection Authority concludes that the proposal could be environmentally acceptable provided the proponent's commitments and the recommendations of this report were implemented. This includes the preparation of a Foreshore Reserve Management Plan and a Waterways Management Plan prior to construction commencing. The Authority has established an implementation and auditing system which requires the proponent to advise the Authority on how it would meet the requirements of the environmental conditions and commitments of the project. The proponent would be required to develop a Progress and Compliance report for this project as a section of the recommended audit programs.

The Authority's experience is that it is common for details of the proposal to alter through the detailed design and construction phase. In many cases alterations are not environmentally significant or have positive effects on the environmental performance of the project. The Authority believes that such non-substantial changes, and especially those which improve environmental performance and protection, should be provided for.

The Authority believes that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Authority.

7. Recommended environmental conditions

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

1 Proponent Commitments

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

- 1-1 In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the Consultative Environmental Review and in response to issues raised following public submissions. These commitments are consolidated in Environmental Protection Authority Bulletin YYY as Appendix 1. (A copy of the commitments is attached.)

2 Implementation

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

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

3 Foreshore management

Remnant samphire vegetation growing along the Mandurah Channel is considered to be of local and regional importance.

- 3-1 The proponent shall minimise the disturbance to remnant wetland vegetation during construction and operation through providing a landscaped buffer and a demarcating barrier between the development and the remnant wetland vegetation in consultation with the Environmental Protection Authority and the Peel Inlet Management Authority.
- 3-2 The proponent shall rehabilitate the southern wetland area, as shown on Figure 1, between the existing bund and the Mandurah Channel to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.
- 3-3 The proponent shall cede the rehabilitated wetland area referred to in environmental condition 3-2 for inclusion in the foreshore reserve.
- 3-4 The proponent shall provide an adequate foreshore reserve between the commercial precinct and the Mandurah Channel to the requirements of the Minister for the Environment and the Minister for Planning on advice of the Environmental Protection Authority, the Peel Inlet Management Authority and the Department of Planning and Urban Development .
- 3-5 The proponent shall address foreshore reserve management in the Environmental Management Programme required by condition 4-1. The programme shall include consideration of, but not necessarily be limited to management of the:
 - 1) wetlands area;
 - 2) landscaped buffer zone and public access; and
 - 3) foreshore reserves.

4 Waterways management

The proponent has made a commitment to prepare a Waterways Management Plan to identify appropriate management measures for the redevelopment.

- 4-1 Prior to construction, the proponent shall, following consultation with the Peel Inlet Management Authority and the City of Mandurah, design an Environmental Management Programme to the requirements of the Environmental Protection Authority. The plan shall describe how acceptable water quality will be maintained in the canal system and include consideration of, but not necessarily be limited to:
 - 1) water quality monitoring and management procedures;
 - 2) sediments monitoring and management procedures;
 - 3) sedimentation monitoring and management procedures;
 - 4) structural soundness and condition of entrance and water way walls monitoring and management procedures; and
 - 5) long term waterway management.
- 4-2 The proponent shall implement the Environmental Management Programme required by conditions 3-5 and 4-1.
- 4-3 Prior to grant of final approval to the Scheme amendment to "Canal" zoning, the proponent shall finalise an agreement with the City of Mandurah, regarding the long-term management of the artificial waterway (i.e. post five years) to the requirements of the Minister for the Environment and the Minister for Planning.

5 Proponent

These conditions legally apply to the nominated proponent.

- 5-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination

of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

6 Time Limit on Approval

The environmental approval for the proposal is limited.

- 6-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority.)

7 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

- 7-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of this project, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

8. References

Halpern, Glick, Maunsell Pty Ltd (1992) Consultative Environmental Review - Redevelopment of Mandurah Marina, Lot 11, Old Coast Road, Mandurah, Western Australia.

Waterways Commission (1992) Peel Inlet Management Programme, 1992, Waterways Commission Report No. 27, Mandurah, Western Australia.

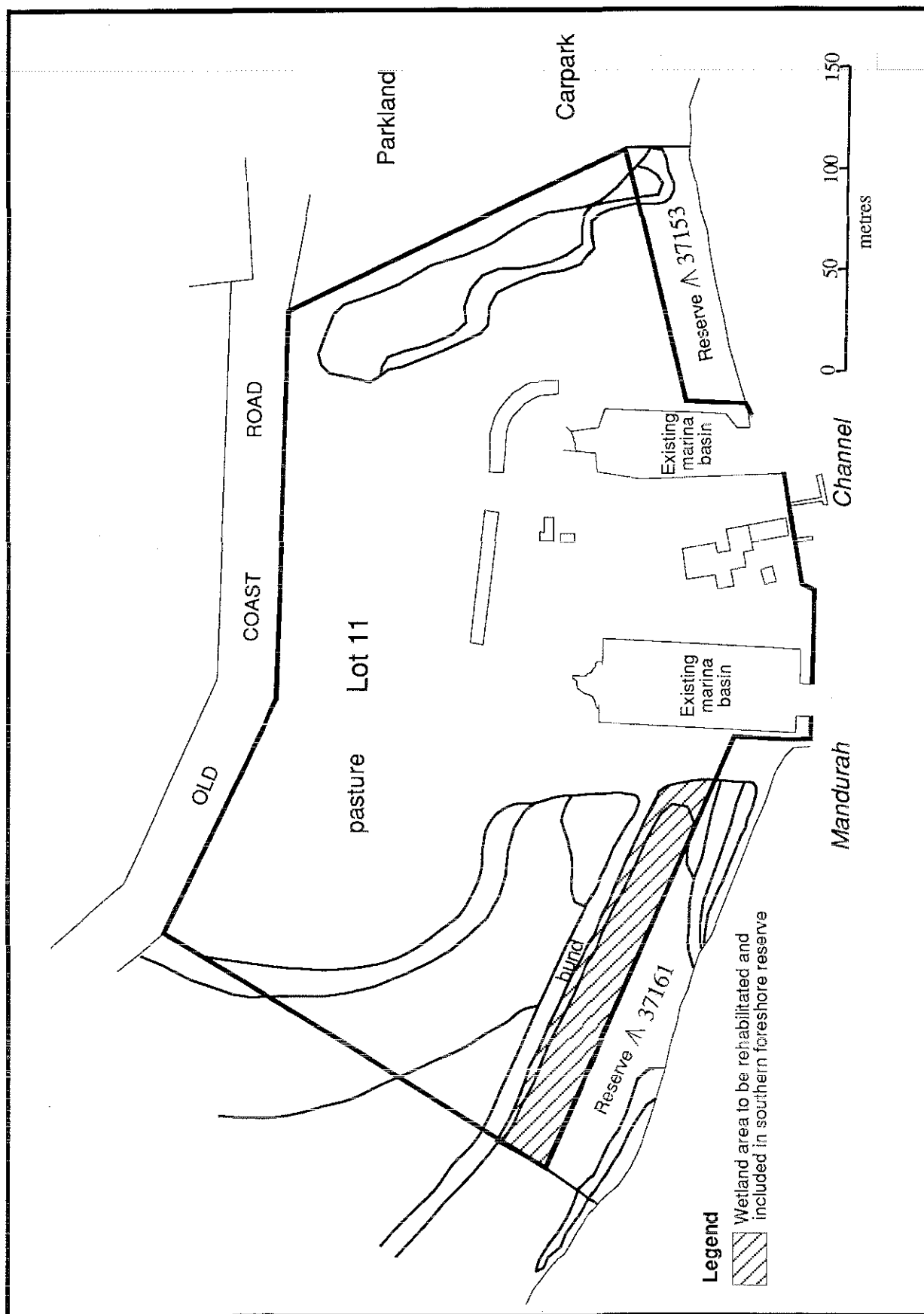


Figure 1: Wetland area referred to in Recommended Environmental Condition 3-2.

Appendix 1

Proponent's list of environmental management commitments

Norman Hope Nominees Pty Ltd's list of environmental management commitments

The proponent has made the following environmental commitments:

Preconstruction

1. A Foreshore Management Plan will be prepared to the satisfaction of the EPA, PIMA and DPUD. This plan will detail:
 - 1.1 Nutrient application and monitoring.
 - 1.2 Areas at the canal entrance which will be hardwalled to prevent erosion.
 - 1.3 The location and maintenance of retaining walls between the foreshore and areas which have be infilled.
 - 1.4 Rehabilitation of the foreshore reserves.
 - 1.5 Retention of the southern tidal samphire wetland.
 - 1.6 Location and design of public accessways to the northern foreshore reserve.
 - 1.7 Restriction of public access to the southern foreshore reserve.
 - 1.8 The location of exclusion barriers to limit vehicle access to foreshore reserves.
 - 1.9 The integration of the samphire area into the City of Mandurah's mosquito control programme.
 - 1.10 Maintenance of retaining walls bordering the foreshore reserves. Maintenance will be the responsibility of individual lot owners under the supervision of the City of Mandurah.
2. A Waterway Management Plan will be prepared to the satisfaction of PIMA and the EPA. This plan will detail:
 - 2.1 Maintenance of structures and facilities.
 - 2.2 Contingency safeguards for failure of the deep sewerage system.
 - 2.3 An emergency procedures manual incorporating oil and fuel spill contingency plans.
 - 2.4 Responsibilities for the regular removal of macroalgae, debris and litter from the basins.

- 2.5 The regular monitoring and reporting of hydrographic parameters, and water and sediment quality within the basins and the Mandurah Channel (this programme will run for five years from the time of dredging after which the programme will be reviewed in conjunction with the EPA). Ameliorative measures will be proposed in the event that unacceptable deterioration occurs.
3. Formalisation of a long term waterways management agreement with the City of Mandurah.
 4. Waterway construction methods will be finalised to the satisfaction of the Department of Marine and Harbours.
 5. Drainage details and design of the retention basin for the development and for the boat repair area will be finalised to the satisfaction of the EPA and PIMA.
 6. Wall construction materials, including the installation of approved filter cloth, will be finalised with the EPA.
 7. Design of the deep sewerage system will be finalised to the satisfaction of WAWA.
 8. The origin of imported fill will be cleared with the EPA.

During Construction

9. Construction work will be limited to the hours agreed to by the City of Mandurah and the EPA.
10. Dredging activities will be conducted at all times to the satisfaction of the EPA and PIMA.
11. Dust generated during construction will be controlled by the use of water sprays.
12. The soil surface will be compacted, stabilised and revegetated following filling to prevent erosion.
13. Construction waste materials will be disposed of at the Mandurah landfill site.

14. Minimum block levels will be set out at 2.1m AHD subject to review by the Department of Marine and Harbours of tidal range and storm surge within the Peel-Harvey system.

15. A stilling basin will be constructed to receive dewatering effluent prior to its discharge to the channel. Water will be discharged in such a manner so as not to disturb the banks or produce turbid water. The quality of discharge water will be to the satisfaction of the EPA and PIMA.

16. Groundwater levels will be monitored during dewatering activities and ameliorative measures taken if necessary to the satisfaction of the EPA and PIMA.

Post Construction

17. The stormwater retention basin will be regularly cleaned and maintained by the Waterways Manager and nutrient discharge minimised to the satisfaction of the EPA and PIMA.

18. No boat using tributyl-tin based anti-fouling paints will be allowed to moor within the development. Tributyl-tin based paints will not be used on structures or stored within the development. This will be the responsibility of the Waterways Manager.

19. Accumulated debris, litter and algae in the basins will be regularly removed by the proponent and then the Waterways Manager following transfer of responsibility.

20. The navigable entrance and basin walling will be maintained by the proponent for the first five years of operation and then by the Waterways Manager following transfer of responsibility to the satisfaction of the Department of Marine and Harbours and PIMA.

21. The proponent will be responsible for enactment of the Waterways Management Plan for the first five years following development when management responsibility will transfer to the Waterways Manager.

22. Hydrographic parameters, and water and sediment quality within the basins and Mandurah Channel will be regularly monitored for five years from the time of dredging at which time the programme will be reviewed in conjunction with the EPA and PIMA. Ameliorative measures to the satisfaction of the EPA, proposed in the Waterways Management Plan, will be enacted should unacceptable deterioration occur.

23. All appropriate navigational aids will be incorporated into the development following the advice of the Department of Marine and Harbours.

Appendix 2

Summary of submissions and proponent's responses to submissions

1. GENERAL

1.1 Timing

Comment *I do not know if this assessment was deliberately planned to take place over the Christmas-New Year holiday period to minimise the reaction from the general public. I am sure that as this development is made known, the reaction against it will increase. The 6,000 signatures stating opposition to the Creery Wetlands development will be repeated and outstripped.*

The run-up to the Christmas holidays and New Year would make a big dent in the time available for public to visit the library or council offices to read and make a submission on an 80-page CER.

Response The Environmental Protection Authority (EPA) required the Proponent to extend the public review period from the normal four week period to a six week period in recognition of the Christmas-New Year holidays.

1.2 Document Length and Contents

Comment *The document is far too long, does not address the question of alternative uses of this site, and plays down the likely effects on the environment. For example the question of Aboriginal sites could be dealt with in two pages.*

Response The document has been prepared in accordance with EPA guidelines for the conduct of a CER. All likely effects upon the environment have been adequately addressed. The question of Aboriginal sites was dealt with in three pages. The site is located within the City of Mandurah in an area zoned for development and it has been heavily disturbed over most of its extent from previous activity. There is little reason to discuss alternative development scenarios in these circumstances.

1.3 Environmental Impact Evaluation

Comment *The developers claim in their submission that very minimal environmental damage will be created. Any pressure at all will be too much when one considers the pressure applied to the whole area by the second stage of the Port Mandurah project and future residential development of the land opposite on the west side of the Old Mandurah Road.*

Response Environmental damage will be minimal when one considers the already modified regime of the site. The land has a history of water based recreational activity and the present proposal seeks to include a residential component within that activity.

2. RESIDENTIAL DEVELOPMENT AND OLD COAST ROAD

2.1 Site Levels and Traffic Impacts

Comment The land to the west of this project, Cedar Woods is already low-lying, the marina is lower still. Old Coast Road in winter is almost underwater. What will happen to Old Coast Road when both sides are built up? There is already a three way intersection at the juncture of Old Coast Road and Mary Street. High density housing at the marina only about 100m to the south will create another intersection, and the Proponents are referring to more canals for Port Mandurah, a possible bridge, and another intersection all within a few hundred yards.

Response Old Coast Road in this vicinity will be reconstructed in order to bridge the proposed southern entrance channel to the Port Mandurah development. This bridging work will raise the level of Old Coast Road significantly such that it matches the level of fill proposed for the developments abutting the Old Coast Road Reserve. The comment regarding high density housing in the marina redevelopment is totally subjective as there will be a component of single residential housing and medium density housing.

2.2 Residential Development

Comment The upgrading of the present commercial marina area does not concern me, but I do object to the planned residential development surrounding the marina.

Response The residential development within the proposal is consistent with the "Future Urban" zoning of the land.

2.3 Traffic Loadings

Comment Concern should also be shown for additional pressure on the Old Mandurah Road, bridge and supporting intersections brought about by all these adjoining developments.

Response The proposed redevelopment will not impact significantly upon the capacity of the local road system nor the Old Mandurah Road bridge. The question of the structural adequacy of the Old Mandurah Road bridge is being addressed by the Main Roads Department.

3. ALTERNATIVE USE

3.1 Suggested Alternative Use

Comment There have been many requests over the years for a suitable site for a marina oriented project close to the channel and a main road. We suggest that a single building such as suggested recently for an Estuarine and Marine Institute to monitor the impacts of the Dawesville Cut, would be an environmentally acceptable use for this land.

Response The proposal presents a use for the land that is acceptable to the Mandurah City Council. The land is private property and, subject to approval of the CER and rezoning, the owners have an expectation to be able to develop the land.

Development of an Estuarine and Marine Institute should rightly be accommodated on publicly held land.

4. PUBLIC ACCESS AND OPEN SPACE

4.1 Adequacy of Foreshore Reserve

Comment *This project does not leave enough public access to the foreshore of the main Mandurah outlet channel and I feel that some of this land should be reserved for future public use and possible marina extension as Mandurah grows.*

Response Lot 11 was created by subdivision out of Murray Location 58 approximately 10 years ago. At that time a 30m foreshore reserve to the north and south of the marina itself was considered appropriate. The northern foreshore reserve abuts a recreation area and carpark which adjoins Hall Park. The southern foreshore reserve will adjoin land which itself will be reserved for recreation adjacent to the entrance to Stage 3 Port Mandurah. There is within the locality an abundance of land reserved for public use.

The comment regarding land being set aside for future marina extensions runs counter to the sentiments expressed in the opening phrases of the sentence.

4.2 Recreational Land and Strata Titles

Comment *Are the open space provisions adequate for such a large scale development? Is strata title workable?*

Response The first question that requires clarification is with respect to the scale of the development. The development is not a large scale development as stated in the comment. The open space requirements for this particular subdivision have always been intended to be made in the form of a cash in lieu payment to the Council. This matter has been discussed with the Council on the basis that the canal waterway to be provided forms a component of the recreation area available within the development.

The comment also asks "Is strata title workable?" The response in this regard is such that the only strata title development proposed would be the construction of the 13 strata title home units on proposed Lot 68. This method of title is consistent with thousands of home unit developments throughout Western Australia.

4.3 Crown Land

Comment Part of the subject area has been filled below the high water mark (title boundary). Any prospective developer of the land should be notified that all land below the high water mark is owned by the Crown.

Response The developer is aware that the filled land beyond the title boundary is owned by the Crown.

4.4 Commercial Centre Location

Comment The location of the commercial centre is a problem since it is on the shore of the Entrance Channel. This is unacceptable, as PIMA requires a 30m foreshore reserve fronting the development extending from high water mark inwards.

Response The marina/commercial area proposes the redevelopment of the existing centre and whilst the Peel Inlet Management Authority may require a 30m foreshore reserve fronting the development, this matter is subject to negotiation between PIMA, the Proponent, EPA and the Council.

4.5 Lot Definition

Comment Clear delineation is recommended between the residential lots and the southern wetland area. This should be achieved by a raised board walk.

Response The residential lots proposed to be developed in the southern portion of the site will be retained above the existing foreshore reserve. The retaining wall will provide adequate delineation between these lots and the foreshore reserve. The results of investigations carried out through the Consultative Environmental Review process do not necessarily indicate that these lots abut a wetland area.

4.6 Northern Public Reserve Area

Comment The northern public reserve would be improved with more consideration given to a pedestrian link to the rest of the marina circulation route (Figure 1).

Response Figure 4.4 immediately following page 27 of the CER Report indicates that the northern reserve area is adequately catered for with respect to pedestrian and bicycle links to the proposed development site.

4.7 Width of Foreshore Reserve

Comment A foreshore reserve of 50m in width is preferred along the southern part of the development with 30m in width along the northern section of the subject lot to be ceded free of cost to the Crown.

Response Figure 3.1 of the CER Report indicates the existing 30m wide foreshore reserves to the north and south of the existing marina. These reserves were created upon subdivision of Lot 11 from Murray Location 58 in approximately 1982.

5. VEGETATION

5.1 Conservation of Samphire

Comment There are two significant areas of vegetation which need to be conserved, both are samphire located north and south of the development.

Response As noted in the CER (Section 3.5.3) the remnant areas of samphire vegetation on the proposed development site have been largely modified by previous development and land use. They are affected by weed invasion and some areas have been partially filled. On this basis the Proponent does not consider the remnant vegetation to be worthy of conservation having in mind that active management would be needed to improve their current condition.

5.2 Weed Control

Comment Detailed proposals for the control of weed species into the wetland areas must be submitted to the Peel Inlet Management Authority (PIMA) for review.

Effective measures need to be applied to species escaping into the conservation area (south).

Response The requirement is acknowledged and will form part of the Foreshore Management Plan.

5.3 Topsoil Use

Comment There lies a potential for using existing topsoil material in disturbed areas to encourage recolonisation by indigenous species, in the building of the wall sections (Figure 4.8).

Response The suggestion is noted and will be considered during the detailed design process.

6. LANDSCAPE

6.1 Landscape Master Plan

Comment A landscape master plan, landscape maintenance plan and plant species to be used in the development should be submitted for review to the Peel Inlet Management Authority.

Response It is anticipated that a landscape master plan will be prepared at the time of subdivision approval being granted by the Department of Planning and Urban Development. This is normally the case with respect to landscape master plans and maintenance regimes.

7. CONSTRUCTION METHODS

7.1 Method Description

Comment Generally very unspecific about construction methods.

Response Construction methods are adequately explained in Section 4 of the CER Report and more specifically Sections 4.4 to 4.7 on pages 27 to 32.

7.2 Clean Fill

Comment Clean fill material to be used as a foundation for housing development so as to avoid the infiltration of weed species the site.

Response Section 4.4.3 of the CER Report at page 30 quite clearly implies that clean imported sand fill will be utilised as the foundation for the housing development.

7.3 Spread of Weeds

Comment Effective control measures should be applied during construction to limit the spread of weed species existing on-site or imported in fill material.

Response The concern is noted and care will be taken to:

- (a) Control indiscriminate vehicle movement outside the development area during construction.
- (b) Stripping of topsoil prior to earthworks on the site and also from remote sources of bulk fill. This will effectively reduce the risks of weed spread and importation. If earthworks are to be carried out in summer it may be necessary to stabilise topsoil stockpiles to limit spread of seeds, etc.

8. WET PENS

8.1 Number of Wet Pens

Comment Clarification needs to be made on the exact number of wet pens proposed.

Response The CER Report at Section 4.4.3 on page 27 clearly indicates up to 51 vessels may be accommodated on jetties or in wet pens within the redeveloped southern canal embayment. The existing northern embayment will continue to accommodate the 30 or so vessels once rewalling has occurred.

8.2 Ground Levels

Comment The ground level is unclear. In Section 4.3.1 a design vessel of 1.5m maximum draft is indicated. At low water this would be 1.5m. Minimum depth in the southern basin is 1.96 LWM. Hence clearance at low tide is only 0.46m not 1.2m approximately as indicated in Figures 4.6 and 4.7.

Response The southern embayment will be excavated to a minimum depth of RL-2.7. A mean low water level at the site is 0.6m AHD (Appendix 5 page 2). On this basis and given the design vessel, clearance at low tide will be approximately 1.8m.

9. WATER QUALITY

9.1 Turbidity Control

Comment Unclear regarding specific method to control turbidity.

Response Turbidity created during construction of the development and particularly the enlarged inlet will not be permitted to enter the main channel. The construction technique alluded to in the CER (Section 4.4.2) calls for the principal excavation activities to take place within an enclosed basin created by the construction of a bund across the mouth of present inlet. All water to be discharged during dewatering of the excavation will be routed through the settling basin so created before overflowing to the main channel.

The final activity to create the inlet will be the removal of the containment bund by dredge. This will involve relatively minor excavation works that will be conducted in a manner designed to minimise turbidity.

9.2 Algal Blooms

Comment The opening up of such a large area of foreshore land to at times heavily polluted source waters to create another canal estate has been very lightly treated in the CER. The existing basins have been very prone to blue green algae in the past.

Response The algal blooms in the Peel-Harvey system arise primarily as a result of incoming water quality from the surrounding extensive drainage basin. The situation will not be affected substantially by construction of the proposed facilities. The intended function of the Dawesville Channel is to improve water quality generally in the system and assuming this is successful it would be expected that algal bloom problems will progressively decrease. Again, the construction of this project is not expected to adversely impact on the beneficial effects of the Dawesville Channel.

Comment The Proponents have shown no scientific basis that the cumulative effects of putting such high density urban development around a canal estate in an area of land only about 200m wide between Old Coast Road and the estuary waters is not going to result in the problems of algae infestations and silting that has been experienced almost next door at Port Mandurah and at Waterside Canals.

Response As detailed in the CER (Section 5.3.4) the inlet has been designed specifically to maximise waterway flushing to the point that no deterioration of water quality will occur. However, this cannot guard against poor water quality within the Peel-Harvey system as a whole. The Dawesville Channel and other management measures are intended to deal with these issues.

Management measures will be put in place within the development to minimise adverse impacts on water quality as defined in the CER (Section 6.3).

10. MONITORING

10.1 Water Quality Monitoring

Comment Frequency of water quality sampling needs to be increased. Once a season is not enough to indicate or record water quality in a marina - need a one or two week period of day/night sampling each season which would give more realistic data. Note scales of variability.

Response Monitoring will be carried out on a monthly basis for the first year. It is agreed that quarterly sampling during the period Year Two to Year Five is probably insufficient and it is therefore proposed to review the monitoring programme at the end of Year One in consultation with PIMA and EPA.

10.2 Sediment Monitoring

Comment The sediment monitoring programme should also include analyses of total nitrogen, organic carbon, apatite and non-apatite phosphorus and heavy metals.

Response It is already proposed to incorporate analyses for phosphorus and heavy metals in the sediment monitoring programme. Finalisation of the monitoring programme will be in consultation with PIMA and EPA and can include analysis for total nitrogen and organic carbon if deemed necessary.

Comment Need to sample sediments of old marina that will be retained, particularly to get background contaminants and to ensure new marina and boat pen are not polluting.

Response The comment is noted and sediment sampling within the existing marina will be carried out to determine any pre-existing contamination levels. If excessive contamination levels are found measures will be formulated in the Waterway Management Plan to deal with this in a manner satisfactory to PIMA and EPA.

10.3 Monitoring Responsibility

Comment The Proponent should be responsible for all testing (water quality and sedimentation) for the first five years as he is responsible for monitoring of the Entrance and Walls soundness and condition.

Response The Proponent will take responsibility for all testing for the first five years as indicated in the CER (Section 6.3.9).

11. DRAINAGE AND WASTE MANAGEMENT

11.1 Drainage Containment

Comment The submission claims that provision has been made for drainage and storage of water from this and surrounding areas to protect against pollution of the estuary waterways. However on viewing the drawings supplied I cannot see an area large enough to provide this protection. It all seems to be taken up with units and residential housing.

Response It is the intention of the developers to provide an adequate area of land to which water may be drained and stored to protect against pollution of the estuary waterways. The precise location and extent of this area will be determined upon further development of the engineering aspects of the subdivision.

11.2 Waste Disposal

Comment Plans for disposal of containment of solid waste and waste waters from slipping activities and also disposal of bilge water and effluent must be submitted to the Peel Inlet Management Authority (PIMA).

Response The concerns expressed within the response above will be addressed with the Peel Inlet Management Authority as Development Approvals are granted and in accordance with normal practice.

12. SEWAGE DISPOSAL

12.1 Methods of Disposal

Comment The actual method of sewage disposal needs further clarification.

Response At this point in the development of the design, the proposals for the installation of a reticulated vacuum sewerage system as outlined in Section 6.3.4 on page 43 of the CER Report are considered adequate to address this issue.

MANDURAH MARINA REDEVELOPMENT

PROPONENT RESPONSES TO SUPPLEMENTARY ISSUES

1. TREATMENT OF ESTUARINE WETLANDS

As identified in the CER there are two areas of estuarine wetland on the site in question, one on the south-eastern edge and one on the northern boundary. Both areas are reported to have been largely modified by previous uses and they now only contain limited remnant samphire communities.

The issue raised concerns the retention of these samphire wetland areas. The CER reports an evaluation of the wetland values according to EPA Bulletin 374 and demonstrates an M rating, being multiple use.

The proposed development of the property requires the filling of the northern wetland and retention of the least disturbed part of the south-eastern wetland within the pre-existing foreshore reserve. The Proponent is of the view that the disturbed nature of these remnant samphire areas and the current function of the northern area as a drainage outflow justify this approach.

Samphire vegetation assemblages are well represented on the shores of the Peel Inlet and recent recommendations relating to the Sticks Wetlands, the Chimney Spit Wetlands and the wetlands adjacent to Port Mandurah, Stage 2 will provide an adequate store of representative vegetation in the area. These areas are of a size and disposition that allow for their effective management in contrast to the small area at the northern end of Lot 11. The samphire vegetation contained on the site that will be affected is not unique and therefore is not considered to have significant conservation values. The reported high levels of weed infestation add further weight to this view.

It is also relevant to note that the most recent planning for the future development of the Port Mandurah land to the south and west of Lot 11 provides for the foreshore reserve to be extended along the southern boundary of Lot 11 between the current foreshore and Old Coast Road. This reserve will provide a buffer between residences on Lot 11 and the canal entrance to Port Mandurah of approximately 80m in width.

The vegetation to be incorporated into this reserve contains some elements of samphire associations and will represent an additional reservation in the immediate vicinity of the development.

It is also relevant to note that even if the northern wetland were to be conserved it would be surrounded by developed residential land and consequently put under significant pressures that will be difficult to manage.

On the basis of the above discussion and in view of the reported assessment of the wetlands on Lot 11, the Proponent believes that the development proposal as presently configured does not result in unacceptable environmental impacts.

2. FRAMEWORK FOR THE DESIGN OF INFILTRATION BASIN(S)

Consistent with the Moratorium on Stormwater Disposal within the Peel-Harvey system there will be no nett increase in nutrients discharged to the Mandurah Channel as a result of the Mandurah Marina Redevelopment.

This will be achieved by the Proponent through the construction of one or more infiltration basins within the confines of the proposed development. Construction of the basin(s) will allow the retention of a 1 in 10 year storm event on-site for a period of three to four days prior to its release to the waterway development. An outlet pipe will be located to handle all flow in excess of the 1 in 10 year event.

At this stage the detailed engineering design of the development has not been completed. As a consequence it is impossible to detail the exact location, size or number of infiltration basins required. Nevertheless, the Proponent will provide adequate facilities to meet the drainage design parameters specified.

Infiltration basins act as significant pollutant-removal mechanisms by allowing surface runoff to infiltrate into the ground. The effectiveness of pollutant removal by infiltration is variable and is based primarily on the structure and chemical characteristics of the soil or substrate. Attributes of the soil or substrate that will enhance pollutant removal include:

- * high contaminant absorption capacity;
- * alkaline soils;
- * high organic matter content; and
- * low water table.

The Bassendean Sands in the study area provide relatively poor pollutant stripping capacity and the most efficient method of increasing their contaminant absorption capacity is through their amendment with stripping agents.

In this case the proposed stripping agent is a bauxite residue amended with gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). The residue itself is unsuitable due to a high alkalinity and sodicity. However, when amended with gypsum the material is buffered at around 8.3. The phosphorous binding potential of the residue is attributed largely to its high concentrations of iron oxides and oxyhydroxides. The affinity of iron for soluble phosphate is well recognised.

The use of bauxite residue as a nutrient stripper has recently been applied by Halpern Glick Maunsell to the construction of infiltration basins for the Leda Subdivision. Application rates were calculated by firstly calculating the pollutant loading in kg/ha/year and subsequently developing the relationship between the phosphorus retention index required and the kg of nutrients stripped per m^3 of substrate. It is then a simple task of correlating substrate thickness to the number of years of performance.

At Leda it was recommended that the substrate should be 35% residue ($160\text{kg}/\text{m}^2$ of basin surface area) mixed to a depth of 300mm. At an orthophosphate (soluble P) loading of $0.3\text{kg}/\text{PO}_4/\text{ha}/\text{year}$ the minimum lifespan of the basins is 131 years.

An analysis similar to that conducted above will be undertaken for the proposed infiltration basin(s) for the Mandurah Marina Redevelopment. All calculations will be made available to the EPA for review prior to construction commencing.

3. NUTRIENT MANAGEMENT

Consistent with the requirements to control nutrient inflow to the Peel-Harvey catchment the Proponent will undertake a nutrient management programme as part of the proposed development. Key elements of this programme will include:

- * incorporation of nutrient stripping soil amendment in stormwater infiltration basins on the development;
- * the direction of all runoff from development lots via roadways and the formal stormwater drainage system to the infiltration basin or basins;
- * preparation of brochures to educate future landowners and residents on the benefits of use of slow-release fertilisers, minimisation of fertiliser application rates and the planting of native vegetation that requires less fertiliser;
- * the adoption of native planting treatment to landscaped road verges wherever possible to minimise grassed areas.

The style of development proposed on the site is considered to be consistent with nutrient management in that there is an extensive area of attached housing which will be intensively developed leaving minimal garden and lawn areas. In addition, the residential lots proposed are relatively small, ranging from 450m² to 784m² with the average being approximately 530m². Experience with development in Mandurah on waterfront lots strongly indicates that there will be very limited areas within individual lots that are left unpaved.

The Proponent is of the view that these factors and the proposed nutrient management programme will adequately address the issue of minimising nutrient inflow to the Peel Inlet in an area that is well flushed because of its proximity to the ocean entrance.

4. PEDESTRIAN ACCESS

The issue of pedestrian access through the Lot 11 development has been raised. The intended access is shown in Figure 4.4 of the CER. The route shown provides the most convenient and direct access across the development area and ties into the intended foreshore reserve extension on the southern boundary of the land (refer Point 1 above). This route will ultimately be extended to connect into the Old Coast Road which will cross the Port Mandurah entrance canal on a bridge structure.

It is noted that the pathway route selected will not preclude public access into the foreshore reserves but this will not be actively encouraged to ensure minimal disturbance.

5. WATERWAYS MANAGEMENT

The CER identifies the basis of establishing a waterways management scheme for the development that was consistent with principles being considered by the authorities at the time of document preparation. The Proponent continues to support those proposed arrangements.

However, the Proponent also recognises that no formal arrangements regarding long term waterways management have been agreed and is fully prepared to give consideration to any scheme that may be finally ratified by the various authorities concerned.